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PHYSICAL ACTIVITY, LEARNING SELF-EFFICACY AND ACADEMIC ACHIEVEMENT OF ADOLESCENT STUDENTS:

THE FIELD-LEVEL STUDY IN INDIA AND FIJI

SUSMITA MANDAL

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by

Susmita Mandal

A thesis submitted in fulfillment of the
requirements for the degree of
Doctorate of Philosophy
in Education

School of Education
Faculty of Arts, Law and Education
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October, 2015

DECLARATION

I, Mrs. Susmita Mandal, declare that this thesis is the outcome of my own work and that, to the best of my knowledge, it contains no material previously published, or substantially overlapping with material submitted for the award of any other degree at any institution, except where due acknowledgement is made in the text.

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The research in this thesis was performed under my supervision and to my knowledge is the sole work of Mrs. Susmita Mandal.

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DEDICATION

This thesis is dedicated to my beloved daughter, Ms. Dipanwita Maiti.

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ABSTRACT

Because general and mental health problems among adolescent students are increasing in modern societies, the contemporary literature urges the engagement of young people in sufficient physical activity to maintain their well-being. But parents and teachers do not embrace positive attitudes towards such activity, since it diverts students' attention and time from academic activity. Consequently, they do not encourage adolescents towards this activity sufficiently, especially in developing societies, where securing a decent job is highly competitive. The present study investigates whether time devoted to physical activity adversely affects academic aspects like academic emotional state, learning self-efficacy and academic performance. Improvement in such aspects not only promotes academic development but also helps adjustment to the formal educational system and in combating various inefficiencies facing them in the rapidly changing socioeconomic environment. The existing literature records few studies in this area; those that do concentrate on the interface between physical activity and academic achievement show contentious results that encourage further study. The objective of this study is to investigate the possible influence of physical activity on the attainment of such academic aspects as academic emotional state, learning self-efficacy and academic achievement of adolescent students. This influence must be through the acquisition of positive sociopsychological states by acquiring physical activity self-efficacy as a first step to improvement in general emotion, self-confidence and school adjustment in India and Fiji.

The study relies on the positivist/quantitative paradigm and elicits cause–effect relationships to draw robust findings. A structured questionnaire was developed to capture the proposed variables such as physical activity, physical activity self-efficacy, general emotion, self-confidence, school-adjustment, academic emotional state, learning self-efficacy and mathematics learning self-efficacy into a quantitative framework. A survey collected relevant information for these variables from 873 adolescent students of class X from 16 schools selected in rural and urban areas in India and Fiji. Academic achievement measures were derived from school records and student reports. Cronbach's alpha test was used to assess the reliability of the instruments to justify the questions, before principal component analysis (PCA) was employed to construct suitable indices of the sociopsychological variables. Since the questions used to represent any sociopsychological instrument are not all equally

important, coefficients of the first component derived from PCA were used as weights to construct an index of the sociopsychological variable. Statistical analyses such as ANOVA and regression methods were followed to establish various relationships among the variables. Finally, a structural model was used to establish the pathway from physical activity to academic achievement through various sociopsychological channels.

The results suggest that the sample of students were participating in physical activity mainly by walking, bicycling and nationally popular sports, like cricket in India and volleyball and rugby in Fiji. More than 50% of the total sample of adolescent students engage in physical activity at the lowest level (0–1.4 hours per day), and 23% spend less than 30 minutes. No significant difference was apparent between the average levels of physical activity in India and Fiji, and girls engaged in physical activities at a significantly lower level than boys in both countries. Father's occupation and mother's education played a significant positive role for students' physical activity in India, but not in Fiji. This apart, the statistical results suggested that physical activity definitely had improved academic emotional state, learning and mathematics learning self-efficacy and academic achievement of adolescent students, by enhancing their positive psychological states such as physical activity self-efficacy and then, general emotion and self-confidence, but not through school adjustment, because the attitude of school administration boards towards this activity was not positive. The findings of this study are in line with contemporary research studies, which show the positive influence of physical activity on students' overall development, including academic aspects; moreover, undertaking pathway analysis significantly advances the existing understanding. The study affords anatomical proof of Bandura's (1994) theoretical model of the sources for developing learning self-efficacy. By advancing the awareness of the numerous benefits of physical activity among teachers, parents, educators and policy makers, this study would improve their attitude towards this activity so that physical education is placed in the school curriculum with due emphasis and care.

ABBREVIATIONS

AA	Academic Achievement
AE	Academic Emotional State
AIHW	Australian Institute of Health and Welfare
AISS	Adjustment Inventory for School Students
ANOVA	Analysis of Variance
BDNF	Brain Derived Neurotropic Factor
BMI	Body-Mass Index
BP	Blood Pressure
CDC	Center for Disease Control and Prevention
CDE	California Department of Education
CE	Coordinative Exercise
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSPAP	Comprehensive School Physical Activity Program
CV	Cardiovascular
CVD	Cardiovascular Disease
FES	Family Environment Scale
GDI	Gender-related development index
GDP	Gross Domestic Product
GE	General Emotion
GLS	Generalised Least Square
GLSE	General Learning Self-Efficacy
GMLSE	General Mathematics Learning Self-Efficacy
GNI	Gross national income
HDI	Human Development Index
HR	Heart Rate
ICMR	Indian Council of Medical Research
IDF	International Diabetes Federation
IHD	Ischemic Heart Disease
LSE	Learning Self-Efficacy
LSSE	Learning Skill Self-Efficacy
ME	Mastery Experience
MLSE	Mathematics Learning Self-Efficacy

MSE	Mean squares within Errors
MSG	Mean squares within Groups
NCD	Non-Communicable Disease
NFHS	National Family Health Survey
NPE	National Policy on Education
NSL	Normal Sport Lesson
OLS	Ordinary Least Square
PA	Physical Activity
PAQ	Physical Activity Questionnaire
PAQ-A	Physical Activity Questionnaire for Adolescents
PCA	Principle Component Analysis
PCFI	Perceived Competency Functioning Inventory
PE	Physical Education
PSE	Physical Activity Self-Efficacy
QLTT	Quantum Learning Teaching Techniques
SA	School Adjustment
SC	Self- Confidence
SESRL	Self-Efficacy for Self-Regulated Learning
SESRLM	Self-Efficacy for Self-Regulated Learning in Mathematics
SP	Social Persuasions
SPSS	Statistical Package for the Social Sciences
SSE	Sums of squares within Errors
SSG	Sums of squares within Groups
U.K	United Kingdom
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
USA	United States of America
VE	Vicarious Experience
WHO	World Health Organisation

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CHAPTER 1: ESTABLISHING THE CONTEXT AND RATIONALE

1.1 Introduction

It is evident that ten minutes of regular walking enhances energy and mental acuity, influences social compatibility and promotes positive mood and well-being (Edmunds, Biggs & Goldie, 2013; Weir, 2011). By participating in moderate physical activity daily, most people can improve not only their physical health but also their mental health, by this means improving the quality of life for all age groups (CDC, 1996a)[1]. Physical activity (for example, walking, cycling, participating in sports, and exercises) that requires extra energy has constructive effects on many parts of the body such as heart, skeletal muscles, bones, blood (i.e., cholesterol level, circulation and oxygen carrying capacity), immune system and nervous system[2]. It can reduce mortality and morbidity rates by protecting people from several noncommunicable diseases (NCDs) such as coronary heart disease, hypertension, diabetes mellitus, overweight, obesity, osteoporosis and colon cancer (C3, 2011; de Rezende et al., 2015)[3]. This is well-accepted in the literature and quite evident in daily life. The World Health Organization has identified physical inactivity as the fourth leading risk factor for global mortality (WHO, 2010a). Globally, physical inactivity is implicated in 21.5% of heart disease, 11% of stroke, 14% of diabetes, 16% of colon cancer and 10% of breast cancer (Bull et al., 2004).

Although this is a valid issue for health awareness, it recognizes only a partial story of physical activity. A growing volume of research suggests that physical activity can reduce stress, anxiety and depression and thus, prevent various mental health syndromes (Klein & Deffenbacher, 1977; Klein et al., 1985; Stimpson, 2000). It is believed that physical activity seems to be encouraging a positive attitude[4] and self-confidence[5] as well as perhaps reducing dropout[6] rates and restraining students from

[1] CDC refers Centers for Disease Control and Prevention located in USA.
[2] http://zumbafitnessmumbai.in/the-impact-of-physical-activity-on-health-and-benefits-of-zumba/
[3] C3 represents Collaborating for Health located in London.
[4] "*A person's disposition towards life in a manner that shows optimism*" (http://www.the-benefits-of-positive-thinking.com/definition-of-positive-attitude.html).
[5] Self-confidence describes how a person has belief about himself /herself in general (http://www.uq.edu.au/student-services/counselling/self-confidence).
[6] Dropout defines a "*student who withdraws before completing a course of instruction"* (http://dictionary.reference.com/browse/dropout).

high-risk activities such as alcohol abuse and smoking, which are often experimented with during the period of adolescence (Klein & Deffenbacher, 1977; Norris, Douglas & Raymond, 1992; Duda et al., 2014; Eyler, Brownson, Bacak, & Housemann, 2003; Brown & Evans, 2002). Moreover, the contemporary literature reveals that physical activity has a positive effect on the enhancement of learning and memory (Kramer, Erickson & Colcombe, 2006) and considerable curative properties for cognitive and brain function (Voss, Vivar, Kramer & Praag, 2013; discussed in Chapter 2 in detail). However, this area is still under-researched, and the existing literature does not clearly demonstrate the pathway to derive the favourable effects of physical activity on academic aspects through sociopsychological development. The lack of such recognition is partially reflected in the limited inclusion of physical education in educational systems, particularly in developing societies.

Engagement in physical activity appears to be the essential factor for overall human development in life. It is immensely important, specifically in the adolescent period. This stage of puberty (from 12 years to the early 20s) brings a lot of physiological, psychological and social changes, depending upon various socioeconomic and other environmental factors. Further, adolescence is inherently a "*period of identity-formation*" (Erikson & Erikson, 1997) and defined as "*the age of great ideals and the beginning of theories as well as the time of simple adaptation to reality*" (Piaget, 1966). This is the most important period of life for overall development, in which adolescents must be encouraged to build not only sound physical health but also their mental health and intellectual ability. It is the period of life when the importance of physical activity could be embedded so that young people can continue with it throughout their lives. Thus, physical activity is expected to be playing a favourable role for adolescents by developing their physical activity self-efficacy[7] (Stimpson, 2000). It regulates them in such a way that the effect could accelerate positive emotion for academic activities and build self-efficacy in learning for their proper development in this period. Self-efficacy here refers to one's belief about one's capabilities to learn or perform behaviours at designated levels (Bandura, 1986; Bandura, 1993; Bandura, 1994; Bandura, 1997). Academic emotional state is one of the principal sources to develop learning self-efficacy and is defined as how a person interprets his or her physiological

[7] Physical activity self-efficacy is concerned with people's beliefs about themselves to regulate regular physical activity (Bandura, 2006).

or affective reactions (e.g., mood, anxiety, stress) related to academic activities (Bandura, 1997). Since a substantial change occurs during the adolescent period, a rise in self-efficacy for learning is urgently needed in order to update knowledge as well as their motivation in learning (Gao, Lochbaum & Podlog, 2011; Pekrun, Goetz, Titz & Raymond, 2002; Bandura, 1997). While literature studying the effect of physical activity on mental state has been growing (Edmunds et al., 2013), the literature on its effect on academic emotional state, learning self-efficacy and academic achievement is still limited. In other words, physical activity could play a favourable role in promoting general emotion[8], self-confidence, and school adjustment[9], thus improving academic emotional state, learning self-efficacy and achievement[10]. If this is possible then such activity should be encouraged more at the school level so that adolescent students can be moulded to pursue this throughout their life. This would not only build their immunity power and improve health status but also benefit them by raising their general emotion, self-confidence and school adjustment, and then follow on to their academic emotional state, learning self-efficacy, and achievement.

In addition, since physical activity could have a positive effect on memory, concentration and brain development, this would be immensely important for the sound development of adolescents and their academic achievement. This consciousness has significant relevance to modern society, because it is observed that physical activity declines dramatically during adolescence (CDC, 1996a; CDC, 1996b; Allison, Adlaf, Dwye, Lysy & Irving, 2007)). According to Sibley and Etnier (2003), a major group of children suffer from obesity due to increased sedentary activities such as using computers, playing electronic games and watching TV, and decreased regular physical activity. However, the necessary limitations on the scope of this research meant that it was not possible to look at the physiological and cognitive effects of physical activity; its focus was very much confined to sociopsychological states and academic aspects.

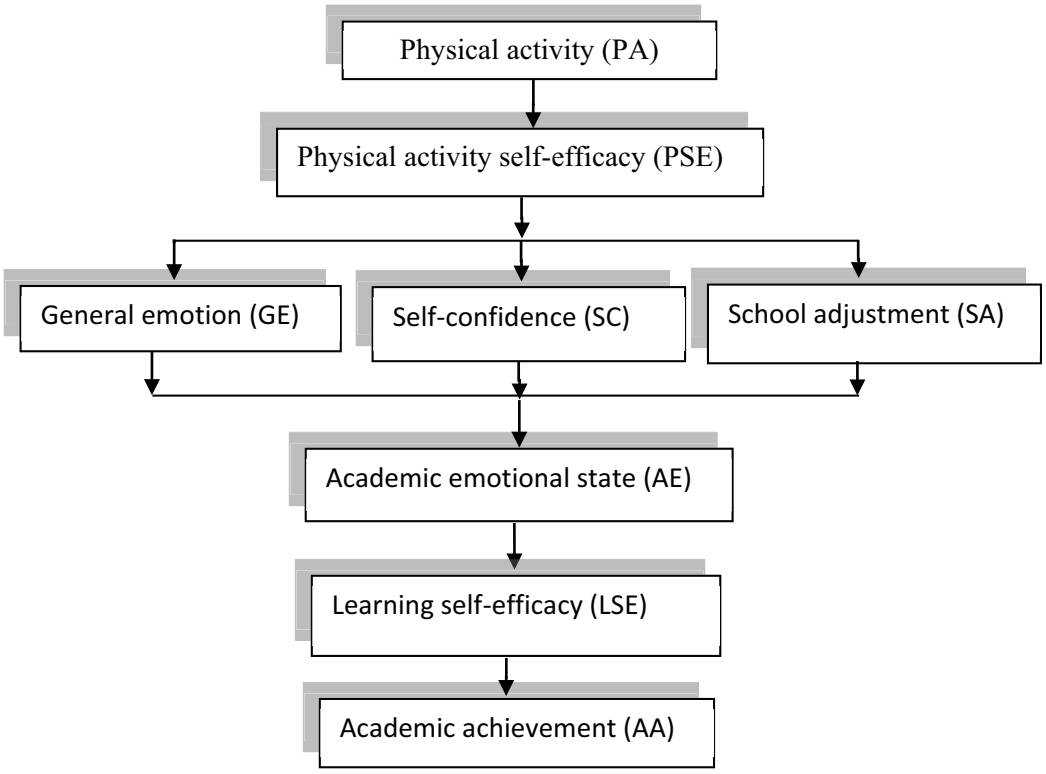
[8] General emotion is defined as complicated psycho-physiological understanding of one's mind status which is the outcome of interaction between bio-chemical (internal) and environmental (external) influences (http://www.jainworld.com/science/Metaphysics/Emotions.pdf).
[9] School adjustment is defined as students' healthy, active participation in various group activities including learning in school (http://medind.nic.in/jak/t07/i1/jakt07i1p73.pdf).
[10] Academic achievement is the learning outcome of a student to achieve his/her educational goal.

Still the positive effect of physical activity on academic achievement is not universally accepted. According to general belief, particularly among parents and school teachers in a typical developing society, the engagement of the adolescent in regular physical activity is at the cost of their academic achievement since this activity diverts their attention and time from academic exercises. Thus, this research study investigates whether such activity favours academic emotional state, learning self-efficacy, and academic achievement by developing physical activity self-efficacy, general emotion, self-confidence, and school adjustment (shown in Diagram 1 and also explained in section 1.7 in detail).

To build a picture of what happens during the years of adolescence in a typical developing society, the research study proceeds by taking sample of adolescent students from two developing societies, India and Fiji. These two countries were considered because of the similarity in socioeconomic conditions and the prevalence of a high poverty ratio and inequality. Nevertheless, significant differences in the geographic and demographic size, educational systems and cultures of those two societies do exist (discussed in detail under section 1.2, Context of the Study). It is important to mention at this stage that the purpose of considering samples from these two countries is not to undertake any comparative analysis but to investigate common relationships that might exist among physical activity, sociopsychological states and academic aspects of adolescent students under the two socioeconomic settings.

The rest of this chapter discusses a brief context of the study in relation to contemporary social problems in section 1.2. Further, it locates the research problems based on contemporary social problems and the existing literature in section 1.3. Section 1.4 describes the statement of the research questions and the objectives of the study have been laid out in section 1.5. Section 1.6 discusses the research paradigm, section 1.7 states the hypotheses and section 1.8 narrates the significance of the study. An outline of the study has been presented in section 1.9, which leads to the summary of this chapter in section 1.10.

Diagram 1: Hypothetical schematic presentation of the effect of physical activity on academic emotional state, learning self-efficacy and academic achievement of adolescent student



1.2 Context of the study

Physical and mental health of the people of a nation is a vital resource for human development. Any deterioration in the condition of such health brings a loss of resources. According to the WHO (2004a), health is "*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*." Various types of health hazards and mental disorders have been mounting all over the world, not only in adulthood but also during the years of adolescence. Therefore, awareness of the benefits of physical activity in preventing and curing such disorders has been increasing. Within this perspective, the current study intends to investigate the role of physical activity in various sociopsychological states as well as academic emotional state, learning self-efficacy and academic achievement during the adolescent period. In order to rationalize such study, increasing evidence of noncommunicable diseases, mental health disorders and adolescent problems,

financial limitations on health sector development, conventional approaches of education systems and the role of schools in relation to the physical activity, mainly in India and Fiji, are discussed below.

1.2.1 Growing noncommunicable diseases (NCDs)

Noncommunicable diseases are characteristically, chronic diseases that are not infectious, result in long term health consequences, and may progress slowly[11]. Four types of NCDs are considered as serious burdens for health and rising mortality rates throughout the world: cardiovascular diseases (such as heart attacks and stroke), cancer, chronic respiratory diseases, and diabetes (WHO, 2014). These are the leading causes of death in the world, resulting in 63% of all deaths annually, of which 80% are in low and middle income countries (WHO, 2010b). According to the World Health Organisation report (WHO, 2011a), around 30% of all deaths globally are due to cardiovascular diseases (CVD), of which 80% of cases are in low and middle income countries including India.

India is the second most populated developing country of the world with a population of 1.21 billion (Census Organisation of India, 2011)[12]. The cultures of India, in terms of languages, religions, dance, music, architecture, food and customs, vary widely across provinces. As well, socioeconomic conditions of the people living in India are not substantially developed. About 70% of the population still live in rural areas and almost 30% fall below the poverty line. Both income[13] and gender inequalities are registered at very high levels in the country (see Table 1.1). The human development index of India, prepared by the United Nations Development Programme (UNDP, 2013), is 0.586 and it ranks 135th in the world in 2013. The approximate life expectancy of people living in India is 66.4 years whereas it is 80.2 and 74.5 years for very highly and highly developed countries respectively (UNDP, 2013; see Table 1.1). Low life expectancy would be the result of premature death and poor health status due to high NCDs, in spite of the progress of medical facilities. The preservation of the health status of the people in India has become a major issue for its human development. In this country, people are increasingly suffering from severe NCDs like cardiovascular diseases, stroke, diabetes mellitus, cancer and chronic lung diseases. They are largely

[11] http://www.globalhealth.gov/global-health-topics/noncommunicable-diseases/
[12] http://www.census2011.co.in/
[13] http://www.wider.unu.edu/research/WIID3-0B/en_GB/wiid/

due to increasing industrialization, urbanization and changing lifestyle without paying proper attention to its adverse consequences on health status. Ischaemic heart disease (IHD) is the leading cause of death. According to the Indian Council of Medical Research (ICMR, 2006), the number of deaths due to IHD is increasing in both rural and urban areas (Upadhyay, 2012). Stroke ranks as the second leading cause of death. Not least among the noncommunicable diseases, diabetes mellitus currently stands at an epidemic rate in India (International Diabetes Federation (IDF), 2009; as cited in Upadhyay, 2012). The National Family Health Survey (NFHS 3, 2005; as cited in Upadhyay, 2012) states that an alarmingly high share of Indian people is suffering from asthma: more than 12 million adults suffer from such chronic pulmonary disease. According to the ICMR (2004), the number of cancer cases is increasing in the country and females are suffering more than males (Upadhyay, 2012). On the other hand, problems like overweight and obesity have increased among females in the urban and high socioeconomic status groups day by day.

Similarly, Fiji is one of the largest of small island developing countries of the South Pacific with a population 837,000 (FIBS, 2007). The cultures of Fiji reflect the mixture of its various ethnicities: iTaukei (Fijian), Rotuman, Indian, European, Chinese and other Pacific Islanders of various types. Its languages, food, costumes, belief systems, architecture, arts, craft, music, dance and sports are widely diverse, with a good deal of overlap as well. According to the studies of Cornejoa, Gonzaleza, Sallis and Veigaa (2015) and WHO (2011b), the young population is relatively large with about 29% under the age of 14 years and 12% between 15 and 24 years. Almost 31% of the population fall below the national poverty line. Income and gender inequalities are also prevalent in the country, but less than those of India (see Table 1.1). Fiji's human development index, prepared by UNDP (2013), is 0.724 and it ranks 88th in the world. Although the economy places it as a high developed country, it presents the level of underdevelopment on many socioeconomic aspects (like poverty, inequality, informal employment, lack of social security). The approximate life expectancy of people in Fiji is 69.8 years. This age is much lower than that for very highly and highly developed countries (UNDP, 2013). According to the recent study conducted by Carter et al. (2011), the life expectancy has been static since the 1980s. This may be an effect of early deaths from NCDs (GBD, 2012; as cited in Snowdon, Raj, Waqa, Kanungo & Robinson, 2013)). Like other developing countries of the world, Fiji is experiencing

changes in lifestyles and suffering from increased mortality and morbidity rates due to NCDs like cancer, cardiovascular diseases, stroke, ischaemic heart disease, chronic obstructive pulmonary diseases and mental disorders (Maharaj & Reddy, 2012; MOH, 2010). From these studies, it is noted that NCDs are the main reasons behind the mortality rate, causing 77% of all mortality in Fiji in 2008. Within these NCDs, the most common was cardiovascular diseases. Cancers, respiratory diseases and diabetes were also found responsible for the mortality in 2008[14]. Pacific Islands like Fiji are experiencing the extra burden of noncommunicable diseases, with the highest rates of obesity and diabetes in the world (Cheng, 2010; WHO, 2008). The record shows a large increase of mean body-mass index (BMI) among females in Fiji (WHO, 2004b). According to WHO (2004b), overweight and obesity are the significant risk factors for cardiovascular diseases, diabetes, cancers and musculoskeletal disorders.

All this information indicates the links between high incidences of mortality and NCDs in both countries. The necessity for proper attention to reduce these problems is apparent.

1.2.2 Growing problems of mental health

"*Good mental health is a sense of wellbeing, confidence and self-esteem*"[15]. Corrosion in mental health causes some mental disorders that affect one's mood, thinking and behaviour. Along with general health, it is observable that awareness of mental and addictive disorders are increasing throughout the world. The most common forms of mental disorder are schizophrenia, depressive psychosis and organic brain syndrome. Due to unhealthy lifestyles such as smoking, alcohol and other substance abuse and a sedentary lifestyle, as well as the prevalence of poverty combined with an uncertain future in developing societies like India and Fiji, mental health problems are increasing along with physical health problems.

In India, 50 million people (approximately 5% of the population) are affected by mental or behavioural disorders[16]. According to the World Health organization (as cited in Reddy, Gupta, Lohiya, & Kharya, 2013)), 9.5 to 102 per 1000 population in India suffer from some degree of either mental or behavioural disorders at some stage

[14] Link-http://www.commonwealthhealth.org/pacific/fiji/noncommunicable-diseases_in_fiji/
[15] http://www.mentalhealth.wa.gov.au/mental_illness_and_health/mh_whatis.aspx
[16] http://www.shraddharehabilitationfoundation.org/mental-health.htm

of their lives. They are suffering from moderate to acute mental health problems like mania, schizophrenia and depressive psychosis (Shah, Parhee, Kumar, Khanna & Singh , 2005). In addition, the report states that depressive psychosis is occurring at a severe rate, e.g., 3.67 per 1000 people in Calcutta, the capital of West Bengal. On the other hand, schizophrenia is acute in Patiala in the State of Punjab, registering 3.09 per 1000 people. A report prepared by UNDP (2013) found that suicide rates were 7.8 female and 13.0 male per 100,000 people in India during the period of 2003–2009.

Similarly in Fiji, it is beyond doubt that unhealthy lifestyles (i.e., smoking, *marijuana*, *yaqona,* alcohol and other substance abuse, poor nutrition and sedentary lifestyle) along with low level of development and continuous out-migration are responsible factors for increased mental disorders. Reliable national-level data on mental illness in Fiji are unavailable. The global prevalence rate of mental illness statistics derived by the World Mental Health Survey in 2004 (as cited in Singh, et al., 2013) indicated that 79,950 adults (13% of the total adult population) suffer from a mental disorder, of which 18,450 adults (3% of the total adult population) have been under severe mental disorders and the rest (61,500 people or 10% of the total adult population in Fiji) have been suffering from mild to moderate mental disorders. These mental disorders include schizophrenia, mood disorder, personality disorder and others. Compared to the adult population, fewer numbers of younger children (below 17 years) have been affected by problems like mental disorders. Furthermore, the study of Singh et al. (2013) states that 58 people (36 males and 22 females) committed suicide, whereas 141 people (63 males and 78 females) attempted suicide in 2009 in Fiji. Over a period of ten years (1994–2003), the suicide cases totalled 949 and the number of attempted suicide cases was 1082.

In sum, there is mounting evidence of various mental health disorders along with physical, especially noncommunicable diseases in both countries. This hazard clearly demands the adoption of proper measures to prevent as well as cure by initiating various changes in cultural and behavioural practices.

Table 1. 1: Human development indicators in Fiji and India

Countries	Human Development Index (HDI), 2013	Life expectancy at birth (years), 2013	Mean years of schooling (years), 2012	Expected years of schooling (years) 2012	Gross national income (GNI) per capita (2011, ppp$)	Gender-related development index (GDI, value), 2013	Income inequality (Gini), 2009
Fiji	0.724 (88)	69.8	9.9	15.7	7,214	0.937 (89)	42.8
India	0.586 (135)	66.4	4.4	11.7	5,150	0.828 (132)	36.8
Very high human development	0.890	80.2	11.7	16.3	40,046	0.975	---
High human development	0.735	74.5	8.1	13.4	13,231	0.946	---
Medium human development	0.614	67.9	5.5	11.7	5,960	0.875	---
Low human development	0.493	59.4	4.2	9.0	2,904	0.834	---

Note: Figures in parentheses represent country rank in the world.

Human Development Index (HDI): A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living.
Life expectancy at birth: Number of years a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant's life.
Mean years of schooling: Average number of years of education received by people aged 25 and older.
Expected years of schooling: Number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout the child's life.
Gross national income (GNI) per capita: Aggregate income of an economy generated by its production and its ownership of factors of production, converted to international dollars using PPP rates, divided by midyear population.
Gender-related development index (GDI): Female to male ratio of HDI.
Gini: Standard measurement of income inequality.
Source: UNDP & WIDER

1.2.3 Adolescent problems in modern society

The previous sub-section has delineated some of the health hazards developing countries experience. This sub-section discusses the prevalence of such problems, attending specifically to the years of adolescence. The stage of adolescence is a vital phase of human development, when much of the most significant biological, psychological and social changes occur. These years are described "*as the spring of life of human beings*" (Chauhan, 2009). According to the biological view, this stage occurs during an individual's 12^{th} to 20^{th} years and is accompanied by major maturational changes. It is also the period of more complex emotions of admiration, when individuals begin to become more independent mentally and emotionally and to follow great ideals. This time of transition is marked by its rapidity, variety and excitement and the boosting of energy for bodily development (Chauhan, 2009).

Fluctuations occurring in this transitional period can drive adolescents in modern society to suffer increasingly from various mental disorders as well as NCDs; in reaction, they often commit to high-risk activities. Today, they encounter many complicated situations and are fighting against poverty and violence, struggling for a better future and coming across parental problems. As a result, some children are found to be mentally depressed and encounter unfavourable experiences. It is true that an individual starts to become independent in this period, but he/she still needs proper guidance. As a result, young people face various conflicts between guidance and independence and some are, therefore, suffering from adjustment problems with friends, parents and society. The resultant frustration and emotional disturbance can underlie various adolescent behavioural problems such as attention span problems, '*withdrawn syndrome*', indulgence in illicit drugs, alcohol ingestion, delinquency, dropping out of school, or displaying suicidal tendencies.

The literature related to adolescent problems in modern society has been increasing. Dropping out of school has emerged as an increasing problem during the period in recent years. The National Center for Education Statistics in the US reports that the dropout rate has been accounted for 8% of all 16 to 24 year olds in 2009 (Aud et al., 2011). At the same time, higher rates were found among various ethnic categories in the USA. According to UNICEF (2013), 8 million children in India are totally out of

the school enrolment and 80 million are not completing their basic schooling[17]. Similarly, UNDP (2013) reports that the primary school dropout rate is 9.1% in Fiji compared to 3.6% and 8.1% observed in very highly and highly developed countries respectively during the period of 2003–2012 (see Table 1.2).

Simultaneously, as part of the same push to modernization, suicide is appearing to be the most dangerous issue during the adolescent period, as mental disturbance of various kinds worsens throughout the world. Almost one out of every four to five youths in the USA suffers from a severe mental disorder throughout their lifetime. This mental irregularity first appears during childhood and adolescence (Merikangas et al., 2010). According to the study conducted by the Center for Disease Control and Prevention (CDC, 2009) , "*Suicide is the third leading cause of death among teenagers*". In the United States, 12% of all deaths among the youths aged 10-24 years result because of suicide (CDC, 2010). One out of every 53 high school students, i.e., 1.9% of high school students in the USA had been seen to report for a serious attempt at suicide (CDC, 2010). According to CDC (2007), suicide is the second leading cause of death among American Indians/Alaska Natives in the age group of 15–34 years old and its rate is 1.9 times higher than the overall national average for the same age group. In an another research study, Heron (2007) conducted a work on the adolescent suicide rate and found that the death rate due to suicide of American Indian/Alaska Native males in the age group 15–19 years old[18] is 2.5 times higher than the overall national rate for males. According to WHO, India has the highest suicide number in the world and the suicide rate[19] accounts for 21.1 per 100,000 people in 2012. Within this number, most suicides take place among the young age group (15–29), especially among females[20]. The adolescent suicide rate has also been increasing gradually in Fiji. It was 66 in 2008 compared to fewer than 50 during the period 2005–2007[21].

Internationally, suicide is an alarming issue, as stated by a superintendent in a New England School District, "*Every school in our district had a crisis plan if a staff*

[17] www.thehindu.com › News › National.
[18] www.Samhsa.gov.
[19] http://articles.economictimes.indiatimes.com/2014-09-04/news/53563875_1_suicide-attempts-suicide-rate-prevention.
[20] http://www.dw.de/suicide-rates-soar-among-indias-young/a-16069866.
[21] www.wpro.who.int/.../adolescent.../fiji_fs.pdf.

member died of cancer or a student got in a car accident. But suicide . . . it wasn't on my agenda". He added, "*We just did not think it was going to happen here. Unfortunately we learned the hard way. It was only after we had a [death in our school community by] suicide that we realised we needed to take a comprehensive approach to preventing a tragedy like this. And we realized we needed to involve everybody—the school staff, students, parents and the community".*[22]

This shows that suicide seems to be a extremely common problem among the young age group even in a very highly developed country. It is undoubtedly known that there are many mental problems—such as depression, anger, drug abuse and other mental disorders—that lead adolescent students towards suicide. More recently some school authorities have realized the necessity to reduce self-destructive behaviours and to improve students' positive attitudes towards the value of life. This has led to the inclusion of various preventive steps in their school curricula to lessen the pull of suicide as an option when youth encounter problems. The introduction of more emphatic physical activity programmes in schools could well be an effective strategy among such remedial initiatives.

Increasingly, evidence suggests that some problems relating to physical health occur even during the adolescent period due to the onset of puberty[23]. Mohammadpour-Ahranjani and colleagues highlighted the intensifying concern about overweight and obesity in adolescence (Mohammadpour, Rashidi, Karandish, Eshraghian & Kalantari, 2004). Their study demonstrated that among a sample of Tehrani adolescent students, girls, in particular, suffer from health problems on an epidemic scale because of overweight. Throughout the world, adolescents in general also suffer from a number of NCDs such as diabetes mellitus, hypertension, coronary heart disease and cardiorespiratory diseases. The increasing adolescent problems have become a grave concern for national governments because of the limits they impose on human development. Governments must tackle this issue.

[22] http://prezi.com/u5mq2suhbwf8/comprehensive-suicide-prevention-in-schools/.
[23] Puberty is the period of transformation from the stage of reproductive immaturity to maturity.

1.2.4 Inadequate government expenditure on health

In order to deal with worsening physical and mental health problems, national governments are showing enduring interest in improving medical services and infrastructure. Although budgetary allocations for this seem to be ever-growing, they are still limited in comparison with requirements. Developing countries like India and Fiji are unable to meet the requirements, to a large extent because of other competing purposes for welfare measures among poor and disadvantaged people. Government budgets for health sectors happen to be low in these countries. According to the report of the United Nations Development Programme (UNDP, 2013), total expenditure on health[24] in India is only 3.9% of GDP, while it is 12.2% and 6.0% in very highly and highly developed countries respectively. Out-of-pocket [25] (personal and private) expenditure on health in the country is very high and this accounts for approximately 59.4% of total health expenditure, whereas it is 13.7% and 33.8% in very highly and highly developed countries respectively. Similarly, according to WHO-CHOICE (2003)[26], the Indian Government allocates less than 1% of the health budget to the treatment of mental illness, as against an 18% allocation in developed countries. There are three psychiatrists per one million people in India compared to 100 per million in Australia and 150 in other developed countries.

In comparison, the total expenditure on health in Fiji is not sufficient. The same UNDP report (2013) finds it as only 3.8% of GDP and out-of-pocket (personal and private) expenditure on health is approximately 21.0% of total health expenditure. Only a small percentage of health expenditure is allocated for mental health problems.

While these two developing countries are suffering from increasing noncommunicable diseases and mental disorders, governments are unable to provide adequate budgets for further health sector improvement so the burden is left to fall on the individuals.

[24] Total health expenditure: Current and capital spending on health from government (central and local) budgets, external borrowing and grants (including (including donations from international agencies and nongovernmental organization) and social (or compulsory) health insurance funds, expressed as a percentage of GDP (UNDP, 2013).

[25] Out-of-pocket health expenditure: Household direct payments to public and private providers of health care services and nonprofit institutions and nonreimbursable cost sharing, such as deductibles, copayments and fee for services, expressed as a percentage of total health expenditure (UNDP, 2013).

[26] http://www.who.int/mental_health/media/investing_mnh.pdf.

Gross national income (GNI) per capita in purchasing power parity terms, reported in UNDP (2013), is US$5,150 in India and US$7,214 in Fiji, whereas GNIs are US$40,046 and US$13,231 in very highly and highly developed countries respectively (see Table 1.1). In India and Fiji, because of the underdevelopment a large section of populations cannot afford the medical expenses out of their own pockets. Remedying this is possible only by sacrificing the budget for other basic needs of the poor. With growing impediments and abysmally low government expenditure, a developing society is unable to cure these disorders and diseases: reduction of the level of those disorders is the best-seeming solution.

1.2.5 Issues of school educational systems in India and Fiji

National governments are required to undertake desirable innovation in school education systems with a view to minimizing the occurrence of physical and behavioural disorders during adolescence. In this regard, this sub-section reviews a few aspects of the education systems in these two countries that may be less than conducive to dealing effectively with these problems.

The Right to Education Act of India (2009)[27] provides that education is free and compulsory for all children from 6 to 14 years of age (Niranjanaradhya & Jha, 2013). But its effective implementation and the quality of the education provided have remained issues at the public school level[28].The trend among parents to enrol their children into the best private English-medium schools provided they can afford it is strengthening. But admission to private schools is highly competitive and places are limited[29]. Competition to secure a job in the future is also intense. As a consequence, the entire education system is designed to provide training and academic knowledge for future employment prospects. This education system is largely reliant on theoretical learning and cramming, with a serious lack of practical learning. It follows text books and articles that are outdated whereas developed countries are more likely to employ advanced technologies to deliver the learning materials for the students and to use project-based learning to encourage students in self-learning [30]. Due to too much

[27]http://indiacode.nic.in/amendmentacts2012/The%20Right%20to%20Free%20and%20Compulsary%20Education%20Act.pdf
[28] http://theviewspaper.net/education-system-of-india-its-functions-drawbacks-and-its-contribution/.
[29] http://india.angloinfo.com/family/schooling-education/school-system/.
[30] http://www.mapsofindia.com/my-india/education/the-examination-system-in-india-some-problems-and-their-solutions.

exam-oriented assessment followed in India, the students compete among themselves even for a difference of 0.5% in the academic score. This process increases the already huge competition among students and escalates their tension. With these lacunas in the Indian educational system, there is virtually no scope to develop students' creativity through their engagement in extra-curricular activities. In the traditional educational system, text book learning and memorization receive more importance than does development of their self-learning, learning self-efficacy and creative thinking[31]. The Indian government, in particular, has brought changes in policies (known as the National Policy on Education, NPE) from time to time in order to improve the quality of education for the Indian people. But such changes hardly pay attention to the extra-curricular activities in the formal educational system. Insufficient government expenditure on education (3.3% of GDP as shown in Table 1.2) and lack of consciousness of the benefits of physical and other extra-curricular activities could be some of the responsible factors behind the negligence towards these activities.

In Fiji, the challenge of obtaining formal education and jobs is somewhat less severe than in India. Government expenditure on education is 4.1% of GDP, which accounts for a higher share than that of India (see Table 1.2). Compulsory education came into effect in 1997 (Ministry of Education, 2000). The target of this policy was to provide access to good-quality education for all school-age children. Despite some reform efforts, Fiji is still following features of the traditional educational system[32] like rote learning and does not place sufficient importance on the development of self-learning, learning self-efficacy and creative thinking. The Ministry of Education began to place more emphasis on the importance of extra-curricular activities like physical education[33], music, art and craft (PEMAC). But PEMAC is still a low priority within the formal educational system. The Ministry of Education in Fiji provides resources as much as possible for an improved quality of education at all levels of the education system, particularly in rural areas. Personnel management, in-service training and budgetary matters are also included in the policy[34]. Still, in the current educational system, the emphasis on physical activity for all students has been somewhat

[31] http://india.angloinfo.com/family/schooling-education/school-system/.
[32] http://education.stateuniversity.com/pages/466/Fiji.html.
[33] https://www.usp.ac.fj/index.php?id=6706.
[34] http://www.fiji.gov.fj/Government-Directory/Ministries-and-Department/Ministry-of-Education,-National-Heritage,-Culture-.aspx.

underplayed due to the lack of consciousness of its health benefits and role in the academic area.

Thus, the school educational systems in both countries fail to recognize their role in dealing with various health hazards and fall far short of any real progress in preventing them. It could be said that the under-spending on the health and education budgets by the governments arises in both these countries. This is not only from their socioeconomic underdevelopment but also from the lack of appreciation of the vital importance of the role of physical education during the adolescent years.

Table 1. 2: Educational status in Fiji and India

Countries	Adult Literacy Ratio	Youth Literacy Ratio	Population with at least some secondary education	Primary school dropout rates	Pupil–teacher ratio	Expenditure on education
	(% aged 15 and above)	(% aged 15–24)	(% aged 25 and above)	(% of primary school cohort)	(number of pupils per teacher)	(% of GDP)
	2005–2012	2005–2012	2005–2012	2003–2012	2003–2012	2005–2012
Fiji	..	..	57.8	9.1	31	4.1
India	62.8	81.1	38.7	..	35	3.3
Very high human development	..	..	86.9	3.6	..	5.3
High human development	94.2	98.9	64.9	8.1	..	4.6
Medium human development	71.7	85.9	47.5	18.3	..	3.7
Low human development	58.2	70.2	22.1	42.7	..	3.7

Adult literacy rate: Percentage of the population ages 15 and older who can, with understanding, both read and write a short simple statement on their everyday life.

Youth literacy rate: Percentage of the population ages 15–24 who can, with understanding, both read and write a short simple statement on their everyday life.

Population with at least some secondary education: Percentage of the population ages 25 and older that reached at least a secondary level of education.

Primary school dropout rate: Percentage of students from a given cohort that have enrolled in primary school but that drop out before reaching the last grade of primary education.

Pupil–teacher ratio: Average number of pupils per teacher in primary education in a given school year.

Education expenditure: Total public expenditure (current and capital) on education, expressed as a percentage of GDP.

Source: UNDP, 2013.

1.2.6 Role of school and physical activity in dealing with problems of adolescents

In a complex society with health hazards and traditional educational systems, the emphasis should be placed on adolescent development as the young people are the future wealth of a nation. Because of high poverty, unemployment and insufficient government resources to address these issues adequately, adolescent students of the developing world, including India and Fiji, face problems and challenges in their daily lives. They encounter mental health problems like depression, stress, anxiety, frustration and suicidal tendency as well as problems for general health. They tend to be more frustrated when they see thousands of unemployed people competing for the same job and face uncertainty for the future. Such a socioeconomic environment for teenagers can intensify a suicidal tendency or compel them to commit into high-risk activities, such as drug and alcohol abuse. This also increases the dropout rate among the adolescent students. Since competition and challenges in modern societies cannot easily be reduced, the future generation needs to be stronger to cope with frustration and depression and to struggle with the competitive world for existence. The effort must be to bring the required change in the approach of educational systems even at the school level, for more successful prevention of the occurrence of such disorders, allowing adolescents a better and healthier future.

Adolescence is the right period in life to build youngsters' academic development as well as their overall development and well-being. It is known that all aspects of human development are interrelated. Plato said, "*the part can never be well unless the whole is well*"[35]. This philosophical view suggests that the school has a highly important role not only to develop the children academically but also to nurture each individual as a complete human being. School is an institution where the young children under 19 years receive education and at the same time have fun with friends. Hence, it can easily promote good habits and positive attitudes. On the other hand, learning is a part of one's intellectual mental activity. It is not possible or sensible to improve only the learning area without paying any attention to proper psychological and physical well-being. It is, thus, very important to develop students' positive attitudes, their general

[35] http://www.wholehealthclinic.net/whc/node/184

emotion and self-confidence level properly from the earliest stage of adolescence so that they can function effectively in the challenging world.

Such development can be fostered by bringing physical activity (PA) with other extra-curricular activities in the school educational system. In this way, schools can discharge an important role: to engage the children in this activity (PA), to promote their physical and mental health[36] and thereby, to economize the health budget for a nation. Many studies (e.g., Brown & Evans, 2002; Duda, et al., 2014; Klein & Deffenbacher, 1977; Klein et al., 1985; Norris et al., 1992; Tremblay, Inman & Willms, 2000; WHO, 2004a) suggest the positive effect of physical activity on general and mental health. According to WHO (2004a), it is common from the literature that participation in physical activity is a "*fundamental means of improving the physical and mental health of individuals*". According to Klein and Deffenbacher (1977), in hyperactive impulsive children, physical activity increases overall happiness in boys, decreases depressive emotions in both genders (Klein et al., 1985). Norris et al. (1992) suggest that during the adolescent period, high intensity aerobic exercise has positive effects on emotional well-being (e.g., less stress and less depression). The existing studies also show that moderate or vigorous physical activity (PA) has a positive effect on health status (blood pressure and weight), quality of life (QOL) and diminishing anxiety and depression (Norris et al., 1992; Duda et al., 2014). Some research studies show a positive association of physical activity with self-esteem (Tremblay et al., 2000), school satisfaction and connectedness that prevent dropping out (Brown & Evans, 2002). Today educators in many countries have given their attention to preventing the risk behaviours of young children through a school-wide extra-curricular (including PA) programme. This programme has a positive impact on skill attainment, pro-social behaviours and character development (Bower, van Kraayenoord, & Carroll, 2015).

Though the various positive effects of physical activity are acknowledged globally, the real picture regarding participation in physical activity is not encouraging. For example, one Australian study reported that 42% of the children aged five to twelve

[36] Mental health is "a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community" (WHO, 2001).

years did not participate in any organized sport or dancing (AIHW, 2008). According to CSIRO (2008), 31% of boys and girls (9 to 16 years) did not follow the national guidelines for physical activity in Australia and adolescent girls participated in physical activity at lower levels than boys. Only a few girls aged 14 to 16 years met the specified standard of national guidelines for physical activity. While adolescents need to engage more in physical activity, to avoid the rising physical and mental health problems, the various factors (like the poor socioeconomic conditions, future uncertainty, sociocultural practices, lack of consciousness and so on), especially in a typically developing society, hold them back from such engagement. The schools are also far from providing the students an adequate level of physical education (PE) and opportunities for this activity. High-quality PE programmes are difficult to find even in the United States (Barroso, McCullum-Gomez, Hoelscher, Kelder & Murray, 2005; as cited in Dorovolomo & Hammond, 2014). Government and school policy makers still think that a physical education syllabus would make the curriculum overloaded (MacPhail & Halbert, 2005). In Fiji, according to Bacchus (2000), 80 minutes per week is allocated for secondary school PE. The school timetable has allocated one or two periods (40 minutes duration per period) per week but in many cases it is simply not strictly followed[37]. As a minimum health related requirement for physical activity, physical education should be taken at a minimum of three times (roughly 40 minutes duration for each) per week (Ronda, Assema & Brug, 2001). Another source recommends that students should be participating in physical education for at least 30 minutes a session, each day of the week (Barroso et al., 2005). However, a significant number of schools are still not providing at least two hours' physical education per week for each student as per the scientific recommendation (MacPhail & Halbert, 2005; as cited in Dorovolomo & Hammond, 2014). To find the space for daily physical activity in the school system is a challenge, partly because of the low priority given to PE compared to other (academic) subjects and partly because of lack of funding (4.1% of GDP for education in Fiji compared to 5.3% in very highly developed countries).

In India, the situation is even worse. Physical education is largely neglected and is not included properly as a part of the education system. Many schools do not realize the importance of physical activity as a part of the educational system and have made it an optional subject only. A few schools do maintain it as an offering, but still do not

[37] http://www.usp.ac.fj/index.php?id=6706.

allocate it sufficient time. The reason lies in the lack of proper funding (only 3.3% of GDP for education), the lack of facilities, and the poor attitude towards physical activity, which is seen as wastage of time. In fact, in India pressure from competition, in each area, for getting admission in schools from primary level to higher education and for securing a job, is tremendous. Entry to each area depends on selection by a high-level competitive examination system and academic requirements. Small wonder that Indian students are more focused on examinations and academic subjects. Nor do parents encourage their children to engage adequately in physical activity. Social constraints and gender inequality make the situation even worse for girls. Here it should be mentioned that realizing the importance of physical activity among all sections of people United Nations has celebrated 21st June, 2015 as the *First International Yoga Day* so that it could increase the awareness among all[38].

This analysis of the study context has portrayed growing health hazards in modern societies throughout the world, particularly in developing countries like India and Fiji, with specific attention to the period of adolescence. The inadequacy of the financial status of governments to deal with problems is apparent. Even school educational systems are not sufficiently in favour of recognizing the importance of measures to prevent such hazards by bringing physical education into the curriculum. Within this broad perspective, the next section locates appropriate research problems for the present study.

1.3 Locale of the research problems

This section is going to find out the exact research area of the study. General and mental health problems are on the rise in modern society in spite of the medical advancement and the existing literature advocates the placement and proper management of physical activity programmes in school educational systems to counter the trend. Still, schools and parents largely continue to encourage students to focus on academic learning activities so that they can prepare themselves well for future working life. They hardly place due importance on physical activity for the welfare of adolescents because the activity may divert students' attention and time from learning activities. Learning is a part of one's intellectual mental activity. One cannot improve

[38] www.yogakenya.org/downloads?task=download&id=9

the learning effectively without proper physiological and psychological well-being. Because, all features of human development are interconnected. It is very important to develop students' positive attitudes, general emotional well-being and self-confidence levels properly as well as their self-efficacy in learning, from the time of their adolescence, so that they can perform in academic areas successfully and also succeed in future challenging circumstances. During the adolescent period, a significant level of learning self-efficacy is imperative in order to update an individual's knowledge as well as motivation in continuous learning (Bandura, 1997; Pekrun, Goetz, Titz & Raymond, 2002). A rise in the level of self-efficacy also helps to overcome various adversities (e.g., setbacks, frustrations, inequities and inefficiencies) that adolescents face in the ever-changing socioeconomic environment, particularly in developing countries like India and Fiji. Besides, in the age of internet, students are more focused on self-learning rather than depending totally on school for knowledge transmission and educational development. Today knowledge building has become more dependent on electronic media. Research shows that students with high self-efficacy for self-regulated learning can make best use of internet-based instruction (Debowski, Wood & Bandura, 2001; Joo, Bong & Choi, 2000).

Self-efficacy beliefs have also received increasing attention in educational research, primarily in studies of academic motivation and self-regulation (Pintrich & Schunk, 1995). People must have a robust sense of efficacy to deal with adverse situations and to sustain the perseverant effort that is needed to succeed. Successes in a period of life further develop personal efficacy (Bandura, 1986). The nature, area and scope of perceived self-efficacy are being changed throughout the span of life. Here, it should be noted that a person's academic emotional state—defined as that person's interpretation of his or her physiological or affective reactions (e.g., mood, anxiety, stress etc.) related to academic activities—influences learning self-efficacy (Bandura, 1997; discussed in Chapter 2). Whether physical activity promotes the academic emotional state and learning self-efficacy of an adolescent student is obviously, then, an important research question. The answer to the question would essentially have implications for the improvement of people's attitude towards physical activity as well as for the ongoing educational strategies applied in these developing countries. This is also important in light of worsening social problems such as: health hazards like NCDs, poor attention span, juvenile delinquency, depressive and disruptive behaviour,

lack of persistence, and dropping out among the present generation of adolescent students.

A growing literature indicates a positive impact of physical activity on cognitive function and brain development as well as on academic outcomes. Sigman (2012), an eminent psychologist and author, suggests that this type of activity helps a child's cognitive processing by increasing blood and oxygen flow to the brain, by increasing levels of norepinephrine and endorphins to decrease stress and improve mood, and by increasing growth factors that help to create new nerve cells and support synaptic plasticity that are the basis of learning[39]. For example, some researchers state that regular exercise can improve cognitive function and increase levels of substances in the brain responsible for maintaining the health of neurons (Cocke, 2002; Rovio et al., 2005; Cornejoa, Gonzaleza, Sallis & Veiga, 2015). Others suggest that such physical activity may have a positive impact on learning and memory (Kramer et al., 2006; Dwyer, Blizzard & Dean. 1996). They came to the conclusion that physical activity is also associated with the maintenance of cognitive function in older adults. According to Active Living Research (2009), children who are physically active and fit tend to perform better in the classroom, and that daily physical education does not adversely affect academic performance. Various studies in the literature support the positive relationship between physical activity/physical fitness and academic performance **(**Linder, 1999; Dwyer, Sallis, Blizzard, Lazarus & Dean, 2001; Fourestier, 1962; 2014; Castelli et al., 2014). Physical activity has positive influences on concentration, memory development, classroom behaviour and academic performance and it is recommended that physical activity can be added to the school curriculum without risk of obstruction of student academic achievement. On the other hand, it is seen that shifting time to "*academic*" or "*curricular*" subjects from physical education programmes does not enhance grades in these subjects. Rather, such shifting may cause health conditions to deteriorate **(**Dwyer et al., 1996; Kirkendall, 1986; Shephard, 1997; Trudeau & Shephard, 2008). In parallel, there do exist some studies in the literature which do not support the positive effect of physical activity on academic performance (Shannonhouse, 2012; Taras, 2005; Keeley & Fox, 2009). The

[39] http://www.telegraph.co.uk/education/educationnews/9133534/Daily-exercise-significantly-improves-pupils-test-scores.html.

effect of physical activity in this area remains controversial and generates interest for further enquiry of its efficacy among different settings.

The literature seems to confirm that physical activity enhances brain function, energy level, body build/perception, self-esteem and behaviour, and does not necessarily improve academic performance. It does not give importance to academic emotional state and learning self-efficacy, which may be developed from physical activity through developing one's general emotion, self-confidence and school adjustment. There is no doubt that academic emotional state and learning self-efficacy are not only predictors of academic achievement but also help students to adjust to the formal educational system as well as to engage more in self-learning, which helps to cope with the challenging world.

1.4 Statement of the research questions

From the previous discussion, it is evident that society is increasingly facing general and mental health problems and that bringing physical activity into the school educational system with an emphasis during the adolescent period may offer an effective means of minimizing the future occurrence of such problems. But the situation is that current education systems focus primarily on learning activities. No doubt, since adolescent students do need to improve learning activities and outcomes, it is important to know whether well thought out physical activity programmes do in fact affect those learning activities and outcomes adversely, as many people assume.

Inclusion of physical activity in the school educational system could definitely bring improvement in both physical and mental states, but such incorporation might be possible only at the cost of time allocated for formal learning and training. Thus, in spite of taking time from learning activities, whether such activity can improve academic performance by promoting academic emotional state and learning self-efficacy through the development of various psychological states would be an obvious research question. This leads to raise three initial questions:

- What extent adolescent students are engaged on physical activity in two developing countries, India and Fiji? Is there variation among the physical activity levels across countries, gender and other socioeconomic conditions (parental income, and educational status)?

- Does engagement in physical activity improve self-efficacy to regulate physical activity?
- Does this engagement significantly explain general emotion, self-confidence and school adjustment and their resultant impact on academic emotional state, learning self-efficacy and academic achievement?

1.5 Objectives of the study

The study intends to pay closer attention to the effect of physical activity on academic emotional state, learning self-efficacy and academic achievement of adolescent students in developing societies like India and Fiji. The objectives of the present research are to study:

(i) the types (e.g., sports, physical exercise, walking/cycling, dance etc.) and levels of physical activity among adolescent students and the variation of the level across various socioeconomic conditions (country, gender, parental income, and educational status).

(ii) the effect of physical activity on physical activity self-efficacy as well as general emotion, self-confidence and school adjustment.

(iii) the influence of general emotion, self-confidence and school adjustment on academic emotional state and on the attainment of learning self-efficacy as well as academic achievement of adolescent students.

1.6 Research paradigm for the study

The previous section which sets the objectives of the study requires the establishment of a scientific framework to help to draw robust and generalized findings in the specific context. This section discusses possibilities for a suitable research paradigm best fitted for the focus of the study that can guide the formation of the required framework. "P*aradigms are patterns of beliefs and practices that regulate inquiry within a discipline by providing lenses, frames and processes through which investigation is accomplished*" (Weaver & Olson, 2006). Taylor, Kermode and Roberts (2007) refer to a paradigm as "*a broad view or perspective of something*". Over the years, based on the beliefs and perceptions of scholars, a number of paradigms have evolved with the increasing problems of research: interpretivist, positivist, transformative, and

pragmatic (Mackenzie & Knipe, 2006). But the two predominant paradigms seen in social science research are the interpretivist and positivist.

The interpretivist paradigm is based on the philosophy of Edmund Husserl's phenomenology (Mertens, 2005; as cited in Mackenzie & Knipe, 2006) intending to understand "*the world of human experience*"[40]. Researchers believing in this paradigm rely on the "*participants' views of the situation being studied*" (Creswell, 2003). Because this paradigm depends on individuals' perspectives and understanding, the paradigm is subjective and depends heavily on qualitative method, information and analysis (Mackenzie & Knipe, 2006).

On the other hand, the positivist paradigm is originated from '*positivism*'**.** In general, positivism refers to '*scientific method*' or '*science research*' and is "*based on the rationalistic, empiricist philosophy that originated with Aristotle, Francis Bacon, John Locke, August Comte and Emmanuel Kant*" (Mertens, 2005; as cited in Mackenzie & Knipe, 2006). It "*reflects a deterministic philosophy, in which causes probably determine effects or outcomes*". Such paradigm is applied in social science assuming that the social world can be studied in the same way as the natural world and explained by causal nature (Mertens, 2005). Hence this paradigm establishes a theory or describes an experience in order to predict and control forces around us (O'Leary, 2004). The paradigm demands objectivity and most commonly uses quantitative methods (Mackenzie & Knipe, 2006).

Both paradigms are very important and useful in providing guidelines for research in different social aspects. The present research on the effect of physical activity on sociopsychological states and academic aspects of adolescent students seemed to require some sound scientific methods in a way that could easily provide strong relationship. Over the years, educational psychology has appeared as a scientific study of the process of human learning. Growing research in this area demands a highly improved methodological approach for the establishment of cause–effect relationship. This approach identifies and quantifies a clear set of dependent and independent variables rather than depending on someone's experience, opinion and '*common sense'* (Smeyers & Depaepe, 2012). Keeping this development and requirement in

[40] http://uir.unisa.ac.za/xmlui/bitstream/handle/10500/1007/03Chapter3.pdf

mind, this research study accepts the positivist/quantitative paradigm as the best approach to deal satisfactorily with the all essential methodological aspects. It should be noted that the study relies on collecting qualitative information of human behaviour before quantifying it for the required analysis to produce robust and objective findings.

1.7 Hypotheses of the study

Following the above mentioned positivist paradigm the current study proposes to test the following hypotheses empirically.

(i) Moderate to high levels of physical activity are limited to a few adolescent students. The level is significantly influenced by various socioeconomic factors.

(ii) The level of physical activity will improve physical activity self-efficacy, but at a decreasing rate. The resultant physical activity self-efficacy significantly promotes students' general emotion, self-confidence and school adjustment.

(iii) General emotion, self-confidence, and school adjustment improve academic emotional state and learning self-efficacy of adolescent students that in turn results in their improved academic achievement.

Physical activity can enhance learning self-efficacy and academic performance via the following mechanisms. (i) By engaging in physical activity, a student can increase physical activity self-efficacy (Stimpson, 2000) and self-satisfaction and reduce stress, depression and anxiety (Norris et al., 1992), which will improve his or her general emotion. (ii) Physical activity develops students' self-efficacy in physical activity and increases their competitive and challenging spirit, which enhances their self-confidence (Bandura, 2006). (iii) Studies show that by participating in physical activity people can strengthen inter-personal relationships and link with one another, build active communities and enhance a safe and supportive environment (Sport England, 1999; Bloom, Grant & Watt, 2005; Sport Matters Group, 2005). Maintenance of good relationships with teachers, peers and the school environment helps to increase students' desire to go to school, prevents dropping out from school (Brown & Evans, 2002) and restrains them from high-risk activities like drug and alcohol ingestion and smoking (Smith, Osgood, Caldwell, Hynes and Perkins, 2013). These attitudinal shifts among students may ultimately have a positive effect on their school adjustment. (iv)

The acquired physical activity self-efficacy, general emotion, self-confidence and school-adjustment may improve their academic emotional state and learning self-efficacy, which definitely exert a positive influence on academic achievement. A schematic presentation of such effects of physical activity on academic emotional state, learning self-efficacy and academic achievement has been demonstrated in Diagram 1 (shown in section 1.1).

1.8 Importance of the study

The study is important on several counts, as listed. It

- would advance the consciousness of various benefits of physical activity among policy makers, educators, teachers, and parents not only for physical health, but also for mental health and academic aspects in the adolescent years
- would find an alternative way to deal with growing mental health disorders and try to economize the health budget when the government is incapable of spending more money for health sector improvement
- would emphasize the importance of placing physical education in the school curriculum
- would contribute significantly to the field of educational psychology by establishing evidence for the source of learning self-efficacy, i.e., academic emotional state. It is very important for adolescent students' motivation and self-regulation
- could bring analytical evidence of Bandura's theoretical model (like social cognitive theory) emphasizing learning self-efficacy that can be developed also through engagement in systemic physical activity.

1.9 Outline of the study

The current work investigates the effects of physical activity on learning self-efficacy and academic achievement among adolescent students in typical developing societies, with particular reference to India and Fiji. The second chapter of the study examines various relevant research and evidence in order to identify the exact gaps amongst the existing literature. Chapter 3 elaborates the research design and the methodology that have been used in this study. The study has used quantitative methods to establish the various relationships among physical activity, various sociopsychological states and

the academic aspects. Chapter 4 analyses the types and variations in the level of physical activity across countries, gender and other socioeconomic factors. It also seeks to establish the relationship between the level of physical activity and self-efficacy to regulate physical activity among the sample students. Chapter 5 analyses the effect of physical activity self-efficacy on students' general emotion, self-confidence and school adjustment, while Chapter 6 focuses on the resultant effect of general emotion, self-confidence and school adjustment on academic emotional state and the effect of academic emotional state on learning self-efficacy and academic achievement among the sample adolescent students. Chapter 7 contains the summary of the findings, concluding remarks and recommendations.

1.10 Summary of this chapter

This chapter has introduced a brief context of the study in relation to growing problems of general and mental health, mainly among the adolescents in modern societies, particularly in India and Fiji, and inadequate government financial support to deal with the problems. The current literature suggests participating in physical activity regularly will overcome these hazards. But parents and the school system seem not to hold favourable attitudes towards this activity, assuming that it will divert students' attention and time from learning activities. With this backdrop, the present study has tried to identify important research problems such as whether this activity does in fact affect their academic aspects and performance adversely.

In short, the study set out to investigate the effect of physical activity on adolescent students' academic emotional state, learning self-efficacy and academic achievement through developing their various sociopsychological states such as physical activity self-efficacy and then, general emotion, self-confidence and school adjustment, taking samples from two developing states, India and Fiji. The objectives of the study rely on the positivist research paradigm to develop methodology for their investigation. Based on this paradigm, the study defines some hypotheses to be tested empirically. The following chapters will describe the existing literature and methodological framework to be used for the study and then will analyze the pathway and causal relationships originated from physical activity.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In the previous chapter, the importance of the study has been contextualized in the perspective of increasing health hazards such as NCDs and mental disorders, mainly among the adolescents in modern India and Fiji. It is argued that though a growing number of studies shows the overall health benefits from physical activity, especially during this adolescent period, parents and school educational systems do not encourage much their children to actively engage in this activity. Because it might divert their attention and time from learning activities. For this reason, the current work proposes to examine any adverse effect of physical activity on academic aspects and performance of adolescent students, if any are found to exist. The study sets to investigate the level of physical activity and its influence on academic emotional state, learning self-efficacy and educational achievement by developing a positive mental health status among the adolescent students purposively sampled from Fiji and India. Before undertaking the analysis, this chapter illustrates current understanding on the above mentioned issues in details that were introduced in chapter 1.

The whole set of literature has been presented in line with the five areas of the current research:

(i) physical activity by types and health benefits, described in section 2.2
(ii) adolescent development and problems and the role of physical activity, discussed in section 2.3
(iii) the impact of self-efficacy on academic outcomes and its sources, discussed in section 2.4
(iv) the effect of physical activity on various sociopsychological outcomes (e.g., physical activity self-efficacy, general emotion, self-confidence and school adjustment), presented in section 2.5
(v) the effect of physical activity on cognitive skills and academic outcomes, outlined in section 2.6**.**

In addition, section 2.7 undertakes the identification of significant gaps in existing research studies. Section 2.8 includes the summary of this chapter.

2.2 Physical activity: types and health benefits

As the growth of health hazards (mainly NCDs) escalates throughout the world (WHO, 2010a), the awareness of physical activity about its various health benefits is rising. This section represents some of the evidence of such hazards, particularly in two developing societies, India and Fiji, and highlights some research studies showing the role of physical activity as a way of dealing with these problems.

Physical activity is known as any form of body movements created by skeletal muscles and needing extra energy. Exercise is recognized as the principal form of physical activities that should be "*a planned, structured and repetitive [activity] for the purpose of improving or maintaining physical fitness*"[41]. In order to raise the level of physical activity among the students school educational systems of many countries introduces physical education in their curriculum. It is important to mention here that physical education contains a curriculum to be delivered by an experienced physical education professional and makes an individual educated for physical activity throughout life time (Shannonhouse, 2012). There are four main types of physical activity[42]:

Aerobic: Aerobic activity moves one's big muscles like in arms and legs. This type of activity requires deep breathing. Examples of aerobic activities are running, swimming, walking, cycling, dancing and jumping. One's heart and lungs become strong by engaging in this activity. The intensity of aerobic activity may vary from mild to vigorous, depending upon how hard one can do the activity.

Muscle-strengthening: This type of activity improves the strength, power and survival of muscles. Lifting weights, climbing stairs and digging in the garden are examples of such activity.

Bone-strengthening: This type of activity helps to build strong bones. Examples of bone-strengthening activities include running, walking, jumping rope and lifting weights.

[41] http://www.k-state.edu/kines/kineseducation/whatispa.html
[42] http://www.netwellness.org/healthtopics/healthyweight/typeactivity.cfm

Stretching: This type of activity improves elasticity and capability for better and effective movements of one's joints. Touching toes, doing side stretches and yoga are a few examples of such activity.

All these types of activity inevitably improve health status. As mentioned in the previous chapter, physical inactivity is implicated in 6% of deaths worldwide[43]. Globally, this inactivity is a significant contributing factor in 21.5% of heart disease, 11% of strokes, 14% of diabetes, 16% of colon cancer, 10% of breast cancer (Bull et al., 2004) and various mental health syndromes (Klein et al., 1985). Therefore, the study on investigating the benefits of physical activity has been undertaken purposefully at a time when health hazards (NCDs and mental disorder) are increasing significantly worldwide, particularly in the developing societies, India and Fiji. Specific incidence of such hazards in relation to these two countries has been highlighted below from several sources.

In India, people are increasingly suffering from severe NCDs. World Heart Federation states that 35% of all deaths take place due to cardiovascular diseases (CVD) within the age group 35–64 years in the country (Fuster & Voute, 2005). According to the Indian Council of Medical Research (ICMR, 2006; as cited in Upadhyay, 2012), the number of deaths has been increasing due to IHD (Ischaemic heart disease) in both rural and urban areas (463,562 in 1998 and 554,194 in 2004). The ICMR report (2006) states that the mortality rate has increased from 593,362 in 1998 to 639,455 in 2004 due to stroke. Within these numbers approximately 12% occur among the age group below 40 years. As per report of International Diabetes Federation (IDF, 2009; as cited in Upadhyay, 2012), the total number of diabetic patients in India is 50.8 million. The National Family Health Survey (NFHS 3, 2005; cited in Upadhyay, 2012) states that 1,600 per 100,000 Indian people are suffering from asthma. It has been seen that more than 12 million adults in India are suffering from chronic pulmonary disease. According to the population data on cancer registries compiled by ICMR, the number of cancer cases was 0.82 million in 2004, of which 0.39 million were male and 0.43 million were female (Upadhyay, 2012). The comparison between NFHS-2 (1998–1999) and NFHS-3 (2005–2006) reports reveals an increase in overweight from 5.9% to 7.4% and obesity from 0.9% to 1.3% among females (Upadhyay, 2012).

[43] http://www.who.int/dietphysicalactivity/pa/en/

Similarly, 22% of Indian people are suffering from moderate to acute mental health problems like mania, schizophrenia and depressive psychosis (Shah et al., 2005). Among these, depressive psychosis and schizophrenia are acute in Calcutta (3.67 per 1000 people) and Patiala (3.09 per 1000 people) respectively. India has the highest suicide number in the world and its rate is 7.8 female and 13.0 male per 100,000 people during the period of 2003–2009 (UNDP, 2013). The most suicides take place among the young age group (15–29).

People in Fiji are also suffering from common NCDs such as cardiovascular diseases, cancers, respiratory diseases and diabetes, which are responsible for 42%, 12%, 6% and 4% of deaths in the total mortality respectively in 2008[44]. Fiji is also suffering from high rates of obesity and diabetes (Cheng, 2010 ; WHO, 2008). The record shows a large increase of the mean body-mass index (BMI) among females in Fiji (WHO, 2004b).

Similarly, in Fiji, 79,950 adults (13% of the total adult population) suffer from mental disorders such as schizophrenia, mood disorder, personality disorder and others (World Mental Health Survey, 2004; as cited in Singh et al., 2013). Furthermore, the study of Singh et al. (2013) states that 58 people (36 males and 22 females) committed suicide, whereas 141 people (63 males and 78 females) attempted suicide in Fiji in 2009. During the period of 1994–2003, the total suicide cases were 949 and the number of attempted suicide cases reported was 1082.

In short, evidence of various physical and mental health disorders is growing in both countries. This hazard calls for prevention and cure by adopting proper behavioural practices within the cultural system. Physical activity has positive effects on several body parts such as heart, skeletal muscles, bones, blood (i.e., cholesterol level, circulation and oxygen carrying capacity), immune and nervous system and is able to diminish mortality and morbidity rates by protecting people from several noncommunicable diseases (NCDs) such as coronary heart disease, hypertension, diabetes mellitus, over-weight and obesity, osteoporosis, colon cancer (C3, 2011). Moreover, it also helps to strengthen bones and muscles, to benefit mental health, and mood and energy levels[45] and has a positive effect on quality of life (QOL) and

[44] Link-http://www.commonwealthhealth.org/pacific/fiji/noncommunicable-diseases_in_fiji/
[45] http://www.k-state.edu/kines/kineseducation/whatispa.html

diminishing anxiety and depression (Klein et al., 1985; Norris et al., 1992; Duda et al., 2014).

The obvious question would now be what would be the minimum duration of physical activity for deriving positive health benefits. The U.S. Department of Health and Human Services (2008) says that if adults participate in aerobic activity at a minimum of 150 minutes per week, they could prevent early death, coronary heart disease, stroke, hypertension, diabetes of type 2 and depression. According to them more physical activity is even better. They also suggest that it is better to engage in less physical activity (less than 150 minutes per week) than nothing. There is no upper limit of total activity according to current science[46]. Rovio et al. (2005) showed that physical activity can be a protection against dementia and Alzheimer's diseases.

US Center for Disease Control and Prevention developed a Comprehensive School Physical Activity Program (CSPAP). The purpose of this programme was to provide the students all opportunities to be physically active in the school so that they could engage in physical activity for at least 60 minutes each day and build up awareness, skill and self-belief for physical activeness to be maintained for a lifetime[47] (National Association for Sport and Physical Education, 2008; Centers for Disease Control Prevention, 2011). The weight of the evidence, then, suggests that physical activity has a strong positive influence for getting better health and quality of life of an individual.

2.3 Adolescent development and problems: the role of physical activity

Physical activity is observed to be playing a favourable role for overall health development. The degree to which it is essential is particularly great during the years of adolescence. This section provides an understanding of adolescent development and an overview of the behavioural characteristics and problems associated with this developmental phase. Also these issues are supported by some research studies showing the role of physical activity in dealing with adolescent problems.

[46] http://sciencebasedrunning.com/2011/08/whats-the-minimum-and-maximum-exercise-to-improve-health/
[47] http://www.cdc.gov/healthyyouth/physicalactivity/cspap.htm

Adolescence is the most significant period of human life in terms of mental, physical and cognitive developments. The word *adolescence* originates from the Latin verb *adolescere* (to grow to maturity). A child experiences revolutionary changes in this transitional period from childhood to adolescence (Chauhan, 2009). According to Jersild (1961), adolescence is the risky period of life when children move from childhood to maturity, '*mentally, emotionally, socially and physically*'. Rogers (1969) described adolescence as, '*a process rather than a period, a process of achieving the attitudes and beliefs needed for effective participation in the society*' (Chauhan, 2009). Piaget (1966) narrated it as '*the age of great ideals and the beginning of theories as well as the time of simple adaptation to reality*'.

The stage of adolescence commences at about year 12 and continues through to the early or mid-twenties. Sometimes the duration of this period depends on culture and socioeconomic conditions of the country. It is the transitional period from childhood to adulthood when great changes occur in all developmental dimensions of an individual (Chauhan, 2009). The adolescents face a range of problems due to these changes during the onset of puberty[48]. Puberty is known as the age of progression from a phase of reproductive immaturity to complete competence. It is the period when the child wants to be independent from dependency and requires substantial adjustment to the physical, mental and social changes that differentiate mature behaviour from those of infantiles.[49] Because of the presence of these versatile characteristics, an adolescent needs to follow proper guidance and nurturing so that he/she can build better and healthier future.

Theory of adolescent development

It is very important to have a proper understanding of the adolescent developmental process for guiding and nurturing them in a scientific way. Therefore, a brief review of the fundamental theories of cognitive, personality and psycho-social development during this period is a relevant starting point. There are a large number of theories evolved on different aspects of adolescent development. However, the current study confines itself to highlighting only a few theories that are related to particular aspects of their development, such as theories of personality (Hall's theory, Freud's

[48] http://old.nios.ac.in/secpsycour/unit-13.pdf
[49] http://old.nios.ac.in/secpsycour/unit-13.pdf

psychosexual development theory and Erik Erikson's psychosocial development theory), theory of social learning (Bandura's theory) and theory of cognitive development (Piaget's theory) (Ausubel, 2002).

Hall's theory is known as the pioneering one of '*a scientific study of adolescence*'. Hall (1904) argued that an individual's psychological development depends on both genetic and social characteristics. He characterised the adolescent period as a period of '*storm and stress*', full of contradiction, rapid changes in mood and emotion; hence, it is defined as an unstable period of human life.

However, today not all psychologists agree with Hall's view that common adolescence is a phase of '*storm and stress*'. According to Bandura (1964), if the society symbolises adolescence as a period of radical tension, rebellion, volatility, and carelessness, such a culture may force them to execute the role of rebel. Bandura says this as a 'self-fulfilling prophecy'. Further, the behaviour of an adolescent is very much affected by the social and traditional setting (Atwater, 1992). As a leading social learning theorist, Bandura observed that adolescents' academic activities and behaviour are significantly influenced by observational learning as well as cognitive variables like abilities, programming schemes, ambitions, ethics and self-regulatory systems (self-monitoring and motivation).

The first publication of Sigmund Freud (1905) about adolescent development focused on the unconscious, the interpretation of dreams, the id, ego and super ego. These various features are explained in his psychosexual development theories (Freud, 1962; Pearce, 2009; Levesque, 2011). There are 5 phases in this theory – oral, anal, phallic, latent and genital. According to this theory, in the latency stage (6 to 11 years) children's unconscious sexual desires are repressed and most of the children like to play and make friendships with the same sex. But after that, in the genital stage (adolescence) that is awakened due to puberty, teens feel attraction to the opposite sex. This stage lasts throughout adulthood, maintaining a balance between all areas of life. According to Freud, personality depends on the shaping of id, ego, and super-ego in the formative years of life. Id is the biological and subconscious part of human personality, which emphasizes immediate satisfaction of instinctual appetite, impulse and need. Ego is psychosocial and it functions to control the demands of the id and adapts the individual to reality. Super-ego is social in nature, which emphasizes moral

values of society and tries to connect the gap between id and ego. According to this theoretical perspective of the sexual conflict in the adolescent period, this period produces anxiety, which results in the development of a variety of defense mechanisms like suppression and self-discipline for coping with stress. Anna Freud (daughter of Sigmund Freud) also espoused that adolescence is a diverse period of instability due to the sexual conflicts of puberty (Ausubel, 2002; Steinberg & Morris, 2001). From this, it is clear that Freud neglected or downplayed the significance of sociocultural influences. But some aspects of his theory (i.e., of a triadic personality) are still foundations for understanding human behaviour (The Pennsylvania Child Welfare Trainning Program, 2005). Triadic personality means that human personality depends on three mutually interacting elements: behaviour, internal personal factors and the external environment (Bandura, 1986).

Like Freud, Erikson (1968) also thought that the personality of an individual depends on a series of predetermined stages (Erikson, 1968). But Erikson's psychosocial theory includes more factors such as social and cultural components influencing human development across the entire life span. According to him, there is a series of internal conflicts throughout the developmental stages, named as '*crisis*'. The crisis in the adolescent period is named as the crisis of identity versus identity of confusion and signifies the struggle to develop self-identity. He believes that if youth develop a clear understanding of their individual identity successfully, they will be confident, healthy and well-adjusted. When someone fails to reach that goal, he will be socially disconnected, confused, lacking in confidence, and lacking in emotional maturity, and may adopt extremist positions. Like Freud, Erikson believes that adolescence is a period of stress and confusion originating from an identity crisis (The Pennsylvania Child Welfare Training Program, 2005; Steinberg & Morris, 2001).

Jean Piaget is one of the most famous and powerful child development psychologists. His first publication, during the 1920s, was on the theory of cognitive development (Case, 1985; Krapp, 2005; Chauhan, 2009); contemporary researchers are still highly influenced by his theory. Piaget defined five kinds of cognitive development during the adolescent period – (1) formal operations, (2) hypothetic-deductive reasoning, (3) propositional thought, (4) the imaginary audience, and (5) the personal fable.

Formal operations: In Piaget's thinking the child experiences revolutionary changes in his/her cognitive development during his/her adolescent period. In this period, the youth can go away from the boundaries of concrete mental operations and mature the capability to think more abstract concepts like algebra and science, more intangible concepts like '*justice*' and '*poverty*' and also the effect of these intangible concepts. Piaget terms this ability '*formal operations*'. Children's cognitive development depends on many factors such as family, culture, the quantity and quality of formal schooling or training, and numerous health and emotional conditions.

Hypothetic-deductive reasoning: Besides the ability for formal operations, children in this adolescent stage develop more scientific and logical standing in the way of problem-solving. Piaget terms this ability '*hypothetic-deductive reasoning*'. With this ability, they can understand various variables in logical ways to formulate hypotheses and to reflect on possibilities.

Propositional thought: According to Piaget, youths in this period can achieve development of another complicated thought process, '*propositional thought*'. This means that the thinker can decide whether a testimonial is fully logical or not.

The imaginary audience: The teens in this age group not only develop more scientifically and logically, but also develop improved ability in the way of observation and interpretation. By observing others' behaviours, words, remarks and appearance, they are able to interpret this information and come to conclusions or reasonable guesses about the thinking, wanting, needing or feeling of the person observed. For this, the children also begin to ask questions about the thinking of other people about them. So unfortunately, with these new reasoning capabilities, the younger adolescents start fighting with the uncertainties about their unstable appearance, individuality and life understanding. According to Piaget, altogether these factors combine to generate the '*imaginary audience*'. Sometimes the adolescents might believe by mistake that everybody around them is observing, judging and inspecting their every movement. As a result, sometimes they become painfully self-conscious. Therefore, the '*imaginary audience*' is an example of the inter-relationship among intellectual, emotional and social development.

The personal fable: Because of developing the capability to practise abstract thought and strong observational abilities, the adolescents attune to others and become more

sensitive to people's requirements. Sometimes, it generates some societal and emotional problems as they compare themselves to others using their new cognitive abilities. They may feel themselves exceptionally unique and different from anyone else in the world. This is known as '*personal fable*' by Piaget. Due to this '*personal fable*', a person can think of himself/herself as superior, cleverer or stronger than others. They may experience some shocking moments as sometimes they might take hazardous risks by over-estimating their capacities. So it is essential for adult caregivers to continue monitoring adolescents' behaviour, selections and decisions. On the other hand, some may feel themselves as less clever, feebler and more mediocre than others. This kind of personal fable may lead them to feel unhappy, frustrated and isolated. If these harmful feelings and thought expand continuously, the individual may become depressed, leading to to further hazardous behavioural problems such as drug use, unsafe sexual activity or even suicide. These young people need sufficient love, supervision and proper care from their caregivers to support them for maintaining balance through these difficult situations.

Though Jean Piaget's theory has greatly helped us to advance our knowledge and understanding of cognitive development, new research modifies his theory. Recent research shows that everybody does not necessarily pass through the phase of Piaget's formal operations, i.e., the capability to think conceptually (Keating, 1979; Cole, 1996). Further, these studies recommend that the skill of abstract thinking may never be fully developed, if it is not practised frequently. Even the majority of adults are able to think conceptually only in some particular areas in which they are expert and have special interest (Nisbett, 1990): adults are not adept at prolonged abstract thinking about unfamiliar topics and concepts.

In summary, the most important characteristics highlighted by various psychologists during the adolescent period can be listed as the following:

1. This is the most crucial and significant period of human life due to substantial changes in all developmental dimensions of an individual.
2. It is the period when the individual is prone to feeling various anxieties and worries.
3. It is the period of frequent fluctuations of mood.

4. It is the period of more complex emotions of admiration such as sentiments of respect and approval.
5. It is the period when an individual begins to become independent and to follow great ideals.
6. It is the period of rapidity, variety, excitement and getting extensive forces of bodily development.

Due to huge changes in various developmental dimensions, an adolescent faces substantial conflicts and encounters complicated situations in modern society. Contemporary studies show that these conflicts can bring not only physical health problems but also various mental health disorders such as adjustment problems, depression disorders, drug abuse and suicidal tendencies

Deepshikha & Bhanot (2009) examined the importance of family environment of adolescent girls and its impact on their socioemotional adjustment in Indian society. One hundred adolescent girls aged 17–18 years were taken as participants of the study. The Adjustment Inventory for School Students (AISS) developed by Sinha & Singh (1971) and the Family Environment Scale (FES) proposed by Bhatia & Chadha (1993) were administered to the sample adolescents. Data was analyzed using percentage and multiple regression analysis. The statistical analysis exposed that family environment played a significant role in socioemotional and educational adjustment of adolescent girls. In a similar study, Gould, Fisher, Parides, Flory and Shaffer (1996) also examined environmental and social characteristics along with familial characteristics and their effects on suicidal risks among children and adolescents. There were significant impacts of the family and school characteristics on increasing suicidal risk among children and adolescents. The most significant risk factors were difficulty in school, family suicide record, deprived parent–child communication and traumatic life events. It is very purposeful to reiterate here that India has the highest suicide numbers (21.1 per 100,000 people) in the world (WHO, 2012) and most suicides take place among the young age group (15–29), especially among females[50]. The adolescent

[50] http://www.dw.de/suicide-rates-soar-among-indias-young/a-16069866

suicide rate has also been increasing gradually in Fiji. It was 66 in 2008 compared to fewer than 50 during the period 2005–2007[51].

Fergusson, Horwood and Swain-Campbell (2002) conducted a study on the relationship among frequency of cannabis use and all negative outcomes in psycho-social behaviour such as violence, crime, depression, and suicidal tendency among adolescents/young adults in New Zealand. They took 1265 children aged 14–21 years as their sample. The results established that cannabis use was related significantly ($p < 0.05$) with all those outcomes. It was also seen that younger (aged 14–15 years) users were more affected by cannabis habit than those in the 20–21 year age group.

Elgar, Arlett and Groves (2003) studied rural and urban differences in stress, ways of coping and behavioural problems in the adolescent period in Canada. The result suggested that in spite of existing difficult socioeconomic situations in rural areas, stress levels and their coping ways were similar to those of urban adolescents. On the other hand, urban boys showed more inconsistency and externalizing behaviours than girls and rural boys. However, stress, coping methods and behavioural problems were interconnected. Brooks, Harris, Thrall and Woods (2002) also studied stress, depression and high risk behaviours among adolescent students and examined the association between them. Here, stress and depression were the dichotomous dependent variable. The regression analysis showed that feelings of depression and stress were related to age, female gender and increasing levels of tobacco use.

Rosenberg and Schoenbach (1989) studied self-esteem and various adolescent problems. As a sample, 1886 American adolescent boys were selected for an investigation into the common association among self-esteem and three common problems of youth - juvenile delinquency, poor school performance and psychological depression. They concluded that low self-esteem fosters delinquency and school performance level is primarily associated with their self-esteem level. The association between self-esteem and depression is bi-directional.

Apart from the research studies relating to the psychological and behavioural disorders of the adolescence period, there are also some surveys and studies related to various physical health problems during this developmental period in the existing literature.

[51] www.wpro.who.int/.../adolescent.../fiji_fs.pdf

Yang et al., (2014) examined the trends and difference of cardiovascular (CV) health metrics among US adolescents. They took 11,233 adolescents aged 12–17 years as a sample from the National Health and Nutrition Examination Survey (1988–1994, 1999–2004 and 2005–2010). They estimated the mean score of CV health metrics and its disparities by sex, race/ethnicity, educational attainment and poverty–income level. The survey report observed that the occurrence of non-smoking and healthy diet was increased, whereas the normal body-mass index and physical activity were decreased from 1988 to 2010. However, the incidents of adolescent CV health metrics were low i.e., 3.5%, 4.0% and 4.0% in the above mentioned surveys respectively and more-or-less unchanged during 1988–2010. There were disparities in mean CV health score among the adolescents by sex, race/ethnicity, educational attainment and poverty–income level.

The increasing health (physical and mental) hazards facing adolescents has become a major issue and thereby, the emphasis should be given to reduce such occurrence and to preserve their health, because they are the future wealth of a nation. Physical exercise is supposed to reduce such physical and mental health related problems during the adolescent period and school can easily deal with them by bringing substantial activities to the routines at the premises. Some studies exist that do suggest the positive role of physical activity and school based programs to reduce adolescent problems.

Valois (2004) studied the association between physical activity and better psychological well-being for teenagers and argued that adolescent involvement in physical exercise was correlated with reduced anxiety and depression and also with better educational attainment. Further, it enhanced parental relations, improved self-esteem and satisfaction and reduced anger and mental strain. Thus, this activity reduced mental health problems as well as decreased tobacco, alcohol and marijuana habits. A similar study conducted by Kirkcaldy, Shephard and Siefen (2002) determined the relationships among the level of involvement in physical activity, self-image, physical and mental health and general life style of adolescent students. They included almost 1000 German adolescent students (aged 14–18 years) as their sample. A complete series of questionnaires was used to assess anxiety-depression, smoking and drinking action, general health problems, self-image, parental acceptance and educational attainment of the adolescent students. Results indicated that there was a

significant relationship between the involvement in sports and the variety of personality; that personality helps the adolescents to refrain from smoking and drinking. It was also found that teenagers participating in regular physical activity were considered to have fewer anxiety–depression and social behavioural problems than those who were much less active physically. The clear implication was that physical activity was strongly linked to physical and mental well-being of adolescents and it also improved their self-image.

In another interesting study, Kim, Seo, King, Lederer, and Sovinski (2014) have looked at school-based obesity prevention intervention. They examined the effectiveness of 18 months of school-based obesity prevention intervention that included physical activity and similar effective ways, under the Center for Disease Control and Prevention. There was a significant downward trend observed in systolic blood pressure (BP) and diastolic BP among the students who accepted this intervention. Also, the study revealed an interesting finding that television viewing hours increased students' BP. Therefore, this school-based program can be used effectively to decrease the incidence of high BP.

In summary, an individual experiences a substantial change in both physical structure and behavioural characteristics during his/her adolescence. Improper nourishment for their sound development may lead to a rise in various forms of behavioural risk. Engagement in more physical activity could prevent them from such high risk behaviours. It is possible to do this in an appropriate way if they develop a sufficient level of self-efficacy to monitor themselves in a proper designated level by participating in regular physical activity.

2.4 Self-efficacy: its impact on academic outcome and sources

In the adolescent period, a substantial increase in self-efficacy in the academic area is needed to deal with the ever changing world, to struggle for future development and employment and to reduce high risk activities. This section discusses various sources for developing a student's learning self-efficacy and its contribution mainly in academic performance.

Perceived self-efficacy is referred to as a person's belief about his/her capability to perform at a designated level and is implemented to control his/her actions throughout

the whole life (Bandura, 1994). A well-built self-efficacy increases an individual's success and well-being through several ways. A person with high efficacy in his/her capability in any area will be able to deal with difficulties and challenging tasks without avoiding them for fear of failing. It fosters his/her inherent curiosity and profound attention in that activity and as a result, he/she is able to acquire skill in that particular activity or area. The individual can pursue a set of difficult aims or objectives and recover quickly even after failure or setback. They recognize ominous situations by way of reassurance because he/she has belief about him/herself to adopt appropriate measures to deal with those situations. Therefore, self-efficacy affects one's emotional development as well as reduces anxiety and depression (Bandura, 1994).

Similarly, physical activity self-efficacy represents a person's belief about his/her capability to regulate regular physical activity (Bandura, 2006). According to Bandura physical activity develops people's efficacious outlook and fosters their intrinsic interest in this activity. This interest helps them to set challenging goals so that they can overcome various untoward situations to maintain regular physical activity.

In addition, learning self-efficacy stands for a person's belief about his/her capability in learning activity. Students who have beliefs about their skill and performance in learning as well as in using effective self-regulatory learning strategies, such as organizing their works and managing their time, are more likely to have higher learning self-efficacy and achievement (Usher & Pajares, 2008).

Contribution of self-efficacy

According to Bandura (1993), the perceived self-efficacy contributes to cognitive growth and performance. It operates with four main systems, which contain cognitive, motivational, affective and selection processes. It makes a contribution in academic development. Therefore, the students' efficacy-belief to control their academic activity and be expert in that area helps them to establish aspiration and incentive level, as well as achievements in learning.

Self-efficacy in social cognitive theory

In this perspective, to explain the importance of self-efficacy in human life as well as in the adolescent period, it must be mentioned that self-efficacy has an important function as an element within the theoretical structure of Bandura's social cognitive theory. According to this theory, human nature is the product of the interaction between environmental characteristics and a person's thinking processes like inner merits and self-beliefs (Bandura, 2001; Bandura, 1986)

A large volume of recent literature discusses the contribution of self-efficacy to various aspects of life and academic outcome. Some of this will be narrated for understanding the dynamics. Engels, Hale, Noom and Vries (2005) investigated the relationship among self-efficacy, emotional adjustment and smoking addiction in early adolescents among a sample of 1,861 students aged 12–13 years from 11 secondary schools in the Netherlands. A series of questionnaires was used to identify the three variables for the study. Cross-sectional and short-term longitudinal analysis yielded almost the same result: that more depressive mood, and lower self-esteem and self-efficacy are associated with a rise in the level of smoking.

Mahyuddin, Elias, Cheong and Muhamad (2006) investigated the association between students' self-efficacy in the English language and their accomplishment in that subject. As a sample, 1,146 students were taken from various secondary schools in Malaysia. A self-efficacy scale was administered to all the students. The result revealed that there was a positive correlation ($r = 0.48$, $p = 0.001$) between self-efficacy and achievement in English language.

In a similar study, Caprara et al. (2008) examined the role and effect of self-efficacy for self-regulated learning on learning outcomes, as well as its role in the possibility of continuing formal education in school using a sample of 412 Italian students aged 12 to 22 years. The statistical analysis indicated that self-efficacy of the students in junior high school was positively associated with their junior high school achievement. There was a significant downturn in self-regulatory efficacy of the students due to their shifting from junior to senior high school. However, the lesser downturn in self-regulatory efficacy signified better senior high school achievement and the possibility of continuing high school education.

Thijs and Verkuyten (2008) undertook an interesting and slightly dissimilar investigation studying the relationship between peer ill-treatment and learning outcome and the function of academic self-efficacy in this regard. The subjects of this study were 1,895 grade 6 students from 108 schools in USA. Similar observations were found from various schools to the effect that peer ill-treatment was negatively related with learning outcome through decreasing academic self-efficacy of the students. It was proposed that ill-treated students had low academic self-efficacy because they thought themselves to be less capable and as a result, they performed academically less well.

As self-efficacy plays an important role in human life, it is essential to identify the sources of developing self-efficacy in learning for the adolescent students. Bandura (1994) identifies four sources to develop learning self-efficacy of the students:

(i) **Mastery experience**: A person's perception of the outcome of his or her own learning areas gives the experience of mastery. According to Bandura (2006), this is the strongest source of self-efficacy. If a student perceives his or her performance as successful, self-efficacy will increase in that area. Conversely, if one perceives his or her performance as a failure, self-efficacy will decrease accordingly.

(ii) **Vicarious Experience:** An individual's perception of others' actions or performances in learning yields a measure of vicarious experience to the observer. Looking at the success of a model, his/her self-efficacy typically increases and decreases where the model fails. People who have little or no previous experience with the task would be more influenced by this source (Bandura, 1997).

(iii) **Social Persuasions:** These are other persons' verbal or nonverbal evaluative responses about a person's performance, such as positive or negative feedback, compliments and others' comments, which can have strong or persuasive effects: one's self-efficacy can be increased by another's specific compliment and positive feedback. On the other hand, it can be decreased through criticism.

(iv) **Academic Emotional State:** This is a fourth source of self-efficacy and captures a person's interpretation of his/her physiological or affective reactions (e.g., mood, anxiety, stress) related to the academic areas which can positively

or negatively influence his/her learning self-efficacy (Bandura, 1997). Pekrun et al. (2002) have done work on academic emotional state. In their study, a self-report questionnaire was developed to determine students' emotion in the academic area. Results suggest that academic emotional state was notably associated with students' motivation, learning strategy, cognitive resources, self-regulation and academic achievement. The study indicated that it is important for educational psychology to pursue affective research in emotional diversity in the academic area, because it has been largely neglected. It should be noted that the present study is more concerned with this particular source with special reference to physical activity.

Some, though scanty, literature has focused on developing self-efficacy among children and students and the role of parents and teachers in this regard. Bandura (1997) and Meece (1997) stated that children, during infancy, get some experiences from parents and caregivers that influence their self-efficacy. Parents who expose their children to different activities and support their efforts help them to meet more challenging works. Meece (1997) has shown that when children are being curious in some activities, they are motivated to work on those activities and thereby, learn new information and skills that develop their self-efficacy (Bandura, 1994). According to Cairns, Cairns and Neckerman (1989) peer influence plays an important role in developing self-efficacy. Students have a tendency to be similar to one another, which through their following and imitating each other has an effect on their self-efficacy. Schunk and Pajares (2002) focused on the influence and role of parents, family environment, peer group, school environment and gender difference for building students' self-efficacy (Schunk & Meece, 2005). Hinton, Simpson and Smith (2008) after a study of developing self-efficacy determined the effects of Quantum Learning Teaching Techniques (QLTT – an incorporated form of teaching and learning to create a productive classroom learning environment[52]) on the students' self-efficacy. Participants were taken randomly from the middle schools in the North Georgia Mountains. QLTT were applied in all sample schools. The Perceived Competency Functioning Inventory (PCFI) was used to test motivation and cognitive aptitude of the students, which indicated their change in self-efficacy before and after applying QLTT. Results suggested that QLTT created a positive learning environment that

[52] www.iqln.com/25A/QLmethods.asp

raised the efficacy-belief in the academic area of the middle–school learners and that self-efficacy increased students' achievement.

Therefore, in the adolescent period a substantial level of self-efficacy is essential for sound development and to develop this holistically within an ever-changing world. Parents and teachers should monitor their children by encouragement in various designated activities so that they are able to acquire self-efficacy in those particular areas.

2.5 The effect of physical activity on sociopsychological outcomes

The benefits of physical activity in dealing with adolescent problems have been discussed before. The previous section has discussed the contribution and importance of self-efficacy in this period. Therefore, the immediate question is this: if physical activity improves a person's overall (physical and mental) health, does it also improve his/her academic emotional state (source of learning self-efficacy), self-efficacy in learning and thereby, academic achievement through developing various sociopsychological states? This section outlines contemporary literature that discusses the various effects of physical activity on sociopsychological variables such as physical activity self-efficacy, general emotion, self-confidence and school adjustment.

Firstly, the discussion will be on what recent studies have suggested about the relationship between physical activity and self-efficacy to regulate this activity. Stimpson (2000) determined five stages for physical activity – pre-contemplation, contemplation, preparation, action, and maintenance – and their relation with self-efficacy in physical activity. Samples for the study were selected randomly from Virginian society. The result exposed important associations among the stages of physical activity and self-efficacy in physical activity. Respondents engaging in the first three stages faced the obstacles of physical activity more than the benefits. As a result, these respondents could not develop their level of self-belief to engage in physical activity. Alternatively, respondents engaging in exercise frequently (action and maintenance stages) recognized the benefits from physical activity. They had high self-belief to engage in physical activity even in a difficult condition. This study may help to improve quality of life with regular physical activity. Similarly,

Ryan and Dzewaltowski (2002) conducted a study relating to physical activity and self-efficacy in this area. But the study determined the associations among childhood physical activity and various types of self-efficacy in this activity. As the participants of the study, sixth- and seventh-grade students were taken from elementary and middle schools in America. The sample students responded in different types of physical activity self-efficacy such as physical activity efficacy, barriers efficacy, asking efficacy and environmental-change efficacy. Statistical analyses indicated that environmental-change efficacy had the most significant influence on the children's engagement in physical activity. The study recommended that children's engagement in physical activity could be developed by raising their confidence in creating a positive environment for this purpose.

Physical activity also has effects on general emotion, which will be discussed from several studies. Evans, Evans, Schmid and Penneypacker (1985) reported about emotionally and behaviourally disturbed children and found that the children engaged in various sports like jogging and football reported lower levels of inconsistent talking. In hyperactive, impulsive children, physical activity increases overall happiness in boys, decreases depressive emotions in both genders (Klein & Deffenbacher, 1977). Norris et al., (1992) examined the result of physical activity on emotional stress and well-being among teenagers in the UK. A sample of 147 adolescents was divided into various levels of aerobic and flexibility training groups and a control group. The researchers reported on exercise, emotional stress and well-being prior to and following 10 weeks of training. Results showed that the adolescents undergoing better physical activity reportedly underwent lower levels of stress and depression. This study provides support to recommend that during the teenage years, a high level of aerobic exercise reflects a positive result on well-being. A similar study conducted by Duda et al., (2014) supported these results.

According to a number of recent studies (e.g., Graham, Kremer & Wheeler, 2008; Holder, Coleman & Sehn, 2009) , anyone can develop his/her self-confidence level by executing even a moderate level of physical activity. There is not so much difference in acquiring self-confidence between moderate and intense physical activity (as cited in Mangano, 2009). Eyler, Brownson, Bacak and Housemann (2003) determined the relationship between walking and self-confidence. The participants were divided into

three groups according to their degree of walking. Data was collected in a telephone survey on the amount of walking and other individual and sociodemographic variables. The multiple logistic regression analysis revealed that regular walkers had greater self-confidence and better social support than others who did not engage in walking regularly.

Some studies reported in the literature suggest that by participating in physical activity a person can strengthen his/her relation and connection with others, build the community full of life and enhance a safe, secure and cooperative environment (Sport England, 1999; Bloom, Grant & Watt, 2005,; Sport Matters Group, 2005). Researchers such as Brown and Evans (2002) found a positive relationship between the school physical activity curriculum and some sociopsychological factors like school happiness and school connectedness. It is undoubtedly known that these two factors can increase school adjustment and thereby, check the dropout rate from school. According to Rovio et al. (2005), physical activity could be added into the school curriculum without hazard of diminishing academic attainment. Moreover, adding physical education into the curriculum is a good way to decrease disruptive behaviour and the student dropout rate.

The literature, then, shows clear benefits of physical activity on sociopsychological states such as physical activity self-efficacy, general emotion, self-confidence and school adjustment. As a logical next step the effect of physical activity on cognitive aptitude and academic areas is discussed as below.

2.6 The direct effect of physical activity on cognitive skill and academic areas

This section turns the spotlight onto literature that examines the direct benefits of physical activity on cognitive skills and aptitudes like memory, concentration and brain development, and academic outcome.

Initially, discussion will focus on the effects of physical activity on cognitive functions such as memory and learning. To study the influence of physical activity on cognitive development, Hopkins, Caroline, VanTieghem, Whalen and Bucci, (2012) selected 54 adults, aged 18 to 36 years, from a UK college and the surrounding community. The participants were healthy but generally inactive. As a tool, a series

of questionnaires was used to evaluate their health condition, mood, memory and anxiety. Participants' gene status of brain-derived neurotrophic factor (BDNF) was also determined to control its status. Half of the participants began a program of walking or jogging for at least 30 minutes four times a week under supervision during the next four weeks. The other half remained inactive. After one month the participants were retested. The result suggested that many of the exercising participants significantly improved their scores on the memory and mood tests. The overall message of this study is that exercise generally increases the ability to remember. According to Kramer et al., (2006), physical activity has a constructive effect on learning and memory. They came to the conclusion that physical activity is also related to the preservation of the cognitive role even for elder adults. Similar impact of physical activity on the efficiency of memory has also been identified in a number of studies (e.g., Dwyer et al., 1996; Kirkendall, 1986; Shephard, 1997; Taras, 2005).

Some other studies have focused on the effect of physical activity on cognitive performance like attention and concentration. In an interesting study, Willis (2007) confirmed that pleasurable experience by any activity (like games and sports) increases neurotransmitter dopamine that stimulates memory as well as promoting acetylcholine that increases attention of the students. Budde, Voelcker, Pietraßyk, Ribeiro and Tidow (2008) have examined an attractive issue comparing the implication of physical exercise and sport on cognitive performance in such matters as attention and concentration among adolescent students with attention deficit problems. They randomly selected 115 youth among the age group 13–16 years and set up an investigation and a control group. At first, a test of attention and concentration (known as 'd2-test') was taken by all the students as a pre-test. Then the investigation group was endorsed for 10 minutes of coordinative exercise (CE) and the control group for a normal sport lesson (NSL). Results of a d2-test (post-test) demonstrated that CE and NSL improved attention and concentration significantly. ANOVA results revealed that CE was more useful in improving attention and concentration than NSL, even controlling heart rate (HR). As the HR was controlled for both groups, they considered that the coordinative nature of the exercise and its leading power to pre-activate the brain parts are very effective for increasing attention and concentration. On this basis, the study recommended inclusion of more rigorous

CE at the school level. Graf, Koch and Klippel (2003) carried out parallel cross-sectional study in Germany, but not for the adolescent period. They have compared 12 involved schools (668 sample students aged 6–7years) with 5 control schools (218 sample students) and found that physical activity was positively related to concentration level for those children. Linder (1999) has also established a similar relationship between physical activity and attention.

It is claimed physical activity could also improve brain development. Voss et al. (2013) reviewed some studies and concluded that physical activity develops cognitive and brain function and also protects from neurodegenerative diseases throughout adulthood. They suggested that physical activity is an economical management technique that might include considerable and curative quality for cognitive and brain function. However, this paper did not specifically mention the effectiveness of physical activity during the adolescent period. But Cocke (2002), Tremblay et al. (2000) and Shephard (1997) all stated that adolescents who participate in physical activity show improved brain function, better concentration, and increase in self-esteem, all of which maintain cognitive learning. According to them, habitual physical activity improves brain quality by increasing cerebral blood flow, changing hormone levels, improving nutrient ingestion, maintaining health of neurons and by raising stimulation.

In the development of memory, concentration, and brain function, physical activity is, ultimately, associated with greater academic performance. Dwyer et al., (1996), Kirkendall (1986), Shephard (1997), and Trudeau and Shephard (2008) reviewed the association between various types of physical activity and academic performance in their papers. They suggested that physical activity has positive effects on concentration, memory and classroom behaviour as well as on cognitive function and intellectual performance. They recommended that physical activity can be brought to the school programme with no concern about causing any deterioration of students' academic achievement. Moreover, it is seen that accumulation of time for '*academic*' purposes by less engagement in a physical education program does not improve academic performances and also may cause deterioration of the health condition. Linder's (1999) similar study used a questionnaire to elicit information about physical activity and academic performance from 4,690 sample students aged 9–18 years in

Hong Kong. The result revealed a significant relationship between high academic performance and greater participation in physical activity.

In Australia, a similar study looked at a sample of 7,961 Australian school children, 7–15 years old (Dwyer et al., 2001). A questionnaire was administered to students to capture their physical activity and academic performance correctly. For physical activity the students were asked about their time involvement in sports in a week and academic performance was captured on a 5-point scale. Statistical analysis revealed a significant correlation ($r = 0.3\text{-}0.5$; $p<.001$) between physical activity and academic performance. Similar study results are also reported by (Fourestier, 1962) .

Shephard et al., (1984) compared the students' academic performance according to the intensity of their physical activity. They found that students, participating in physical education at 5 hours per week, had performed academically better than a control group participating in the normal school program for 40 minutes per week.

Active Living Research (2009), a research organisation, published some studies regarding the association between physical activity and academic performance among children and adolescents. According to this publication, the children who were engaging in physical activity and were physically healthy, achieved higher scores in the classroom activities, suggesting that regular physical education does not have any adverse effect on academic performance.

School, it seems, can provide the students this opportunity for excellent learning environments and improving their health status through physical education. The literature reviewed here certainly indicates a positive role of physical activity on cognitive skill development and academic performance.

Nevertheless, not all studies support the positive effect of physical activity on academic performance (Rasberry et al., 2011). Shannonhouse (2012) studied the effect of physical activity on academic achievement among kindergarten aged children using experimental and control groups. The result of ANOVA showed that the experimental group performed academically similar to the control group at the end of a year after undertaking a course of physical activity program during 2008-09. But the limitation of this study is that the researcher took a very small sample (n= 24 kindergarten students) in the experimental group that is not sufficient for sound

statistical analysis. Taras (2005) reviewed 14 studies in relation to the association between physical activity and school performance and demonstrated weak or no correlation between physical activity and academic performance. Keeley and Fox (2009) reviewed a further 18 studies, applying various methods from randomised control trial, quasi-experimental and correlation, to investigate the effect of physical activity on cognitive function and academic achievement. They concluded that there is weak positive association between physical activity, fitness and academic achievement, as well as insufficient evidence to conclude that the time for additional physical education increases academic achievement. Further, they commented that the quality and depth of such research still limit the possibility of making a conclusive remark.

However, the results of the existing research studies are heavily influenced by the methods used and the samples taken. The effect of physical activity on academic achievement has been still debatable and controversial. Therefore, it continues to motivate the researchers to undertake this type of research in different ways under various socioeconomic contexts. Within this backdrop, it is important to identify the gaps in contemporary research on this issue.

2.7 Research gaps

The existing literature identified and discussed in this chapter relating to this study explains (i) the several benefits of physical activity on general and mental health; (ii) the various development theories and real problems of the adolescent period and the role of physical activity in this regard; (iii) self-efficacy and its relationship with academic achievement; (iv) effect of physical activity on psychological and psychosocial outcomes (e.g., physical activity self-efficacy, general emotion, self-confidence and school adjustment); and (v) the effect of physical activity on cognitive skills like memory, concentration and brain development and academic achievement.

Though the effect of physical activity on various aspects of both physical and mental health has been growing in contemporary research, still many issues are under-researched, specifically in the context of the developing societies such as India and Fiji. The current research is an attempt to address this issue but is very much limited to sociopsychological states and academic aspects. It does not go into the investigation

of the physiological and cognitive effects of physical activity. Therefore, the research gaps of the existing literature can be listed as below:

(i) The role of physical activity on behavioural and academic development, in particular, is yet understudied in relation to the problems of the developing world.
(ii) Research on the relationship among sociopsychological state and academic emotional state, learning self-efficacy and academic achievement is scarce.
(iii) Though academic emotional state can influence students' learning self-efficacy positively or negatively (Bandura, 1997), still this issue is under researched in educational psychology.
(iv) Though some research has identified the influence of physical activity on academic outcome, no research to date has shown the effect of physical activity on academic emotional state and learning self-efficacy.
(v) Moreover, a large volume of research studies on the interface between physical activity and academic outcome have been confined to the direct relationship between these two variables only. They ignored the pathway from physical activity to academic area through the development of various psychological and sociopsychological factors. Hence, the research relating to the influence of physical activity on academic achievement through mental health is neglected.

The current research is an attempt to address some of those issues.

2.8 Summary of this chapter

This chapter has provided a current understanding of the various health benefits of physical activity with evidence of significant health hazards in India and Fiji and growing mental and behavioural problems in the adolescent period, drawing from the existing literature. Literature shows various positive effects of physical activity in dealing with physical and mental health hazards of adolescents. This activity is also favourable for cognitive skills development. But the results in case of the effect of physical activity on academic achievement have been still controversial in published literature. Though the literature suggests that the importance of positive academic emotional state and learning self-efficacy are very useful in adolescence, it does not refer to their development with special reference to physical activity. The present study

aims to investigate the effect of physical activity on academic emotional state, learning self-efficacy, and achievement of adolescent students. The next chapter will discuss the required research methodology including questionnaire preparation, data collection and statistical techniques of analysis that have been used to establish the various relationships of the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology that has been utilised to test the hypotheses systematically outlined in Chapter 1. As discussed in Chapter 1, two principal research paradigms (interpretivist and positivist) are dominant in social science research. To a large extent the existing literature in this field of social sciences relies on discursive analysis bringing anecdotal evidence with various qualitative approaches. But such analysis depends heavily on an individual's perspective and understanding and is influenced by subjective judgements (Mackenzie & Knipe, 2006), and hence, suffers from incontrovertible robust findings. No doubt, research on psychological issues needs to depend more on qualitative information of individual behaviour, because the readymade data required for the analysis are not available in quantitative form. But the present research on the effect of physical activity on sociopsychological states and academic aspects of adolescent students asks for a cause–effect relationship to be sought to avoid subjective judgement and attempts to draw robust and objective findings from there. Further, it should be noted that the growing amount of research in psychological and behavioural issues also demands highly improved methodological approaches to discover the cause–effect relationship by identifying and quantifying a clear set of dependent and independent variables rather than depending upon someone's 'common sense' and subjective judgement. With this perspective, the present study relies on the positivist/quantitative paradigm to deal with the objectives and hypotheses of the study. The quantitative approach has been applied to express individual behaviours into the structural framework among a set of sociopsychological variables so that causal relationships between them can be established by applying suitable statistical techniques.

It is a cross–sectional and cross-cultural study and the required data have been collected from samples of adolescent high school students in India and Fiji. A structured questionnaire has been used to collect data from those student samples drawn from the two countries so that a sufficient number of students could be surveyed to allow for sound statistical analysis. In order to capture a generalised picture of a particular country, it requires conducting a detailed sample survey using various strata

to cover all possible regions and sections of the country. The current study does not have such scope, having been somewhat constrained by both time and money. Within this limited scope and opportunity to conduct a sample survey to represent a proxy for the whole country, the sample size really has been small, concentrating on one particular region of a large and diverse country. However, it has been sufficient for conducting reliable statistical analyses.

With a brief introduction of hypotheses of the study, this chapter describes the characteristics of various variables as well as the whole questionnaire capturing those characteristics in sections 3.2 and 3.3 respectively. Survey design for data collection has been explained in section 3.4 and section 3.5 describes various statistical tools and techniques to be used for data analysis. Finally, section 3.6 is a summary of this chapter.

In order to investigate the influence of physical activity on academic emotional state, learning self-efficacy and achievement of adolescent students in India and Fiji, the study has set the hypotheses as follows:

(i) Moderate to high levels of physical activity are limited to a few adolescent students. The level is significantly influenced by various socioeconomic factors.

(ii) The level of physical activity will improve physical activity self-efficacy, but at a decreasing rate. The resultant physical activity self-efficacy significantly promotes students' general emotion, self-confidence and school adjustment.

(iii) General emotion, self-confidence, and school adjustment improve academic emotional state and learning self-efficacy of adolescent students that in turn results in their improved academic achievement.

A schematic diagram that represents the logical flow of the relationship to be examined among the various sociopsychological variables originating from physical activity is shown in Chapter 1.

3.2 Variable description

This section describes the key variables used in this study. These variables are grouped into three broad heads:

(i) physical activity

(ii) sociopsychological variables (e.g., physical activity self-efficacy, general emotion, self-confidence, school adjustment, learning self-efficacy, mathematics learning self-efficacy, sources of adolescent students' learning self-efficacy - mastery experience, vicarious experience, social persuasions, academic emotional state and academic achievement**);** and

(iii) socioeconomic variables (e.g., parental income status, parental educational level, time spent on various activities, purpose of doing physical and learning activity).

3.2.1 Physical activity (PA): The method of estimation

Physical activity is the most important and focused variable in this study. As discussed in Chapter 2, it represents any movement of body that requires more energy than resting. The study has utilized a self-recall and report measurement instrument followed by the Physical Activity Questionnaire for Adolescents (PAQ-A) developed by Kowalski, Crocker and Donen (2004) with minor modification as the measure of physical activity. This self-reported measurement tool can be administered easily to a large sample in a classroom setting. It consists of questions relating to students' participation in the previous seven days in fourteen types of physical activity (such as walking, running, jogging, swimming, dance, football etc.) that they usually perform (see section C.1 and C.2 in appendix A). It captures from moderate to vigorous intensities of physical activity undertaken by the adolescent students. The study has made some modifications to the questionnaire (PAQ-A; Kowalski et al., 2004) as follows: *Firstly*, the students have been asked to report the exact time spent on their various forms of physical activity in the previous seven days, instead of simply asking frequencies of such engagement. *Secondly*, two out of four approaches in the previously mentioned work have been considered for the preparation of the questionnaire here in order to reduce the interview time. *Thirdly*, within the first approach, the study has included some common physical activities such as walking, running, jogging, swimming, dance, football etc. that the students execute in day-to-day life. A few activities like skipping, rowing/canoeing, in-line skating, tag have been ignored as these are not common and relevant for the students living in the sample countries. However, all other activities that are ignored previously have been considered under the '*other*' category (see details in appendix A). *Fourthly*, within the

second approach, the study has included some questions also on total time spent on those physical activities, but at specified periods (i.e., during school physical education class, lunch time, after school, evening) within a school day and also on weekend days during the previous 7 days. Kowalski et al., (2004) also included 'recess' time physical activities within this approach. But the present study has not included these. They have been absorbed within the above mentioned '*specified periods*' when the students are expected to be engaged in physical activity in a day.

The mean value of total time spent on all activities from the above mentioned two approaches would essentially be able to provide a close proxy of the actual time spent on physical activity in the previous seven days. This study on physical activity includes games and purposive acts that involve substantial body movements. In other words, it excludes household activities that students, especially in rural areas, usually execute in day-to-day life, such as sweeping, mopping, washing, and gardening. Though these activities also involve substantial body movement, the purpose and structure of those activities are different and may not be conducive to deriving benefits on the psychological and mental state. The PAQ-A has some strengths as well as limitations that are discussed below:

Strengths

(i) The PAQ-A has strong statistical validity and reliability to measure general physical activity levels of adolescent students.

(ii) It uses memory cues such as physical education class, lunch or evening activities etc. to help the students to develop their recall ability.

(iii) It is low in cost and easy to administer to a large population.

Limitations

(i) The instrument measures only total time spent on common physical activities. It does not assess an estimate of caloric expenditure and discriminate between moderate and vigorous activities or structural and common activities.

(ii) It is appropriate to use during the school time only, not in the summer or holiday periods.

3.2.2 Sociopsychological variables

3.2.2.1 Physical activity self-efficacy (PSE)

Physical activity self-efficacy is concerned with people's belief about themselves to regulate regular physical activity (Bandura, 2006). The study has considered a physical activity self-efficacy scale developed by Bandura (2006) using some questions on self-regulated physical activity depending on this idea that if someone has sufficient self-efficacy in physical activity, he/she must maintain physical activity on a regular basis even if there is any troublesome situation. This scale contains 18 questions to assess students' confidence level for engaging in physical activity in different difficult situations (e.g., when tired, when facing various problems etc.). The answers have been rated on a 10-point scale, '0' representing the lowest and '10' the highest. The higher the value means the greater will be the PSE value (see section D in appendix A).

3.2.2.2 General emotion (GE)

General emotion is defined as a complicated psycho-physiological understanding of one's mind status, which is the outcome of interaction between bio-chemical (internal) and environmental (external) influences[53]. When the body perceives a stimulating fact, it changes accordingly and our feeling for the same fact is known as emotion[54]. It is important to develop the ability to regulate emotion according to the situation that helps to achieve goals. According to Fox (1994), lack of ability in regulating emotion may result in harmful arousal and misdirection of emotion that inhibits one's adaptable ability and appropriate functioning. To capture students' various mood, anxiety, and stress in different situations, a general emotion scale (based on the modified Bell Adjustment Inventory Method, adapted by Mohsin & Shamsad, 1970; used by Roy & Ghosh, 2012; as cited in Rajeswari & Eljo, 2013) has been used in this study. The questionnaire contains 16 questions on various feelings and reactions of the students in different situations or their degree of anxiety feeling under hypothetical conditions such as '*do you feel fear in the dark* or *in the imagination of an earthquake*?' The

[53] http://www.jainworld.com/science/Metaphysics/Emotions.pdf
[54] changingminds.org › Explanations › Theories.

answers of the students have been rated on a 10-point scale, '0' as '*not at all*' and '10' as '*very often*'. All the questions are negatively stated, so the higher the value of the answers means the lower the value of general emotion. To find the higher value of the index for the higher positive general emotion, the values of all answers have been changed in Chapter 5 into a positive direction of emotion by subtracting them from 10. Then, the higher value represents the greater GE value (see section E in appendix A).

3.2.2.3 Self-confidence (SC)

Confidence refers to the general strength of belief, not in a specific area. On the other hand, self-efficacy is the belief in one's capability to achieve something specific (Bandura, 2006). Self-confidence describes how a person has belief about him/herself in general. The study assumed that a person, who has high self-confidence is aware of his strengths and limitations, can take proper decisions and action according to the situation, can accept failure and learns how to strive to achieve success. Hence, he/she gets positive feedback from the people and seems to live life with passion and enthusiasm. To capture these qualities, a scale developed by Mind Tools Corporate[55] based on Bandura (2006) has been used to measure student's confidence level (henceforth SC) where the students have been asked how they face or manage various adverse situations or how they keep a positive attitude even during failure. The scale includes 14 questions, such as '*I handle new situations with relative comfort and ease*'. The answers of the students have been measured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. The higher the value means the greater will be the SC (see section F in appendix A).

3.2.2.4 School adjustment (SA)

Semantically, the meaning of '*adjustment*' is '*to fit, make suitable, adapt, modify, or make correspondent*'. Thus, the adjustment between two things means adaptation or modification of one or both correspond to each other (Mangal, 2011). The study assumed school adjustment as students' healthy and active participation in various group activities including learning and their relationship with peers and teachers in school. Based on a modified Bell Adjustment Inventory method (adapted by Mohsin & Shamsad, 1970), a school adjustment scale has been constructed involving various

[55] http://www.mindtools.com/pages/article/newTCS_84.htm.

adjustments of the students in school such as with teachers, peers, learning and other activities. This scale contains 10 questions such as '*Can you share your problems with your peers*'? The answers of the students have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. This scale has both positive and negative statements. To find all the answers in the positive sense, the negative values of answers of these questions have been changed in Chapter 5 into a positive direction by subtracting them from 10. Then, the higher value represents the higher school adjustment for all the questions (see section G in appendix A).

3.2.2.5 Learning self-efficacy (LSE)

Learning self-efficacy is concerned with people's strength of belief about their capability in learning (Bandura, 2006). The study has constructed a learning self-efficacy scale based on Bandura (2006) and modified by Thomas (2013) for assessing students' confidence level in learning in three different ways:

(i) The first part includes general learning self-efficacy in which the questions are on the students' confidence level in general learning. It contains 4 questions such as, '*in general, how confident are you in your abilities in learning*?'

(ii) The second part includes learning skill self-efficacy in which the students have been asked to identify their confidence level in various academic subjects such as mathematics, science, language, social studies and so on.

(iii) The third part is self-efficacy for self-regulated learning. The study assumed that students, who have belief about themselves for using self-regulatory learning strategies effectively, such as organizing their work and managing their time, have higher learning self-efficacy (Usher & Pajares, 2008). This part contains 10 questions in which the students were asked how they plan, organize and concentrate on their learning activities in different situations, e.g., when there are other interesting things to do or when there are various problems and also about their planning of learning activities.

The answers of the students for each part under learning self-efficacy have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. The higher the value means the greater will be the LSE value (see section H in appendix A).

3.2.2.6 Mathematics learning self-efficacy (MLSE)

This particular learning self-efficacy is concerned with people's belief about their capability for learning activities in the area of mathematics (Bandura, 2006). A mathematics learning self-efficacy scale based on Bandura (2006) and modified by Thomas (2013) has been constructed to assess students' confidence level in mathematics learning in two different ways.

(i) The first part is general mathematics learning self-efficacy in which the questions are about students' confidence level in general mathematics. This part contains 4 questions such as, '*in general, how confident are you in your abilities in maths learning*'.

(ii) The second part is self-efficacy for self-regulated learning in mathematics. It is proposed that students who have belief in themselves for using self-regulatory learning strategies for mathematics effectively, such as organizing their work and managing their time for mathematics, are likely to have higher mathematics learning self-efficacy (Usher & Pajares, 2008). This part contains 11 questions in which the students were asked how they organize their mathematics learning activities in different difficult situations, e.g., when there were other interesting things to do, when there were various problems, and also about their planning of mathematics learning activities.

The answers of the students for each part under mathematics learning self-efficacy have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. The higher the value means the greater will be the MLSE value (see section I in appendix A).

3.2.2.7 Sources of adolescent students' learning self-efficacy

This section discusses the various sources for developing one's learning self-efficacy (see section J in appendix A) as follows:

(i) **Mastery experience (ME):** Mastery experience is the most important source for developing a strong sense of efficacy. A scale (based on Bandura, 2006 and modified by Thomas, 2013) has been used for measuring students' perception of their performance in various academic activities. This scale contains 6

questions in which the students have been asked how they feel about their achievement in their previous report card or how they can perform in a difficult task. The answers of the students have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. The higher the value means the greater will be the ME value.

(ii) Vicarious experience (VE): Vicarious experience involves an individual's perception of others' action or performance in academic areas. In the main, people who have little or no previous experience with the tasks would be more influenced by this source (Bandura, 1997). A scale (based on Bandura, 2006 and modified by Thomas, 2013) has been constructed for measuring students' perception of others' actions or performances in this area. There are 6 questions in which the students were asked how they feel seeing others put in effort or being heavily involved in learning activity or being successful in learning. The answers of the students have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. The higher the value means the greater will be the VE value.

(iii) Social persuasions (SP): Persuasion is based on other persons' verbal or nonverbal evaluative responses about a person, such as positive or negative feedback, compliments and comments. Based on Bandura (2006) and modified by Thomas (2013), a social persuasion scale has been constructed including other persons' verbal or nonverbal responses on the students' performance in learning. This scale includes 6 questions in which the students were asked how the teachers, parents and others give feedback or compliments on their academic activity or performance. The answers of the students have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. The higher the value means the greater will be the SP value.

(iv) Academic emotional state (AE): The fourth source of learning self-efficacy, academic emotional state, provides a person's interpretation of his or her physiological or affective reactions (e.g., mood, anxiety, stress) related to academic activities, which can positively or negatively influence his or her learning self-efficacy (Bandura, 1997). Based on Bandura (2006) and modified by Thomas (2013), a scale for academic emotional state has been constructed involving emotional feeling and mood of the students regarding academic activities. This scale involves 6 questions by which the students were asked how

they feel when thinking about or participating in various learning activities. The answers of the students have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. All the questions are stated negatively. The higher the value of the answers means the lower the value of academic emotional state. For getting the higher value of the index for the higher positive academic emotional state, the values of all answers have been changed in Chapter 6 into a positive direction of emotion by subtracting them from 10. Then, the higher the value represents the greater the AE value.

3.2.2.8 Academic achievement

This is the outcome of students' academic activity to accomplish academic goals. Here, the study has measured academic achievement of the students as the marks (average percentage) obtained by the students in various common school subjects such as Mathematics, Science, Biology, Agriculture, Mother tongue, English, History, Geography, Social Studies and Home Economics in the previous year, i.e., their record of academic outcome in 9^{th} standard. The students were asked to complete the table with marks obtained in relevant subjects (see section K in appendix A). Academic achievement has been taken from what students' reported as well as from schools' annual records.

3.2.3 Socioeconomic variables

Among socioeconomic variables, the respondent students have been asked about their parents' income status, educational status, information about their time spent on various activities (except physical activity) and purpose of doing physical and learning activity.

3.2.3.1 Parental income status

The income status of the parents could be one of the important factors explaining the level of physical activity undertaken by the adolescent students. That is why the study has attempted to construct an indicator for parental income status. In the current study, the students have been interviewed but they were found to have very little information about their parental income. Therefore, they have been asked to report on the nature of their parental occupation (see section B in appendix A). Various occupations

commonly observed in those two countries have been divided into four categories and a numerical value has been assigned to them according to their income status. This value for income status ranges from 1 to 4, indicating the higher the value, the higher would be the status of parental income as well as occupation.

Table 3. 1: Coding for the types of parental occupation and their nominal value

Occupation	Nominal Value
Unemployed, cultivation in others' or leased land, cultivation in own land	1
Informal worker, primary school teacher, high school teacher	2
Local businessman, government employee, lecturer, doctor and other high skilled professional	3
National businessman, international businessman	4

***Note*:** Author's specification

3.2.3.2 Parental educational level

The parental educational level also could be an important factor influencing the level of physical activity performed by the adolescent students. For this reason, the study has attempted to construct an indicator for parental educational level. Students have been asked to report on the level of their parental education (see section B in appendix A). The levels of education have been divided into 3 groups and an ordinal value has been assigned to them according to their qualifications to differentiate their levels. The ordinal values thus range from 1 to 3, indicating that the higher the value, the higher would be the level of parental education. It should be noted that the '*Other*' category (technical education) gets a higher value because its exposure is wider compared to that of master degree.

Table 3. 2: Coding for the level of parental education and their nominal value

Educational Level	Nominal Value
Illiterate, class four passed, class ten or form 4 passed	1
Class twelve form 6 passed, graduate, master degree	2
Other (technical education), doctorate, engineer/doctor	3

***Note*:** Author's specification

3.2.3.3 Time spent on various activities

The sample adolescent students have been asked about their time spent on various activities such as learning, music/singing/drawing, video/computer games, indoor games (see section C.3 in appendix A) and household tasks (e.g., mopping, sweeping, cooking; see section C5 in appendix A) during the previous 7 days. These activities have been added to the questionnaire to control the influences of these activities on the various sociopsychological variables.

3.2.3.4 Purpose of doing physical and learning activity

The study assumed that it is very important to identify the purposes of doing any activity which motivates anybody to execute such activity in different ways. Hence, the purposes of engagement in physical and learning activity by the students could be important factors explaining the levels of those activities. Five purposes have been mentioned for both the activities in the questionnaire. The students had to rank the purposes according to their importance to themselves. The rank value ranges from 1 to 5, indicating the lesser the value, the higher would be the importance of the purposes, i.e., the most important purpose gets the lowest rank '1' (see section C.4 & K in appendix A).

3.3 Questionnaire

Incorporating various features of the above mentioned variables, the study has compiled a questionnaire to collect data on these variables to deal with the hypothesis. It contains eleven sections. Detailed questions have been given in appendix A. Table 4 presents various sections of the questionnaire and sources of data collections.

Table 3. 3: Structure of questionnaire

Section	Variable	Instrument developed by	Respondent
A	General information about school and record of students' academic achievement	Researcher	School administration
B	General information about students including parental occupational status and educational level	Researcher	Student
C1&C2	Physical activity (PA)	Kowalski et al. (2004)	Student
C3	Time spent on other activities such as learning, music/singing/drawing, video/computer games, and indoor games (without moderate to vigorous level of physical activity)	Researcher	Student
C4	Purpose of doing physical activity	Researcher	Student
C5	Time spent on household activities	Researcher	Student
C6	Reporting whether they were sick or prevented by anything else from doing normal physical activity in the previous week	Kowalski et al. (2004)	Student
D	Physical activity self-efficacy (PSE)	Bandura (2006)	Student
E	General emotion (GE)	Modified Bell Adjustment Inventory Method, adapted by Mohsin and Shamsad (1970)	Student
F	Self-confidence (SC)	Mind Tools Corporate [56] based on Bandura (2006)	Student
G	School adjustment (SA)	Modified Bell Adjustment Inventory Method, adapted by Mohsin and Shamsad (1970)	Student
H	Learning self-efficacy (LSE)	Bandura (2006) and modified by Thomas (2013)	Student
I	Mathematics learning self-efficacy (MLSE)	Bandura (2006) and modified by Thomas (2013)	Student
J (i) (ii) (iii) (iv)	Sources of adolescent students' learning self-efficacy Mastery experience (ME) Vicarious experience (VE) Social persuasions (SP) Academic emotional state (AE)	Bandura (2006) and modified by Thomas (2013)	Student
K	Academic achievement (AA) and purpose of doing learning activity	Researcher	Student

[56] http://www.mindtools.com/pages/article/newTCS_84.htm.

3.4 Survey design

In the absence of secondary data and information on sociopsychological and socioeconomical variables that deal with the current objectives and hypothesis for the study, the current study depends on the field-level survey to collect the requisite data and information on all the variables. This section discusses the survey design in detail, covering such aspects as participants' involvement, the method of data collection, and constraints faced during the time of data collection.

3.4.1 Locale of the study

This is a cross-sectional and cross-cultural study with students from India and Fiji. At the same time, sample selection from the different parts of both countries to cover a variety of representatives is quite difficult because of huge costs and the wide variety of individual characteristics for such a sociopsychological study. Driven by this circumstance it was decided to select a limited area for the sample survey. Indian field survey has been conducted in the district of Midnapur which is located at 70 km from Kolkata, West Bengal and the largest one with a good reputation for producing good-quality students from rural, semi-urban and urban areas. Besides this randomly chosen district, no other district was considered for survey, in order to avoid the influences of different cultures and environments on the various sociopsychological variables. In the rural areas of the district, the economy is mainly dependent upon agriculture, whereas most people are engaged in non-agricultural activities in urban areas. This study conducted surveys in ten secondary schools, five from rural, three from semi-urban and the rest two from urban areas. Similarly, five secondary schools from the semi-urban Suva area and one school from *Rakiraki* (rural) in Fiji were surveyed. The sample from the last one was sufficient enough to represent rural area. As in India, rural people in Fiji are mostly engaged in agriculture whereas most urban people are engaged in non-agricultural activities.

3.4.2 Selection of the sample

The first step was the selection of areas, the second and last steps were the selections of sample secondary schools and sample students therein respectively. Budgetary and time constraints limited the sample size to approximately four hundred students from each country, sufficient to allow reliable simple statistical analysis.

In India, Midnapur district is purposely chosen (mentioned in section 3.4.1). Within the district, the three sample areas were randomly chosen as representative of urban, semi-urban and rural areas respectively. Jhargram and Midnapur represent urban area, Panskura represents semi-urban and Debra represents rural area. In the next step, sample schools have been drawn from these sample areas randomly using the following procedure. With an estimate from the local government offices and school boards, the sample schools were selected from rural, semi-urban and urban areas randomly without replacement. Two schools have been drawn from urban areas, three schools from semi-urban and the rest five schools from rural areas. Finally, the all students, who attended in a particular section studying at the 10^{th} standard (aged 14–17 years) in these schools on the day of conducting survey and expressed willingness to participate in the survey, were selected as sample for the study. One or more sections have been selected randomly in case of more than one section in a class within a particular school.

Similarly, Suva and suburbs, and *Rakiraki*, were chosen to represent urban and rural areas in Fiji respectively. All secondary schools were considered and five schools from Suva and one from *Rakiraki* were selected using similar methods to find the exact number of samples from Year 10 (aged 14–17). In Fiji also, within a particular school, one or more sections in a class have been randomly selected. All the students who attended on the day of conducting survey and expressed willingness to participate in the survey in a particular section were considered as participants of the survey, to avoid selection bias within that section of a class.

Boys and girls have been chosen as per their availability and attendance in both countries. The India sample includes 435 adolescent students from 10^{th} standard (aged 14-17 years), of whom 245 are girls and the remaining 190, boys. Similarly, the Fiji sample size is 438 adolescent students, of whom 252 are girls and the remaining 186, boys. As noted, the relative preponderance of girls in each country is a reflection of the girls' availability and attendance, not of selection criteria.

3.4.3 Procedure of data collection

After receiving the permission from The University of The South Pacific, approval was also obtained from the relevant School Boards and authorities in India as well as

Ministry of Education in Fiji. The researcher visited number of schools to seek principals' permission and co-operation for conducting the survey in schools in both countries. While some school authorities were very much co-operative and took interest in this project topic, some others worried that the survey procedure could disturb the classroom teaching. In case, a school did not give permission, an alternative school from the same area was found as replacement. Finally, the field survey in 10 schools in India and 6 schools in Fiji was conducted during January–May 2014. The principals and other assistant teachers in those schools were consulted to arrange suitable times before administering the survey. Sample students were divided into small groups of 15–20 participants and surveyed at a time so that each of them could be given proper attention in explaining the questionnaires. The survey questionnaire was handed out to the sample students and they filled the structured questionnaire themselves separately. One and half hours were allotted for each group to respond to all questions. The questionnaire was explained to them while they were responding section-wise.

3.5 Statistical tools and techniques

After collecting the required data, the next important task of the study was to analyse them by applying suitable statistical methods. The questions from each section have been combined to construct a unique index to represent the variable for each section. In order to do this for a psychological variable, a reliability test was conducted to examine the reliability of the variable and to justify the presence of each question in explaining the variable as a first step. Hence, the reliability test of each variable containing those questions is the most important task before proceeding further on the analysis.

Second, once a set of questions is validated by the reliability test, they have been combined to construct an index. Therefore, the question is: can the values of questions be combined using equal weight or simple average formula? If so, all questions would be receiving equal importance in the constructed variable. This may not be the right approach, because all questions may not have equal importance to explain the variable. Therefore, the study applies a statistical method to find out exact weights for respective questions using the actual information provided by the respondents. For this purpose, the study has followed the principal component analysis to derive proper weights for

each of those questions along one particular dimension (called 'principal component'). The principle component explains the largest variation of the set of questions. It was assumed that this principal component represents the main characteristics of our psychological variable. The weights of those questions have been considered for index formation of that psychological variable.

Once an index is derived, this has been used in further analysis to establish the relationship among psychological variables and others. Details of these methodologies are discussed at below.

3.5.1 Reliability test

At first, the study examined the reliability of the various sociopsychological variables (e.g., physical activity self-efficacy, general emotion, self-confidence, school adjustment, learning self-efficacy, mathematics learning self-efficacy, sources of adolescent students' learning self-efficacy - mastery experience, vicarious experience, social persuasions and academic emotional state) before constructing their indices.. Cronbach's *alpha* is an effective tool to measure reliability of a variable. It is also called numerical coefficient of reliability. According to Cronbach (1951), an eminent psychologist, the value of *alpha* varies from 0 to 1. The higher the value of *alpha*, the higher will be the reliability of the variable.

The study has considered 0.7 as the critical value for the reliability test as it is widely used in psychometric test (Nunnally, 1978). If the observed value of overall *alpha* is higher than this critical value for a particular variable, the set of questions explaining the variable is considered to be reliable. If the value of overall alpha of a variable can be increased by dropping any question, the study has deleted that particular question from the test. The detailed mathematical calculation for the reliability test has been given in Appendix B.

3.5.2 Principal component analysis (PCA) and indexation

Once the reliability test is established for a set of questions from a section in the questionnaire, the questions with significant reliability scores are combined to construct an index to identify a psychological variable. But, all the questions may not be equally important to explain a particular variable, because they may follow different

dimensions. For example, physical activity self-efficacy (PSE) consists of 18 questions - such as pse01, pse02, pse03, ----------, pse018, that may have different dimensions. For constructing the index of PSE, their values of pse01, pse02, pse03, ----------, pse018, as revealed by the participants, cannot be simply combined following simple average formula. Here, we need to construct the index following an alternative method that could capture various weights for each question depending on their variation for one particular dimension. Therefore, at first, the weights of the questions would be calculated and then the questions are combined using the derived weights. In this regard, the method which is popularly used in the literature is known as 'Principal component analysis' (PCA).

The principal component analysis is commonly used to get several artificial uncorrelated dimensions using the eigenvalue [57] problem and estimation. These artificial dimensions are called principal components that effectively represent the same dataset (Dunteman, 1989). Here the study has considered that principal component, which has the highest eigenvalue explaining the variable the most. This will provide a proxy of the psychological variable of interest of the study. It is assumed that principal component with highest variance represents the main characteristics of the psychological variable. The coefficients of that component are considered as the weights of the questions to combine them linearly for index formation as follows:

It is considered that the weights of the questions of PSE found from *comp1* are $w_1, w_2, w_3, ..., w_{18}$ respectively for 18 questions.

Then, the index of PSE after PCA would be

$w_1 * pseo1 + w_2 * pse02 + w_3 * pse03 + - - - - + w_{18} * pse01$ (Lindman & Sellin, 2011; Vyas & Kumaranayake, 2006).

For the normalization purpose, we are using the shared value of each coefficient (here, weight of each question) with respect to the total value of all coefficients so that the

[57] Let A be a square matrix. Then C, a nonzero matrix, is called an eigenvector of A if and only if there exists a number (real or complex) λ so that $AC = \lambda C$. This λ is called an eigenvalue of A. http://www.sosmath.com/matrix/eigen0/eigen0.html

sum of the weight will be exactly equal to one and the index value can vary between 0 to 10.

Therefore, after normalization the index of PSE (defined by the level of physical activity self-efficacy) would be as follows:

Level of physical activity self efficacy =

$$= \frac{(w_1 * pse01 + w_2 * pse02 + w_3 * pseo3 + - - - - + w_{18} * pse018)}{(w_1 + w_2 + w_3 + - - - w_{18})} = \frac{\sum_{i=1}^{18} \omega_i pse0i}{\sum_{i=1}^{18} \omega_i}$$

where ω_i is the coefficient of *i-th* question found in component 1.

The detailed steps for PCA computation is presented in appendix B.

3.5.3 Factor analysis

Based on the students' responses, the level of physical activity, academic achievement and socioeconomic variables and various indices of sociopsychological variables like physical activity self-efficacy, general emotion, self-confidence, school adjustment, learning self-efficacy, mathematics learning self-efficacy, sources of adolescent students' learning self-efficacy - mastery experience, vicarious experience, social persuasions and academic emotional state have been constructed (discussed them in details in the next chapters). Then, those values of sociopsychological and other socioeconomic variables have been analysed statistically in response to physical activity and in some cases within themselves to analyse the pathway using suitable techniques. Three sets of statistical techniques have been used for three different purposes.

First, analysis of variance (ANOVA) has been applied to investigate the significant difference between group average and standard deviation.

Second, multiple regression has been used to examine the extent of relationships between a set of variables.

Third, step-wise simultaneous regression has been applied to investigate the path-way relationship between variables originating from physical activity to academic achievement.

3.5.3.1 Analysis of variance (ANOVA)

ANOVA tests whether differences exist between two or more populations. The present study needs to test means and variances of the level of physical activity between countries, gender, parental occupations, and educational levels (Keller, 2013). The objective is to know whether simple average derived from various groups varies significantly across them (See Appendix B for detailed discussions).

3.5.3.2 Regression analysis

The regression analysis is a statistical method and process for establishing relationship between a set of variables and estimating the extent of exact relationship between them. Various techniques are available for looking at the nature of variables (e.g., qualitative, quantitative and categorical) and their hypothetical relationships.

3.5.3.2.1 Multiple and multivariate regression methods

If one or more independent variables are regressed on a single dependent variable with the assumption of a linear relationship between them, this is known as simple regression. When a regression uses more than one independent variable, it is defined as multiple regression. Since a set of variables cannot explain fully the total variation of a dependent variable using real life data, a part of its variation remains unexplained and this is introduced in the regression model as a random disturbance term. In reality, one dependent variable is explained by more than one independent variable. If all of them are not considered, unexplained variation of the dependent variable would be higher and reflected in more disturbance term. That's why, the multiple regression has been quite popular. In other words, when one is interested to see the effect of a particular independent variable (X_1) on a dependent variable (Y), the multiple regression method helps to control the effect of other possible independent variables (e.g., X_2). With the random disturbance term (u), it can be represented in a regression model as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + u$$

Here, α, β_1 and β_2 are parameters to be estimated using the field level information collected from the sample students. Ordinary least square (OLS) method is used to find the regression parameters assuming standard properties of their distributions[58].

For example, the study uses mastery experience, vicarious experience, social persuasions and academic emotional state as independent variables to regress on the dependent variable, which is learning self-efficacy applying the multiple regression method. In other word, when one is interested to examine the influence of academic emotional state on learning self-efficacy, the effects of mastery experience, vicarious experience and social persuasions on the same time have been controlled. One or more independent variables in the multiple regression method could be dummy or categorical values for qualitative characteristics. They are used to estimate the marginal effect of one category compared to another one. In this study, the examples of such variables are gender, country, and parental occupational and educational status etc. (Keller, 2013).

Multivariate regression differs from multiple regression in such a way that several dependent variables are jointly regressed on one independent variables. Often some of the independent variables could be categorical or dummy to represent qualitative aspect of them and then, this technique is largely employed (Yu & Behrens, 1995). The individual coefficient and standard errors produced by this method are identical to those produced by OLS regression method estimating each equation separately. In this study, general emotion, self-confidence and school adjustment will be jointly regressed on physical activity self-efficacy using multivariate regression method.

3.5.3.2.2 Simultaneous regression method

An independent variable in a regression could be exogenous and endogenous. If an independent variable is influenced by some other variables, the variable is defined as endogenous, otherwise it is exogenous. When any of the independent variables is an endogenous and depends on other variables, simple regression technique (OLS) cannot

[58] The assumptions are normal distribution of the disturbance term with zero mean and constant variance, no significant relationship between disturbance terms (auto-correlation), no significant relationship between disturbance term and independent variable (homoscedasticity) and no significant relationship between independent variables (multi-collinearity)

produce an unbiased result of the regression parameters. Consider, the equation used in multiple regression model in the previous sub-section.

$Y = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + u_1$ (Y= Dependent variable, X_1 and X_2 =Independent variables)

When X_1 depends on another variable (z) which is not used in this system, this model can be represented as follows:

$$Y = \alpha_1 + \beta_1 X_1 + \beta_2 X_2 + u_1$$

$$X_1 = \alpha_2 + \gamma z + u_2$$

This case is estimated by using 2SLS (Two-Stage Least Squares) method. In the first stage, the second equation is estimated by OLS technique and then the estimated X_1 is used in first equation for the estimation in the second stage (Wooldridge, 2009).

In the present study, this technique has been applied to investigate the path-way. For example, academic achievement (AA) is the dependent variable and learning self-efficacy (LSE) is the independent variable. Further, the LSE depends on academic emotional state (AES) and AES depends on general emotion (GE), self-confidence (SC) and school adjustment (SA). Again, GE, SC and SA depend on physical activity self-efficacy (PSE) that depends ultimately on physical activity (PA). The study has used 2SLS method to estimate the exact relationship step by step of the whole pathway originated from physical activity to academic achievement shown in the hypothetical schematic diagram (given in chapter 1, Sec 1.1). The most useful advantage of the structural model is that it considers only the explained part of PSE by PA in the next stage of regression. This continues for other stages as well. Hence, the results would be unbiased and more robust.

3.6 Summary of this chapter

The present study investigates, in India and Fiji, the effect of physical activity on academic emotional state, learning self-efficacy and achievement of adolescent students through developing their various sociopsychological states. This chapter has provided a structure of the research methodology that has been followed to test

hypotheses. According to the objectives, the present study has relied on the quantitative method to study the various relationships. The proposed methodology includes preparation of a structured questionnaire for constructing various variables, survey design for data collection and description of various statistical tools and techniques that have been used for data analysis. In all, 873 sample adolescent students of 10^{th} standard (aged 14–16 years) from a total of 16 schools have been selected from India and Fiji. Reliability test and principal component analysis have been described for index formation of the sociopsychological variables. Then, ANOVA and regression analyses have been explained for drawing various relationships among the variables. Methodology used in the study to address each objective and hypothesis has been summarised in the following Table 3.1. The next 3 chapters will deal with analysis of the collected data using a range of statistical techniques to determine the various relationships.

Table 3. 4: Summarised methodology used against each objective and hypothesis

Sl. No.	Objective	Hypothesis	Methodology (positivist/quantitative paradigm)	Chapter
1.	To study the type and level of physical activity (e.g., sports, physical exercise, walking/cycling, dance etc.) among adolescent students and the variation of the level across various socioeconomic conditions (country, gender, and parental income and educational status)	Moderate to high levels of physical activity are limited to a few adolescent students. The level is significantly influenced by various socioeconomic factors.	Various types of physical activity that the adolescent students take part in during one week have been captured by a self-recall and report measurement instrument. Distribution of physical activity by types and its level (per day) has been calculated from each country setting. Mean tests of the levels among various socioeconomic conditions (country, gender, and parental occupation and education) are conducted by ANOVA and multivariate regression.	4
2	To study the effect of physical activity on physical activity self-efficacy as well as its effect on general emotion, self-confidence and school adjustment	The effect of physical activity will improve physical activity self-efficacy, but at a decreasing rate. The physical activity self-efficacy significantly promotes students' general emotion, self-confidence, and school adjustment.	A structured questionnaire has been prepared for physical activity self-efficacy, general emotional state, self-confidence and school adjustment. A reliability test has been done to justify the questions. Then the indices of various variables have been constructed following PCA. Finally, multiple regression analysis has been used to establish the various relationships.	4 and 5
3	To study the influence of general emotion, self-confidence and school adjustment on academic emotional state and on the attainment of learning self-efficacy as well as academic achievement of adolescent students	General emotion, self-confidence and school adjustment improve academic emotional state and learning self-efficacy of adolescent students, which in turn promotes their academic achievement.	Indices have been constructed for academic emotional state, learning self-efficacy and academic achievement following the methods previously mentioned. Then, multiple regression analyses have been used to establish the various relationships. Finally, a simultaneous regression has been undertaken to confirm the robust understanding for the pathway from physical activity to academic achievement through various sociopsychological states and academic aspects such as academic emotional state and learning self-efficacy.	6

CHAPTER 4: PHYSICAL ACTIVITY OF ADOLESCENT STUDENTS: ITS TYPES, LEVELS, VARIATION AND EFFICACY

4.1 Introduction

This chapter provides an explanation on the types and levels of physical activity, its variation among sample adolescent students sourced from different socioeconomic conditions such as country, gender, and parental occupation and education. Next, the effect of physical activity on physical activity self-efficacy has been analysed against the sample characteristics of the two countries, i.e. India and Fiji, on the assumption that the physical activity cannot be equally important at all levels across all adolescents for developing self-efficacy to regulate this activity and that self-efficacy can also be influenced by their other daily activities.

Physical activity self-efficacy is known as people's beliefs about themselves to regulate regular physical activity (Bandura, 2006). It is the efficacy in a specific designated level that is one of the ways to develop a person's confidence level. The study has hypothesised that if someone participates in physical activity, his/her physical activity self-efficacy will be built up accordingly, but not at the same rate at all levels. According to Stimpson (2000), the participants who engage in exercise on a regular basis perceive the benefits from physical activity. Naturally, these participants derive high confidence in their ability to exercise in challenging situations as well as deal effectively with other challenges for human development. In other words, the study has also hypothesised that if somebody acquires efficacy in a specific area, it influences his/her general emotion, self-confidence and school adjustment (for adolescent students) that must promote the efficacy level in another specific area (e.g., learning) through developing the academic emotional state. However, this chapter will investigate only the effect of physical activity on its self-efficacy. The next chapter will examine the effect of this physical activity self-efficacy on general emotion, self-confidence and school adjustment. After this, the influence of these three variables on academic emotional state, learning self-efficacy, and academic achievement will be discussed in Chapter 6. Therefore, this chapter compares the level of physical activity among the students across various socioeconomic characteristics and investigates its effect on physical activity self-efficacy using analysis of variance (ANOVA) and regression methods. Prior to this, a trial index of the level of physical activity was

prepared so that the relationship between the variables can be examined objectively. At first, the various types of physical activity and their extent across the student sample have been derived from the survey data in section 4.2. Then in section 4.3, an index of 'physical activity self-efficacy' is developed to capture its level among the student sample. Finally, section 4.4 attempts to establish any relationship that physical activity and its self-efficacy have within themselves. Section 4.5 presents concluding observations.

4.2 Physical activity

4.2.1 Types and levels

As discussed in the previous chapter, the study refers to the physical activities such as walking, bicycling, running, jogging, swimming, dancing, and football playing as those that make students sweat, their legs feel tired and their breathing hard. Here, considering only general types of physical activity, the study does not discriminate, though there could be distinctions, between moderate and vigorous intensities of activities. It attempts to include games, sports and purposive physical activities that involve substantial body movements, although it excludes activities of household tasks that students usually execute in day-to-day life, such as sweeping, mopping, washing, and gardening, because the purpose and structure of those activities may not be conducive to deriving benefits for the psychological and mental state. Hence, the students have been asked to report on their time spent on various forms of physical activity in two different ways. The first list of items of the questionnaire for physical activity includes walking, jogging, running, cycling, swimming, dancing, baseball, softball, football, badminton, hockey, volleyball, basketball, physical exercise (PE), yoga, cricket, rugby and other (see appendix A, section C.1 for details). They have been asked to respond on how much time they spent on each of these physical activities in the previous seven days. The second set of items of the physical activity questionnaire contains various types of physical activity the students did during different periods of a day in the previous 7 days (see appendix A, section C.2).

Table 4.1 provides the relative share of each activity out of the total time spent by all the sample students, separately for the two countries and further grouped by gender, based on students' responses received from the first list of items. From the responses

of the participants, it is seen that the sample students of the two countries are engaged in physical activity in a number of different ways. As shown in the table, walking, bicycling and cricket are the most important and preferred physical activities among the sample students in India and together they comprise almost 69% of the total time devoted for all kinds of reported physical activity. On the other hand, in Fiji, the students are not so much engaged in bicycling; rather, they are found to engage themselves more in walking. Next to walking, volleyball and rugby playing are observed to be the preferred physical activities in Fiji and together they comprise almost 61% of total time devoted to various kinds of physical activity. There could be various reasons for higher dominance of bicycling and walking in India as well as walking in Fiji. For example, in India, the mode of transport and communication is heavily dominated by bicycles and walking, particularly in rural and semi-town areas. Usually, the students cover long distances when proper transport arrangements are lacking and due to students' stringent financial circumstances, the majority of them cannot afford it, especially in the rural areas. Concessional transport is rare for students living in rural and semi-town areas of India. At the same time, it is important to note that Indian students enjoy bicycling during their leisure time as well. Hence, the students are found to be more engaged in bicycling than other forms of physical activity. Similarly in Fiji, students are engaged more in walking because of poor road connectivity, unavailability of public transport and lack of affordability of private transport. Walking is also an important activity during leisure time. Bicycling is not generally seen as an alternative mode of transport in Fiji, mainly for geographical and climatic reasons. In sum, it is clear that students are, to a large extent, most engaged with what is convenient: bicycling, walking and the nationally popular sports like cricket in India and volleyball and rugby in Fiji.

Secondly, in India boys and girls are engaged in physical activity in the ratio of 2: 1. Among the Indian boys, walking, bicycling and cricket capture 0.15, 0.29 and 0.30 shares respectively of the total time spent on all activities; clearly, those are the most preferred activities. On the other hand, walking, bicycling and badminton have registered 0.20, 0.38 and 0.14 shares respectively for Indian girls, making these their most preferred activities. In Fiji, within the total physical activity the boys' share is 0.52, which is marginally higher than that of girls (0.48). Among Fijian boys, the preferred activities are walking, rugby and volleyball and their relative shares of total

time spent on all activities are 0.30, 0.20 and 0.12 respectively. On the other hand, the share of time spent by Fijian girls is 0.39 for walking, 0.15 for dancing and 0.15 for volleyball (see Table 4.1).

The difference in the relative share of time spent on various activities seen between Indian boys and girls may be due to the existing sociocultural differences and gender discrimination. Such discrimination may not be prevalent in Fiji to such an extent that it could lead to a huge difference in their performance of physical activity. Moreover, it is seen that in both countries boys are engaged more in games and sports than are girls. Usually girls are largely engaged in household works or in other indoor activities to a large extent so that they cannot find sufficient time for outdoor games and sports. Social and cultural barriers also limit their involvement in outdoor activities. On the other hand, boys engaged heavily in those activities, games and sports that are nationally popular particularly cricket in India and rugby and volleyball in Fiji.

Overall, the types of physical activity the students are most involved in are walking and bicycling – those that can be individual or in small groups, fun, inexpensive and non-competitive. It is clear that the appeal of these activities for them derives largely from the inadequacy and insufficiency of transport facilities for schooling, and the impoverishment of rural people, though some students also choose these as leisure time exercise pastimes. Next to walking and bicycling, the students are involved more in nationally popular games and sports. In India, gender difference is more prevalent as an influence on total physical activity than in Fiji, possibly indicative of a higher level of gender discrimination. Moreover, the girls' lesser engagement in games and sports than boys' is reflective of social and cultural barriers in both countries.

Table 4. 1: Distribution of physical activity by types across country and gender

Types of Physical Activity	India					Fiji				
	Out of total activity done by all students			Boys by types out of boys' total activity	Girls by types out of girls' total activity	out of total activity done by all students			Boys by types out of boys' total activity	Girls by types out of girls' total activity
	Types' share	Boys' share	Girls' share			Types' share	Boys' share	Girls' share		
Walking for exercise	0.16	0.10	0.07	0.15	0.20	0.34	0.16	0.18	0.30	0.39
Bicycling	0.32	0.19	0.13	0.29	0.38	0.03	0.02	0.01	0.04	0.01
Swimming	0.02	0.01	0.01	0.02	0.03	0.08	0.04	0.03	0.08	0.07
Baseball, softball	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Dance	0.02	0.00	0.02	0.00	0.07	0.09	0.02	0.07	0.03	0.15
Football	0.06	0.05	0.01	0.07	0.02	0.06	0.05	0.01	0.09	0.02
Badminton	0.08	0.04	0.05	0.06	0.14	0.01	0.00	0.01	0.00	0.01
Hockey	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01
Volleyball	0.02	0.02	0.00	0.03	0.00	0.14	0.07	0.07	0.12	0.15
Basketball	0.01	0.00	0.00	0.00	0.01	0.04	0.02	0.02	0.03	0.04
Physical exercise, yoga	0.06	0.04	0.02	0.06	0.06	0.05	0.03	0.03	0.05	0.06
Cricket	0.21	0.20	0.01	0.30	0.03	0.01	0.00	0.00	0.01	0.01
Rugby	0.00	0.00	0.00	0.00	0.00	0.13	0.11	0.03	0.20	0.06
Other (specify)	0.02	0.00	0.02	0.01	0.05	0.02	0.02	0.01	0.03	0.01
Total	1.00	0.67	0.33	1.00	1.00	1.00	0.52	0.48	1.00	1.00
Sample number	435	190	245	190	245	438	186	252	186	252

Source: Author's calculation, Field Survey

4.2.2 Average level of physical activity per day

From the above analysis, the relative importance of time spent on the various types of physical activity has been derived out of total time allocated for all activities by the whole sample students surveyed in a particular country. The time spent on those activities in day-to-day life to understand the consistency is not discussed yet. Table 4.2 represents average times spent by the sample students on each type of those activities every day across gender and countries. Indian students reported spending a larger amount of time on bicycling, followed by cricket. On an average, they claimed 38.9 and 25.3 minutes respectively per day. Time spent on walking, 19.8 minutes per day, seems to be large enough. Similar to the previous table, it is clear also from the following table that the students are seen to spend more time on those physical activities that are usually common in everyday life (walking and bicycling) and the nationally popular game (cricket) in India. When these figures are analysed by gender, the Indian boys spend more time on cricket (55.1 minutes per day) and bicycling (53.6 minutes per day) compared to walking (26.8 minutes per day) on the average, while the Indian girls spend more time on bicycling, 27.4 minutes per day compared to 14.3 minutes and 9.8 minutes per day for walking and badminton respectively. In total, the average duration of time spent by boys on all types of physical activity is 185.0 minutes per day, which is substantially greater than that of girls, which is 72.2 minutes per day.

In Fiji, students spend 35.1 minutes per day walking, followed by volleyball (14.1 minutes per day) and rugby (13.9 minutes per day). Next to walking (38.1 minutes per day), boy students spent more time for rugby (26.0 minutes per day) than volleyball (15.8 minutes per day). On the other hand, girl students spent more time on walking (32.9 minutes per day), followed by volleyball (12.9 minutes per day) and dance (12.3 minutes per day). Hence, walking is the most popular form of physical activity among boys and girls in Fiji. On an average, combining all types of activity in Fiji, boy students are found to be spending 127.2 minutes per day on physical activity, which is also substantially greater than that of girls (85.0 minutes per day). But, the difference between boys and girls in India in terms of time spent is larger in comparison to Fiji. As mentioned before, the occurrence of the lowest level of physical activity among Indian girls is probably be due to the prevalence of social discrimination between genders. Social constraints as well as awareness could be binding constraints for them to be engaging in various kinds of physical activity. From the overall observation, it is

clear that Indian students do more physical activity (121.5 minutes per day) than Fijian students (102.9 minutes per day) mainly because of the predominant use of bicycles in India.

Table 4. 2: Average time spent (minutes) on various physical activities per day by the sample students across country and gender

Types of Physical Activity	India			Fiji		
	Total (min)	Boys (min)	Girls (min)	Total (min)	Boys (min)	Girls (min)
Walking for exercise	19.8	26.8	14.3	35.1	38.1	32.9
Bicycling	38.9	53.6	27.4	2.7	4.8	1.2
Swimming	2.8	3.3	2.4	7.8	9.8	6.2
Baseball, softball	1.3	2.1	0.7	0.3	0.3	0.3
Dance	2.8	0.3	4.8	8.8	3.9	12.3
Football	6.7	13.8	1.2	5.9	11.9	1.5
Badminton	10.3	10.9	9.8	0.8	0.5	1.1
Hockey	0.2	0.4	0.1	1.1	0.8	1.2
Volleyball	2.5	5.4	0.2	14.1	15.8	12.9
Basketball	0.9	0.8	1.0	3.9	4.1	3.7
Physical exercise, yoga	7.4	11.4	4.4	5.6	6.3	5.0
Cricket	25.3	55.1	2.2	1.0	1.1	0.9
Rugby	0.0	0.0	0.0	13.9	26.0	4.9
Other	2.5	1.0	3.6	2.1	3.7	1.0
Total	**121.5**	**185.0**	**72.2**	**102.9**	**127.2**	**85.0**

Source: Author's calculation, Field Survey
Note: Min represents minute.

4.2.3 Level of physical activity and its variations

Let us now try to develop a working version of an index to represent the level of physical activity based on the questions asked to the respondents for drawing various relationships. For the purpose, the study needs to convert the values received from the respondents in common units and comparable scale. Since such activities differ substantially in terms of body movements from moderate to vigorousness, one difficulty would obviously be to find out common units that could capture the biological scale of those activities. In fact, the study does not find any readymade information for this purpose. Therefore, the study assumes that the greater the time spent for any activity, the higher would be the probable level of body movement. In

first list of items the students were asked to report on how much time they spent on each mentioned physical activity type in the previous seven days (as discussed in Chapter 3). Second list of items of the questionnaire contains various physical activities done by the students against different periods of a day in the previous 7-day period. This approach was taken to capture the same activities as were captured in the first list but in different ways. Here, two different approaches have been undertaken to help the students in recalling the total time spent for the physical activity in the previous seven days and then those two figures have been combined to get average level of physical activity (see Chapter 3). This will enable us to minimise the error that usually occurs in recall from memory. The following steps are undertaken to construct an index representing the level of physical activity for each student.

Step 1: At first the study has taken the mean of the total times spent under first and second lists. This provides the actual time spent for physical activity during the previous 7 days by each adolescent student.

From section C, physical activity questionnaire, the

$$average\ Level\ of\ physical\ activity\ in\ 7\ days\ (\text{minute}) = \frac{Total\ time\ spent\ on\ first\ list + total\ time\ spent\ on\ second\ list}{2}$$

Step 2: To get the level of physical activity per minute, the average level of physical activity, derived in step 1, is divided by 7*24*60.

$$Level\ of\ physical\ activity\ per\ minute = \frac{Average\ level\ of\ physical\ activity\ in\ 7\ days\ (minute)}{7 * 24 * 60}$$

Step 3: To determine the final index, the above level has been normalised by taking its difference from the minimum level and then, dividing by the difference between maximum and minimum physical activity per minute observed in the sample.

$$Level\ of\ Physical\ Activity\ (Index) = \frac{(Level\ of\ Physical\ activity\ per\ minute - minimum\ level)}{(Maximum\ level - minimum\ level)}$$

It is to be noted that the final index of the level of physical activity is unit free and varies between 0 and 1. This provides an opportunity to construct a scale of physical activity by looking at its range and to compare the level between the sample students. In order to do this, the entire level has been divided into five ranges as shown in Table 4.3 below:

Table 4. 3: Ranges of the level of physical activity

Low	0.00–0.20 (0–84 minutes per day)
Moderate	0.21–0.40 (84–168 minutes, i.e. 1.4–2.8 hours per day)
High	0.41–0.60 (2.8–4.2 hours per day)
Very high	0.61–0.80 (4.2–5.6 hours per day)
Extreme	0.81–1.00 (5.6–7 hours per day)

Note: Author's specification

The scale used here seems to be an arbitrary one and on the high side. It is not based on any physiological reasons but the division is still able to explain sufficient variation of physical activity among the adolescent students. Since an adolescent is usually more active than an adult when walking, cycling and engaging in the various games and sports included in the questionnaire, the scale, though it seems to be on the higher side for an adult, could reflect the right division for adolescent students for the purpose of the study.

From the distribution of the sample students within the range, presented in Table 4.4, a pattern of physical activity becomes evident. In India, the highest share of students (57.7%) belongs to the lowest level or within the first range (0–0.20) who undertake physical activity from 0 to 84 minutes per day. Then, gradually students' share shows a decreasing trend into the higher levels of activity, the highest share of boys falling within the second range (0.21–0.40, or 1.4 to 2.8 hours of physical activity per day), after which the share of boys decreases gradually into the higher levels of the range. On the other hand, the highest share of girl students falls within the first range then gradually decreases along with the higher levels of the range. The fourth range (0.61–0.80, i.e. 4.2 –5.6 hours per day) includes a negligible share of girl students and no girl is found in the highest range (5.6–7 hours per day).

Similarly in Fiji, the highest number of students (66.4%) lies within the first range (0–0.20) i.e., less than 84 minutes of physical activity per day. Then, gradually students' share decreases with the higher levels. Both boys and girls have, to a large extent, fallen within the first or lowest level before decreasing gradually in the higher levels: shares within the fourth and fifth levels are negligible. Here, it is clearly observed that there is more variation in the level of physical activity among boys and girls in India compared to that in Fiji.

Across both countries together, the maximum share of students (62.1%) lies within the first or lowest level. Further, it is found that 23% of the total sample adolescent students are engaged in physical activity even below 30 minutes per day in both countries separately.

Table 4. 4: Level of physical activity by sample distribution

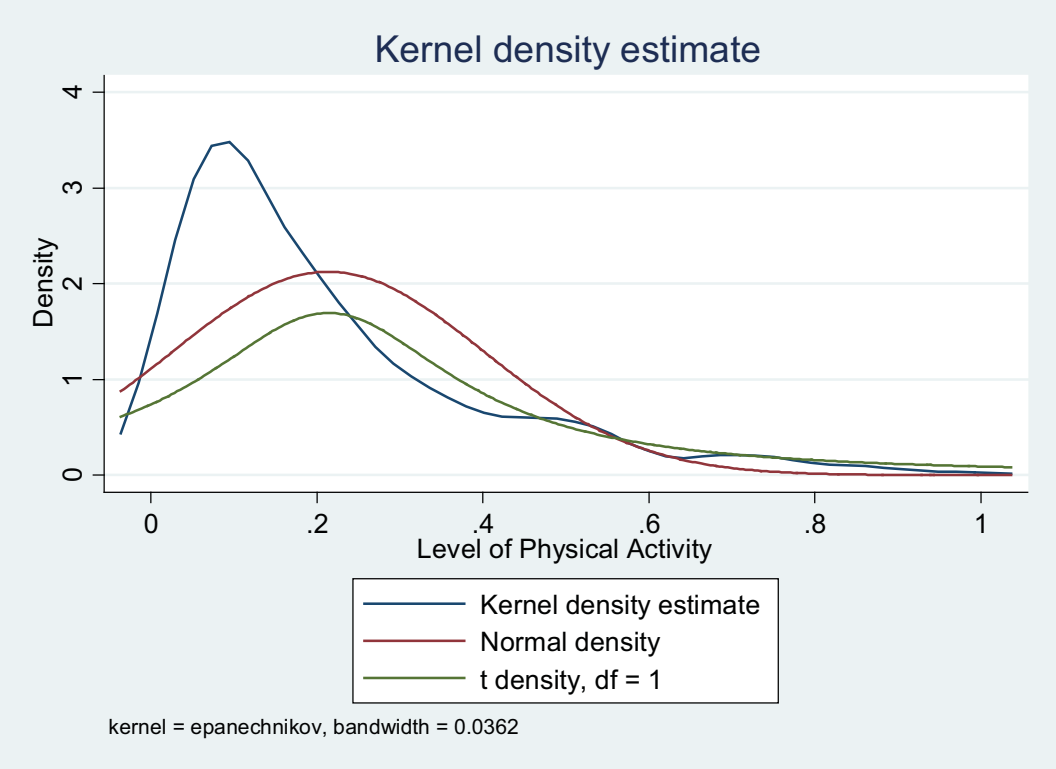
Country	Range of PA	Boys		Girls		Total	
		No.	%	No.	%	No.	%
India	0.0–0.20	60	31.6	191	78.0	251	57.7
	0.21–0.40	68	35.8	45	18.4	113	26.0
	0.41–0.60	41	21.6	7	2.9	48	11.0
	0.61–0.80	15	7.9	2	0.8	17	3.9
	0.81–1.00	6	3.2	0	0.0	6	1.4
	Overall	190	100.0	245	100.0	435	100.0
Fiji	0.0–0.20	105	56.5	186	73.8	291	66.4
	0.21–0.40	42	22.6	44	17.5	86	19.6
	0.41–0.60	20	10.8	19	7.5	39	8.9
	0.61–0.80	14	7.5	2	0.8	16	3.7
	0.81–1.00	5	2.7	1	0.4	6	1.4
	Overall	186	100.0	252	100.0	438	100.0
Total	0.0–0.20	165	43.9	377	75.9	542	62.1
	0.21–0.40	110	29.3	89	17.9	199	22.8
	0.41–0.60	61	16.2	26	5.2	87	10.0
	0.61–0.80	29	7.7	4	0.8	33	3.8
	0.81–1.00	11	2.9	1	0.2	12	1.4
	Overall	376	100.0	497	100.0	873	100.0

Source: Author's calculation, Field Survey.

It is too considered relevant to focus on the distribution of the sample students against the range of the physical activity using various types of plots. For this purpose, three

types of plots have been shown in Figure 4.1: Kernel, normal, and t-distribution. Kernel distribution represents a more actual form of distribution while the others provide it in a normalised form. As per Kernel distribution, the highest density of the sample students lies within the lower range, i.e., 1st range (0–0.20, i.e., 0–84 minutes per day) of physical activity and the other two distributions also suggest that the highest peaks lie almost within the same range. It emerges also from the previous discussion that the largest share of students falls within the lower range of physical activity in both countries.

Figure 4. 1: Distribution of the level of physical activity



Source: Author's calculation, Field Survey.

4.2.4 Level of physical activity by different groups

Overall, students in the sample can be divided into various groups such as country, gender, and parental occupational status and educational level. As a next step, the variation of physical activity will be further seen across those different groups. They are discussed below.

4.2.4.1 Level of physical activity by country

It can be expected that a country can play an important role in explaining physical activity of the sample students due to different socioeconomic and cultural conditions and health consciousness.

In order to justify this, an analysis of variance for physical activity across countries has been conducted and shown in Table 4.5. It suggests that the average level of physical activity is approximately 0.222 for Indian students, a little higher than that of Fijian students (0.206). However, the result of F-statistics for an equality test between two means (level of significant, p = 0.20) shows that the average level of physical activity for this sample of students does not significantly vary between countries. Moreover, Bartlett's test for equal variance (p = 0.41) is not statistically significant and it suggests that the variance within the two groups of sample students in those two countries is not statistically significant. In other words, the level of total physical activity follows almost uniform distribution in both countries. This result more-or-less confirms the observation made in the previous section.

Table 4. 5 Summary statistics and ANOVA of the level of physical activity by country

Summary statistics					
Country	Mean		Std. Dev.	Freq.	
India	0.222		0.191	435	
Fiji	0.206		0.184	438	
Total	0.214		0.188	873	
ANOVA					
Source	df	SS	MS	F	p
Between groups	1	0.059	0.059	1.67	0.20
Within groups	871	30.702	0.035		
Total	872	30.760	0.035		

Note: Bartlett's test for equal variances (chi2(1) = 0.673; p = 0.41)

Source: Author's calculation, Field Survey.

4.2.4.2 Level of physical activity by gender

One might expect that the level of physical activity of sample students can vary across gender due to the prevalence of various discriminations seen in a traditional society and variation in attitude towards physical activity.

The analyses of variance have also been undertaken between gender for the two countries together and each country separately. The results are shown in Table 4.6a and 4.6b respectively. The average level of physical activity has been found to be 0.15 and 0.29 for girls and boys respectively in overall sample students of both countries (see Table 4.6a). But the levels have been found to be 0.13 and 0.33 in India and 0.16 and 0.26 in Fiji for girl and boy students respectively (see Table 4.6b). F-statistics for the total sample (significant at 1% level, p = 0.00in Table 4.6a) and separately for each country (p = 0.00 in Table 4.6b) suggest that physical activity levels across gender are significantly different from each other. Moreover, Bartlett's test for equal variance suggests that the variation within those groups, overall (p = 0.00 in Table 4.6a) and separately (p = 0.00 in Table 4.6b), in the country analysis is also significantly different from each other. The statistics, in other words, indicate that the levels of physical activity for girls compared to boys have been found to be significantly lower. As mentioned before, this could be related to the persistent discriminatory attitude towards the girl child in a traditional society as well as lack of awareness of the importance of physical activity among girls.

Table 4. 6a: Summary statistics and ANOVA of the level of physical activity by gender combining two countries

Summary statistics					
Gender	Mean		Std. Dev.	Freq.	
Girls	0.150		0.135	497	
Boys	0.298		0.213	376	
Total	0.298		0.213	873	
ANOVA					
Source	df	SS	MS	F	p
Between groups	1	4.687	4.687	156.59	0.00
Within groups	871	26.073	0.030		
Total	872	30.760	0.035		

Note: Bartlett's test for equal variances (chi2(1) = 87.783; p = 0.00)
Source: Author's calculation, Field Survey.

Table 4.6b: Summary statistics and ANOVA of the level of physical activity by gender in two countries separately

India	**Summary statistics**					
	Gender	Mean	Std. Dev.	Freq.		
	Girls	0.135	0.121	245		
	Boys	0.334	0.207	190		
	Total	0.222	0.191	435		
	ANOVA					
	Source	df	SS	MS	F	p
	Between groups	1	4.256	4.256	158.25	0.00
	Within groups	433	11.646	0.027		
	Total	434	15.902	0.037		
Fiji	**Summary statistics**					
	Gender	Mean	Std. Dev.	Freq.		
	Girls	0.165	0.147	252		
	Boys	0.261	0.213	186		
	Total	0.206	0.184	438		
	ANOVA					
	Source	df	SS	MS	F	p
	Between groups	1	0.990	0.990	31.24	0.00
	Within groups	436	13.810	0.032		
	Total	437	14.800	0.034		

Note: Bartlett's test for equal variances (chi2(1) = 60.656, p = 0.00 for India; chi2(1) = 29.926, p = 0.00)

Source: Author's calculation, Field Survey.

4.2.4.3 Level of physical activity by parental economic status

Parents play the most significant role for their children during the developmental period through childhood and adolescence. One might expect that higher parental economic status enables to derive greater exposure and opportunity for their children in various games and sports. Those children will be provided more time and support for physical activity. To explore this hypothesis, occupations of both parents are grouped into four categories according to their income in increasing order, for example:

- Income class 1 includes those who are unemployed, engaged in cultivation in either own or others' lands.
- Income class 2 includes any types of informal workers, primary and high school teachers.

- Income class 3 includes local businessmen, government employees, doctors and lecturers.
- And income class 4 includes national and international businessmen.

Highest income class (Class 4) represents the highest level of income. Here, it is to be noted that '0' represents those parents who are not alive or separated from the children.

The results of ANOVA for physical activity of the students according to their fathers' occupations have been presented for both countries together and each country separately in Table 4.7a and 4.7b respectively. It is found that p-value (level of significant) of F-statistics to test mean difference across different groups in Table 4.7a is 0.64. Therefore, average level of physical activity more or less seems to have increased with a higher income status of the father in the overall sample students of both countries but the differences are not statistically significant at the 5% level. On the other hand when the countries are looked separately, it can be seen an interesting observation coming out from the Indian student sample. The students whose fathers are not alive or who are separated from them (mentioned their father's occupational level as 0) demonstrate a significantly lower level of physical activity (0.096 in Table 4.7b) than the rest. It can be argued that students receive fathers' encouragement as well as support more than those without fathers for engagement in physical activity. Another interesting observation can be found from this table is that the students whose fathers fall into the income class 3 (i.e., local businessman, government employee, doctor and lecturer) engage in the highest level of physical activity (0.264). These fathers may provide their offspring more encouragement and support. The p-value of F-statistics is 0.00 in Table 4.7b which is less than 5% level for India. Therefore, the average level of physical activity is found to be significantly different from each other with the father's occupation in India. In the case of Fiji, no significant pattern on the average level of physical activity against the father's occupational level has been found (see $p = 0.31$ for Fiji in Table 4.7b).

Table 4.7a: Summary statistics and ANOVA of the level of physical activity against father's occupation combining two countries

Summary statistics					
Father's occupational level	Mean	Std. Dev.	Freq.		
0	0.190	0.188	49		
1	0.210	0.187	242		
2	0.208	0.182	263		
3	0.227	0.193	277		
4	0.220	0.200	42		
Total	0.214	0.188	873		
ANOVA					
Source	df	SS	MS	F	p
Between groups	4	0.090	0.023	0.64	0.64
Within groups	868	30.670	0.035		
Total	872	30.760	0.035		

Source: Author's calculation, Field Survey.

Note: Bartlett's test for equal variances (chi2(4) = 1.343, p = 0.85)

Table 4.7b: Summary statistics and ANOVA of the level of physical activity against father's occupation by country

India	**Summary statistics**					
	Father's occupational level	Mean		Std. Dev.	Freq.	
	0	0.096		0.074	9	
	1	0.223		0.190	180	
	2	0.174		0.146	91	
	3	0.264		0.213	127	
	4	0.221		0.209	28	
	Total	0.222		0.191	435	
	ANOVA					
	Source	df	SS	MS	F	p
	Between groups	4	0.583	0.146	4.09	0.00
	Within groups	430	15.319	0.036		
	Total	434	15.902	0.037		
Fiji	**Summary Statistics**					
	Father's occupational level	Mean		Std. Dev.	Freq.	
	0	0.211		0.201	40	
	1	0.171		0.173	62	
	2	0.226		0.196	172	
	3	0.195		0.168	150	
	4	0.216		0.188	14	
	Total	0.206		0.184	438	
	ANOVA					
	Source	df	SS	MS	F	p
	Between groups	4	0.164	0.041	1.21	0.31
	Within groups	433	16.636	0.034		
	Total	437	14.780	0.034		

Source: Author's calculation, Field Survey.

Note: Bartlett's test for equal variances (chi2(4) = 22.99, p = 0.00 for India; chi2(4) = 4.74, p = 0.32 for Fiji)

The results of ANOVA for physical activity of the students according to their mother's level of occupation are presented for the two countries and for each country separately in Tables 4.8.a and 4.8.b respectively. The average level of their physical activity gradually increased with a higher income status of the mother, except in the case of the 4th income class, and this trend was statistically significant (p = 0.01 in Table 4.8a)

when ANOVA was run for overall students in the two countries. But an interesting observation similar to the earlier fathers' case is also evident in India. Students whose mothers are not alive or are separated from their children (mentioned their mother's occupational level as 0) perform significantly lower levels of physical activity (0.07 in Table 4.8b) than others. It may be due to the fact that they are lacking mother's encouragement and support. The average level of Indian students' physical activity also increases significantly with the mother's level of occupation (p = 0.02 in Table 4.8b). In Fiji, the level of students' physical activity tends to increase with mother's occupation, except in the case of the 4th income class, but the difference is not statistically significant (p = 0.10 in Table 4.8b). In the overall (both countries) comparison students' physical activity is correlated significantly with parental occupation in India. On the other hand, in Fiji, this is not observed systematically and significantly across the student sample. This tends to support the interpretation that in India, parents are influential in the greater engagement of students in physical activity rather more than is the case in Fiji. The students may get more support and encouragement for their physical activity from the community in Fiji.

Table 4.8a: Summary statistics and ANOVA of the level of physical activity against mother's occupation combining two countries

Summary statistics			
Mother's occupational level	Mean	Std. Dev.	Freq.
0	0.122	0.075	11
1	0.211	0.184	578
2	0.217	0.187	174
3	0.252	0.220	97
4	0.085	0.057	13
Total	0.214	0.188	873

ANOVA					
Source	df	SS	MS	F	p
Between groups	4	0.452	0.113	3.24	0.01
Within groups	868	30.308	0.035		
Total	872	30.760	0.035		

Source: Author's calculation, Field Survey.

Note: Bartlett's test for equal variances (chi2(4) = 33.328, p = 0.00)

Table 4.8b: Summary statistics and ANOVA of the level of physical activity against mother's occupation by country

India	**Summary statistics**				
	Mother's occupational level	Mean	Std. Dev.	Freq.	
	0	0.073	0.046	4	
	1	0.215	0.188	368	
	2	0.249	0.216	43	
	3	0.325	0.176	20	
	Total	0.222	0.191	435	
	ANOVA				
	Source	df	SS	MS	F	p
	Between groups	3	0.350	0.117	3.23	0.02
	Within groups	431	15.552	0.036		
	Total	434	15.902	0.037		
Fiji	**Summary statistics**				
	Mother's occupational level	Mean	Std. Dev.	Freq.	
	0	0.150	0.075	7	
	1	0.205	0.176	210	
	2	0.206	0.176	131	
	3	0.233	0.228	77	
	4	0.085	0.057	13	
	Total	0.206	0.184	438	
	ANOVA				
	Source	df	SS	MS	F	p
	Between groups	4	0.266	0.067	1.98	0.10
	Within groups	433	14.534	0.034		
	Total	437	14.800	0.034		

Source: Author's calculation, Field Survey.

Note: Bartlett's test for equal variances (chi2(3) = 7.125, p = 0.07 for India and chi2(4) = 31.617, p = 0.00 for Fiji)

4.2.4.4 Level of physical activity by parental education

As mentioned in the previous section, the parents have the most important responsibility for their children's development. Better parental educational status is expected to raise the level of consciousness about the benefits for their children's engagement in physical activity to a greater extent. Their children might be encouraged and supported to use greater time for physical activity. To examine this conjecture, the parental educational status is grouped into three categories: level 1, level 2 and level 3. In the grouping, the higher level represents the higher educational status. Level 1 includes those who belong to the group from illiterate to class 10 or form 4 passed. Level 2 includes those who passed form 6 up to masters degree and level 3 includes PhD, engineer/doctor and other similar categories. Here, it is also to be noted that '0' represents those parents who are not alive or are separated from children.

The results of ANOVA for physical activity of the students according to their fathers' education have been presented for both countries combined and each country separately in Table 4.9a and 4.9b respectively. It is found that the average level of physical activity seems to have increased with the higher level of father's education for all students in both countries. But, it is not statistically significant at the 5% level ($p = 0.25$ in Table 4.9a). In India, students' physical activity is significantly rising with the level of father's education ($p = 0.00$ in Table 4.9b). But in Fiji, there is no significant relationship between them ($p = 0.57$ in Table 4.9b).

Table 4.9a: Summary statistics and ANOVA of the level of physical activity against father's education combining two countries

Summary statistics					
Father's educational level	Mean	Std. Dev.	Freq.		
0	0.143	0.095	16		
1	0.205	0.190	359		
2	0.220	0.182	407		
3	0.231	0.210	85		
Total	0.213	0.188	867		
ANOVA					
Source	df	SS	MS	F	p
Between groups	3	0.145	0.048	1.38	0.25
Within groups	863	30.302	0.035		
Total	866	30.447	0.035		

Source: Author's calculation, Field Survey

Note: Bartlett's test for equal variances (chi2(3) = 12.198, p = 0.00)

Table 4.9b: Summary statistics and ANOVA of the level of physical activity against father's education by country

India	**Summary statistics**					
	Father 's educational Level	Mean	Std. Dev.	Freq.		
	0	0.100	0.057	2		
	1	0.204	0.191	260		
	2	0.236	0.182	150		
	3	0.346	0.219	23		
	Total	0.222	0.191	435		
	ANOVA					
	Source	df	SS	MS	F	p
	Between groups	3	0.493	0.164	4.6	0.00
	Within groups	431	15.408	0.036		
	Total	434	15.902	0.037		
Fiji	**Summary statistics**					
	Father 's educational Level	Mean	Std. Dev.	Freq.		
	0	0.149	0.099	14		
	1	0.208	0.190	99		
	2	0.210	0.183	257		
	3	0.189	0.191	62		
	Total	0.205	0.183	432		
	ANOVA					
	Source	df	SS	MS	F	p
	Between groups	3	0.068	0.023	0.68	0.57
	Within groups	428	14.413	0.034		
	Total	431	14.481	0.034		

Note: Bartlett's test for equal variances (chi2(3) = 2.746, p = 0.43 for India; chi2(3) = 7.177, p = 0.07)

Source: Author's calculation, Field Survey.

The results of ANOVA for physical activity of the students according to their mothers' education have been presented for both countries combined and for each country separately in Table 4.10a and 4.10b respectively. It is found that the average level of physical activity is not statistically significant with the educational level of mother for all students in both countries (p = 0.55 in Table 4.10a). In India, the students' physical activity level is rising significantly with mother's education (p = 0.00 in Table 4.10b). But, there is no significant relationship found between them in Fiji (p = 0.48 in Table 4.10b). Overall it is observed that students' physical activity is rising significantly

according to their parental education in India, but not in Fiji. As discussed before, it proves that parental education and consciousness play a greater and more effective role in engaging their child in physical activity in India than is the case in Fiji. The students may get more support and encouragement for their physical activity from the community in Fiji.

Table 4.10a Summary statistics and ANOVA of the level of physical activity against mother's education combining two countries

Summary statistics					
Mother's educational Level	Mean	Std. Dev.	Freq.		
0	0.123	0.072	3		
1	0.206	0.184	399		
2	0.222	0.19	408		
3	0.212	0.197	63		
Total	0.214	0.188	873		
ANOVA					
Source	df	SS	MS	F	p
Between groups	3	0.074	0.025	0.7	0.55
Within groups	869	30.686	0.035		
Total	872	30.76	0.035		

Note: Bartlett's test for equal variances (chi2(3) = 2.694, p = 0.44)

Source: Author's calculation, Field Survey.

Table 4.10b: Summary statistics and ANOVA of the level of physical activity against mother's education by country

India	**Summary statistics**					
	Mother's educational Level	Mean	Std. Dev.	Freq.		
	1	0.207	0.189	311		
	2	0.246	0.181	115		
	3	0.426	0.264	9		
	Total	0.222	0.191	435		
	ANOVA					
	Source	Df	SS	MS	F	p
	Between groups	2	0.504	0.252	7.07	0.00
	Within groups	432	15.398	0.036		
	Total	434	15.902	0.037		
Fiji	**Summary statistics**					
	Mother's educational Level	Mean	Std. Dev.	Freq.		
	0	0.123	0.072	3		
	1	0.203	0.166	88		
	2	0.213	0.194	293		
	3	0.176	0.161	54		
	Total	0.206	0.184	438		
	ANOVA					
	Source	Df	SS	MS	F	p
	Between groups	3	0.084	0.028	0.82	0.48
	Within groups	434	14.716	0.034		
	Total	437	14.800	0.034		

Note: Bartlett's test for equal variances (chi2(2) = 2.588, p = 0.27 for India; chi2(3) = 6.651, p = 0.08 for Fiji)

Source: Author's calculation, Field Survey.

4.2.5 Factors affecting the level of physical activity

In the previous sub-sections, various categories i.e., country, gender, parental occupation and parental education influencing the level of physical activity of the adolescent students have been discussed. But, the analysis has been done simply using one way ANOVA and it does not control or consider the effect of other factors on physical activity. In order to justify the robustness of the above results, there is a need to control the effects of other factors, while searching the effect of one factor on physical activity. Therefore, multiple regression analysis has been applied to accommodate the effect of various factors in one regression. Usually, the marginal

effect of any categorical variable is derived comparing with the lowest category within the variable in multiple regression. Hence, the physical activity is a function of various socioeconomic factors like country, gender, father's occupation, mother's occupation, father's education and mother's education, and school induced motivation in doing physical activity. Here it should be noted that the students were asked to respond on the extent to which their own physical activity is influenced by the school curriculum on a 5-point scale, indicating the higher the value the lower the importance and this is considered as '*school induced physical activity*' in the multiple regression analysis. The regression model can be represented as follows (Box 4.1):

Box 4.1: Regression model of physical activity

level of physical activity = f (country, gender, father occupational level, mother occupational level, father educational level, mother educational level, school induced physical activity) ----- (4.1)

The result of multiple regression for country, gender, father's occupation, mother's occupation, father's education, mother's education and school induced physical activity has been presented in Table 4.11a for all sample students. From the table, it is observed that the gender presence is statistically significant ($p = 0.00$) and income class 3 in mother's occupation is almost statistically significant ($p = 0.06$) for the level of physical activity. Whereas, father's occupation and parental education are statistically insignificant in the overall data, which supports the previous analysis. Here, an interesting finding is also seen that the purpose of doing physical activity through school curriculum is statistically insignificant ($p = 0.55$). In other words, the school induced physical activity seems to have played an insignificant role on the level of physical activity of the sample students.

Multiple regression of the same set of variables against the level of physical activity has been run separately for two sample countries and the results have been presented in Table 4.11b. From the table, it is observed that the gender presence is statistically significant ($p = 0.00$) for the level of physical activity in India . In India, father's occupation appears as almost positively significant for three groups (income class1, 3 and 4) in explaining the higher level of students' physical activity, whereas, it is also higher, but not statistically significant for mother's occupation. Similarly, students' physical activity is higher with father's education, but not significant, whereas it is

significant for mother's education at level 3 education category as specified (p = 0.03). It indicates to some extent that parental education (particularly mother's education) plays a significant role on their children's engagement in physical activity in India. In Fiji, the gender presence is statistically significant (p = 0.00 in Table 4.11b) for the level of physical activity, but no systematic and significant role of parental occupation and education on students' physical activity has been found.

Table 4.11a: Results of multivariate regression on the level of physical activity combining two countries

Variables	Coef.	Std. Err.	p
Fiji	-0.015	0.015	0.30
Boy	0.149***	0.012	0.00
Father's occupation			
1	0.018	0.036	0.62
2	0.011	0.035	0.75
3	0.019	0.036	0.59
4	0.039	0.044	0.38
Mother's occupation			
1	0.077	0.062	0.21
2	0.075	0.063	0.24
3	0.122*	0.064	0.06
4	-0.042	0.081	0.61
Father's education			
1	0.041	0.057	0.47
2	0.027	0.057	0.63
3	0.044	0.060	0.47
Mother's education			
1	-0.041	0.119	0.73
2	-0.032	0.118	0.79
3	-0.028	0.120	0.82
School induced physical activity	-0.002	0.004	0.55
Constant	0.070	0.107	0.52

Note: Adj R^2= 0.17, F(17, 848)=10.28 (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

Table 4.11b: Regression results of the level of physical activity by country

	India			Fiji		
Variables	Coef.	Std. Err.	p	Coef.	Std. Err.	p
Boy	0.197***	0.017	0	0.091***	0.018	0.00
Father's education						
1	0.041	0.130	0.75	0.068	0.067	0.31
2	0.011	0.131	0.93	0.063	0.066	0.34
3	0.059	0.135	0.66	0.062	0.070	0.38
Mother's education						
1	-	-	-	-0.015	0.140	0.91
2	0.001	0.023	0.98	-0.008	0.139	0.95
3	0.132**	0.060	0.03	-0.036	0.140	0.80
Father's occupation						
1	0.122*	0.063	0.06	-0.047	0.047	0.33
2	0.086	0.064	0.18	-0.007	0.043	0.87
3	0.132**	0.064	0.04	-0.035	0.044	0.43
4	0.136**	0.069	0.05	0.014	0.065	0.83
Mother's occupation						
1	0.063	0.082	0.44	0.077	0.092	0.40
2	0.088	0.085	0.30	0.061	0.093	0.51
3	0.101	0.090	0.27	0.107	0.093	0.25
4	-	-	-	-0.041	0.107	0.70
School induced physical activity	-0.007	0.005	0.16	0.000	0.006	0.97
constant	-0.061	0.141	0.67	0.064	0.111	0.57
	Adj R^2= 0.31, F(14, 420)=13.44 (p=0.00)			Adj R^2= 0.10, F(16, 414)=2.78 (p=0.00)		

Note: * p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

It is seen that family income of a typical Indian household largely depends on father's occupation. Their income is expected to be more influential than mother's occupation for children's engagement in physical activity. Usually, a mother is closer to her children from childhood for nurturing them than a father. Therefore, mother's better education provides greater understanding about the need for physical activity for sound development of their children, so the mother's education and consciousness are a more encouraging and influential factor to this end. But the participation in physical activity of a child in Fijian society is highly influenced by the community. Hence, the parental role for children's engagement in physical activity becomes a little bit passive.

4.3 Physical activity self-efficacy (PSE)

The previous section discusses the types, levels and various influential factors of physical activity engaged in by the sample of adolescent students in both countries. The objective is to see the effect of physical activity on self-efficacy to regulate that activity i.e., on physical activity self-efficacy (PSE) and its extent. With the higher level, physical activity may not contribute to the PSE to the same extent and this is because a sufficient level can be achieved with a moderate level of physical activity. Therefore, the study assumes a nonlinear relationship between them. Moreover, such efficacy would generally originate from physical activity, but could also be derived directly or indirectly from other activities (e.g., household activities, learning, various forms of musical and cultural involvement, and indoor games). In this section, the extent of PSE among the sample students is discussed. At first, reliability testing of the questions to which the sample students have been asked to respond has been undertaken. After confirming the reliability of each question in the instrument, the study applied principal component analysis to construct an appropriate index combining the questions. Then in the next section, 4.4, the regression analysis is used to establish the relationship between physical activity and physical activity self-efficacy.

The necessary first step is to define what is meant by physical activity self-efficacy. As discussed in Chapters 2 and 3, it represents an idea about self-efficacy in physical activity. According to Bandura (1994), perceived self-efficacy is defined as people's beliefs about their capabilities to produce performance at a designated level and that exercise can influence the events throughout life. A strong sense of efficacy enhances human success and personal well-being in many ways. People with high efficacy in their capabilities will be able to deal with difficulties and challenging tasks to be mastered instead of avoiding them. It fosters their intrinsic interest and deep engrossment in those activities. They set themselves to take on challenging goals and quickly recover their sense of efficacy after failures or setbacks. They approach threatening situations with assurance that they can exercise control over them (Bandura, 1994).

Similarly, physical activity self-efficacy is concerned with people's beliefs about their capability to regulate their own regular physical activity (Bandura, 2006). The study

assumes that a physical activity efficacious outlook fosters people's intrinsic interest in those activities. This interest helps them to take on challenging goals so that they can overcome various untoward situations to maintain regular physical activity.

As discussed in Chapter 3, the study used a self-efficacy scale (Bandura, 2006) in which the questions assess students' confidence for engagement in physical activity in different improper situations (e.g., when tired, when beset with various problems etc.) and the answers have been measured on a 10-point scale, representing '0' as the lowest and '10' as the highest. The higher the value means the greater the PSE value (see Appendix A). Table 4.12 contains the various questions presented to the sample students to assess their PSE and each question is given a name which is used for further statistical analysis in this section.

Table 4.12: Questions and their names defined for physical activity self-efficacy

Question: How certain you are that you can get yourself to perform your physical activity routine regularly	***Question name***
1.when you are feeling tired?	*pse01_tired*
2. when you are feeling under pressure from work?	*pse02_work*
3. during bad weather?	*pse03_weather*
4. after recovering from an injury that caused you to stop exercising?	*pse04_injury*
5. during or after experiencing personal problems?	*pse05_personal*
6. when you are feeling depressed?	*pse06_depress*
7. when you are feeling anxious?	*pse07_axious*
8. after recovering from an illness that caused you to stop exercising?	*pse08_ill*
9. when you feel physical discomfort when you exercise?	*pse09_discomf*
10. after a vacation?	*pse10_Af_vacatn*
11. when you have too much work to do at home?	*pse11_hm_wk*
12. when visitors are present?	*pse12_visitors*
13. when there are other interesting things to do?	*pse13_oth_int*
14. if you don't reach your exercise goals/	*pse14_goals*
15. without support from your family or friends?	*pse15_fam_sup*
16. during a vacation?	*pse16_vacatn*
17. when you have other time commitments?	*pse17_oth_comnt*
18. after experiencing family problems?	*pse18_fam_prob*

The physical activity self-efficacy is a psychological variable and the questions have been asked to capture this. The questions may not all be equally reliable in representing

this variable, as per the students' responses. Hence the need is to determine their reliability before constructing a reliable index representing self-efficacy to regulate physical activity as well as considering them for further analysis. That is why, at first, Cronbach's alpha test to examine the reliability of each question has been used. When the overall score of alpha surpasses the critical limit (i.e., 0.7) the questions would be reliable and are selected for constructing an index. The result of Cronbach's alpha test for physical activity self-efficacy is reported in Table 4.13.

Table 4.13: Result of reliability test on the questionnaire used for physical activity self-efficacy

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	alpha
pse01_tired	873	+	0.482	0.388	0.195	0.804
pse02_work	873	+	0.521	0.430	0.192	0.802
pse03_weather	873	+	0.462	0.366	0.196	0.805
pse04_injury	873	+	0.463	0.367	0.196	0.805
pse05_personal	873	+	0.535	0.447	0.191	0.801
pse06_depress	873	+	0.498	0.405	0.194	0.803
pse07_axious	873	+	0.487	0.393	0.194	0.804
pse08_ill	873	+	0.565	0.479	0.189	0.799
pse09_discomf	873	+	0.548	0.460	0.190	0.800
pse10_Af_vacatn	873	+	0.428	0.329	0.198	0.808
pse11_hm_wk	873	+	0.515	0.424	0.192	0.802
pse12_visitors	873	+	0.498	0.405	0.194	0.803
pse13_oth_int	873	+	0.477	0.382	0.195	0.805
pse14_goals	873	+	0.514	0.423	0.193	0.802
pse15_fam_sup	873	+	0.495	0.401	0.194	0.803
pse16_vacatn	873	+	0.380	0.277	0.201	0.811
pse17_oth_comnt	873	+	0.444	0.345	0.197	0.807
pse18_fam_prob	873	+	0.488	0.394	0.194	0.804
Test scale					0.194	0.813

Source: Author's calculation, Field Survey.

***Note*:** Column 4 shows item-test correlation that represents the correlation between one item and the total test score. Column 5 shows item-rest correlation that represents the correlation between one item and the total score that is obtained by all other items.
Column 6 shows average inter-item correlation that represents the average inter-item correlation of all items, excluding the particular item of the row. Column 7 shows the Cronbach's α coefficient for the test if the particular item in the row is eliminated.

It shows that the signs of all questions are positive and inter-test correlations are high enough to include them in constructing a combined index. Also, the overall Cronbach's alpha combining all questions is 0.813 and that is beyond the critical value. It indicates

that the questions are reliable to explain the variable sufficiently. Moreover, the alpha score does not increase by eliminating any one of the questions. Therefore, all the questions are considered in constructing a combined index to represent the level of physical activity self-efficacy for each student.

After carrying out the reliability testing for the questions, it is needed to construct an index for physical activity self-efficacy. It is undoubted that each question is not going to get equal weight in construction of the index, due to different dimensions, and hence, a systematic approach has been followed to do so. In order to do this the principal component method has been applied and this provides the separate and appropriate scores to all questions towards various uncorrelated dimensions. However, here the most significant dimension (component 1) which explains the largest variation of the set of questions has been considered. Coefficients of component 1 have been considered as weights against the respective questions in constructing the index. The study looked at the summarised statistics for each question (variable) and the extent of collinearity between them (see Table C1 and C2 in Appendix C for detailed results) before computing PCA. The result suggests that they are highly correlated.

Since they are highly correlated, the next step was to extract principal components of all questions and to derive their coefficients towards one dimension. The results of the PCA have been reported in Table 4.14 and 4.15. From Table 4.14, it is seen that first component has the maximum eigenvalue 44.833 and it describes 23.9% of the total variance of the variables. This component has been considered to construct the index. The coefficients of the component would be the projection or weighting of all questions along its dimension. The detailed information for the first component has been presented in Table 4.15. Note that all coefficients for the first component are statistically significant and hence, they can be considered to assign weights against the corresponding questions for constructing the index. According to their weights found, it is evident that *pse12_visitors* is the most and *pse01_tired* is the least important question to represent the instrument for physical activity self-efficacy.

Table 4.14: Explained variance by component among the variables on physical activity self-efficacy

Components	Eigenvalue	Proportion	SE_Prop
Component 1	44.833	0.239	0.009
Component 2	15.514	0.083	0.004
Component 3	14.805	0.079	0.004
Component 4	11.735	0.063	0.003
Component 5	10.642	0.057	0.003
Component 6	10.006	0.053	0.003
Component 7	9.308	0.050	0.002
Component 8	8.677	0.046	0.002
Component 9	8.065	0.043	0.002
Component 10	7.627	0.041	0.002
Component 11	7.460	0.040	0.002
Component 12	6.584	0.035	0.002
Component 13	6.239	0.033	0.002
Component 14	6.077	0.032	0.002
Component 15	5.899	0.031	0.002
Component 16	5.317	0.028	0.001
Component 17	4.576	0.024	0.001
Component 18	4.307	0.023	0.001

Source: Author's calculation, Field Survey.

Table 4. 15: Principal component analysis of variables on physical activity self-efficacy

Component 1	Coef.	Std. Err.	p
pse01_tired	0.183***	0.015	0.00
pse02_work	0.223***	0.016	0.00
pse03_weather	0.229***	0.020	0.00
pse04_injury	0.219**	0.019	0.00
pse05_personal	0.240***	0.017	0.00
pse06_depress	0.208***	0.017	0.00
pse07_axious	0.203***	0.017	0.00
pse08_ill	0.270***	0.017	0.00
pse09_discomf	0.247***	0.015	0.00
pse10_af_vacatn	0.210***	0.020	0.00
pse11_hm_wk	0.250***	0.017	0.00
pse12_visitors	0.285***	0.021	0.00
pse13_oth_int	0.262***	0.020	0.00
pse14_goals	0.257***	0.018	0.00
pse15_fam_sup	0.249***	0.018	0.00
pse16_vacatn	0.209***	0.024	0.00
pse17_oth_comnt	0.210***	0.018	0.00
pse18_fam_prob	0.260***	0.020	0.00

Note: Rho = 0.239; SE(Rho) = 0.009
LR test for independence (chi2(153) = 2753.99, p = 0.00)
LR test for sphericity (chi2(170) = 2912.89, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

Even if the coefficients are statistically significant, there is no certainty that they are significantly different from each other. Hence Chi-square test for equality of the coefficients derived from the first component has been undertaken and the results are reported in Table C3 (see Appendix C). The probability value of Chi-square suggests that the coefficients are significantly different from each other. Hence, they can be used for constructing the index.

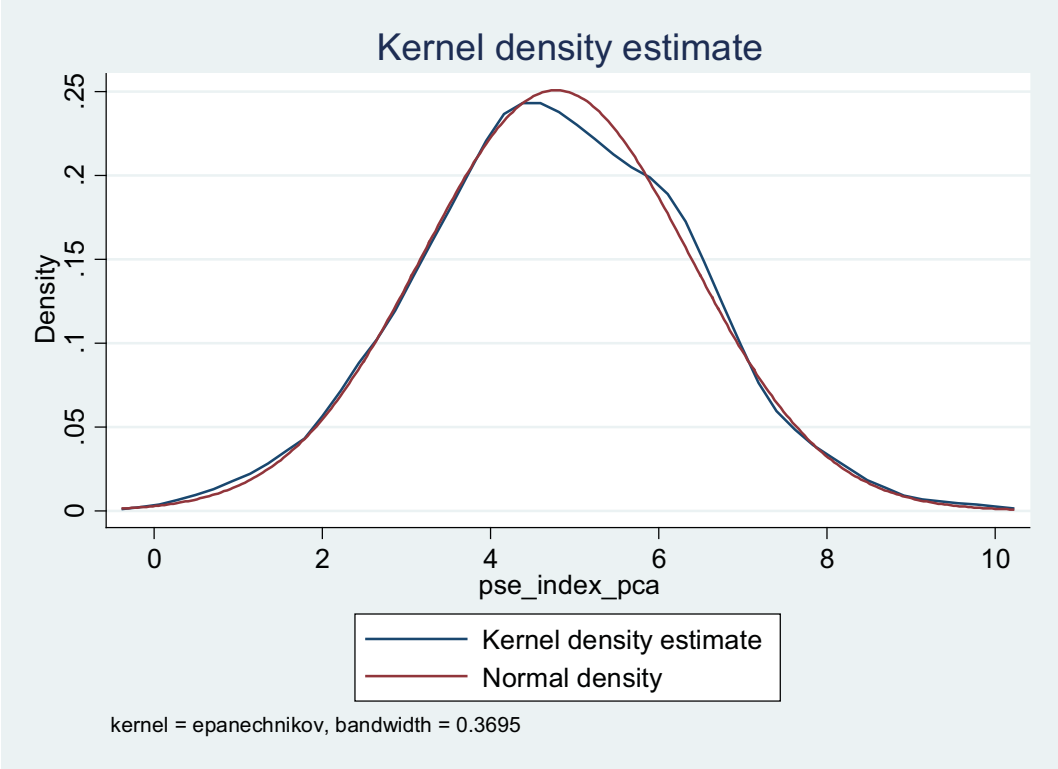
The coefficients of the component can be considered as the weights of the questions used in the analysis and thereby, they can be combined linearly for index formation as follows: For the normalisation purpose, the shared value of each coefficient is used with respect to the total value of all coefficients so that the sum of the weight will be exactly equal to one.

$$Level\ of\ Physical\ Activity\ Self-efficacy\ = \frac{\sum_{i=1}^{18} \omega_i pse\_i}{\sum_{i=1}^{18} \omega_i} \quad \text{----- (4.2)}$$

where pse_i represents value and ω_i is the coefficient of *i-th* (i= 1, ----, 18) variable (question) found in component 1 (see Table 4.15).

The next step is to consider the distribution of the physical activity self-efficacy index against the sample students, using various graphs. For this purpose, two types of graphs have been shown in Figure 4.2. They are the Kernel distribution and normal distribution. As per the Kernel distribution, the highest density of the physical activity self-efficacy index lies at a point a little below the average level (i.e., 5) while the normal distribution suggests that the highest peak lies exactly on 5. Hence, they are almost symmetric. The largest share of students has the average level of physical activity self-efficacy, i.e., 5.

Figure 4. 2: Kernel density distribution of physical activity self-efficacy



Source: Author's calculation, Field Survey.

4.4 Factors influencing physical activity self-efficacy

It would be interesting to know the one to one correspondence between the level of physical activity and acquired self-efficacy to regulate this activity.

A regression technique was applied to establish a robust relationship between physical activity and physical activity self-efficacy while controlling other possible factors. In order to do this, the physical activity self-efficacy was regressed on physical activity. Other sociocultural factors such as country, gender, learning activities, musical and cultural engagement, and household activities were controlled. Here, it could be expected that involvement of other household and higher engagement of learning, musical and cultural activities might limit the self-efficacy to regulate physical activity because these engagements can reduce time availability for physical activity. Hence, the physical activity self-efficacy is a function of physical activity and other sociocultural factors, where physical activity self-efficacy is the dependent variable, physical activity is the independent variable and other factors are control variables. The regression model can be represented as follows (Box 4.2):

Box 4.2: Regression model of physical activity self-efficacy

level of physical activity self-efficacy

= f (level of physical activity, country, gender, share of time spent on household works, share of time spent on learning activities, share of time spent on music, singing and drawing) ----- (4.3)

The results of multiple regression on physical activity self-efficacy (PSE) against the level of physical activity, country, gender, household work, learning and music/singing /drawing have been presented in Table 4.16. From the table, it is observed that there is no significant difference in the level of PSE between the countries. The table shows that the regression coefficient of physical activity is 4.261 and the coefficient of square term of the variable is -3.682. Both of them are statistically significant at the 5% level. Therefore, PSE is significantly increasing with physical activity. But, it is seen that the rate decreases gradually. The same result has been seen in sub-group analysis (shown in Table C4 of Appendix C). This proves a

part of the second hypothesis, suggesting that the level of physical activity definitely improves the self-efficacy to regulate physical activity, but at a decreasing rate. The result supports Stimpson's (2000) study that revealed a significant relationship between the stages of exercise change with respondents' levels of confidence ($p<.001$). The result of the present study also supports the study of Ryan and Dzewaltowski (2002) that shows the association of physical activity and various types of physical activity self-efficacy. However, the present study is distinct in the sense that it mainly focuses on the students of the specific age group, i.e., adolescent students. This apart, it is observed that PSE increases with physical activity at a decreasing rate. As results shown in Table 4.16, it is seen that PSE is significantly increasing with physical activity, but at a decreasing rate. That means it increases with the level of physical activity, reaches to the highest peak and then starts declining. In other words, beyond that highest peak more physical activity might work adversely on the level of physical activity self-efficacy. Therefore, the higher level of physical activity does not influence the PSE to the same rate because a sufficient level of PSE could be achieved with a moderate level of physical activity.

This apart, girl students show a significantly lower level of PSE compared to boys. This means that in spite of doing the same physical activity, girl students do not develop the same level of confidence to regulate regular physical activity as do boys. This indicates that there are some other forms of social constraints that influence this outcome.

Moreover, PSE is significantly decreasing with household work and it may be due to taking away time from physical activity. It is not influenced by learning activity and music/singing/drawing. Therefore, the negative and significant effect of household work on PSE suggests that self-efficacy to regulate physical activity would be lower for higher engagement in household activities, due to not having enough time to engage in physical activity. Here, it is also seen that learning and other activities such as music/singing/drawing do not have statistically significant impact on PSE in both countries. From the following tables it is clearly observed that physical activity is found to be the most influencing and common factor in deriving self-efficacy to regulate physical activity among the sample students in both countries and that supports a part of this study's second hypothesis.

Table 4.16: Regression results of physical activity self-efficacy on the level of physical activity combining both countries

Variable	Coef.	Std. Err.	p
Physical activity	4.261***	0.834	0.00
(Physical activity)^2	-3.682***	1.080	0.00
Fiji	0.188	0.147	0.20
Boy	0.560***	0.114	0.00
share of time spent on household works	-1.230**	0.571	0.03
share of time spent on learning activities	-0.382	0.589	0.52
share of time spent on music, singing and drawing	-0.107	0.648	0.87
Constant	4.056***	0.257	0.00

Note: Adj R^2= o.11, F(7,865)=16.34 (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

4.5 Conclusion

The results from the data analysis can be summarized as follows:

- At first, it can be argued that the level of physical activity of the sample students largely lies within the low (0.0–0.2, i.e., 0–84 min per day) to moderate (0.21–0.40, i.e., 1.4– 2.8 hours per day) level and this activity mainly includes mainly walking, bicycling and nationally popular sports, like cricket in India and volleyball and rugby in Fiji. Walking is widely observed for communication in both countries, but bicycling is seen more in India.
- Secondly, the average level of physical activity performed by Indian students (121.5 minutes per day) is higher than that of Fijian students (102.9 minutes per day), but it does not significantly vary from each other. The average physical activity level of the sample adolescent students seems to be on the higher side because the study has included all the common physical activities including means of transport (walking and cycling). It does not distinguish between structural (physical education, exercise, games and sports) and common day- to-day (e.g., walking and cycling) physical activity. There is no significant difference in physical activity between the samples for the two countries because, Indian students are compelled to engage in physical activity (bicycling) as a means of transport, in spite of having limited leisure time for physical activity due to competitive pressure on learning activities.

- Thirdly, the average level of physical activity is significantly lower for girls compared to boys and this variation between genders is greater in India than that in Fiji. Many constraints for gender equality in society bear the responsibility for it in both countries.
- Fourthly, students' physical activity is more or less significantly increasing with father's occupation and mother's education in India, but in Fiji, parental occupation and education are statistically insignificant for explaining students' physical activity. Therefore, community life might play an important role in engaging the students in physical activity in Fiji.
- Fifthly, in both countries school does not make any significant contribution for students' physical activity. Therefore, due to the lack of school support, many students do not engage themselves in moderate to high levels of physical activity, in both countries.
- Sixthly, adolescent students' physical activity significantly increases their PSE, but at a decreasing rate and so PSE decreases after a certain level of physical activity. Boys' PSE is significantly higher than that of girls, in both countries.
- Finally, PSE decreases significantly with household work and is not influenced by learning activity and music/singing/drawing.

Therefore, the observations mentioned in the first, third and fourth points support part of the first hypothesis. This is that 'moderate to high levels of physical activity are limited to a few adolescent students. The level is significantly influenced by various socioeconomic factors such as gender, parental income and educational status'. The variation in the level of physical activity is not significantly different between the countries and it could be because Indian students are engaged more in bicycling as a means of transport, although they are engaged in only limited leisure time physical activity due to competitive academic activities. Secondly, the sixth point supports a part of the second hypothesis: 'the effect of physical activity is to improve physical activity self-efficacy, but at a decreasing rate.' This observation supports the previously mentioned studies undertaken by Stimpson (2000) and Ryan and Dzewaltowski (2002). This observation also supports other literature (Bandura, 2006) that self-efficacy in a particular area maintains the success or activity (in that area) which further improves self-efficacy in that area. However, the current study is unique

in focusing specifically on an adolescent age group and it found a positive role of physical activity in promoting PSE at a decreasing rate.

The next chapter discusses the effect of physical activity self-efficacy on other sociopsychological variables such as general emotion, self-confidence and school adjustment.

CHAPTER 5: IMPACT OF PHYSICAL ACTIVITY SELF-EFFICACY ON GENERAL EMOTION, SELF-CONFIDENCE AND SCHOOL ADJUSTMENT

5.1 Introduction

This chapter provides an understanding about several sociopsychological variables like general emotion, self-confidence and school adjustment during the adolescent period and the effect of physical activity self-efficacy acquired from regular physical activity on these variables among the sample students taken from both countries, i.e., India and Fiji. The study has hypothesised that if someone participates in physical activity, his/her sociopsychological states such as general emotion, self-confidence and school adjustment develop accordingly. In the previous chapter, it has been observed that the level of physical activity undertaken by the students positively influences their physical activity self-efficacy but at a decreasing rate. The study argues that this self-efficacy regulates the students in a favourable way and, as a result, they might increase their positive general emotion, self-confidence and school adjustment. This chapter investigates whether the acquired physical activity self-efficacy from regular physical activity promotes general emotion, self-confidence and school adjustment of sample students during the adolescent period.

As the study is cross-sectional, the analysis on the relationship between the various proposed variables will be inferred from the results drawn from regression methods in this chapter. The attempt has been undertaken throughout the chapter to construct suitable indices for general emotion, self-confidence and school adjustment so that their relationship with the level of physical activity self-efficacy can be examined objectively. Before that, a brief discussion of how physical activity influences those psychological variables is presented below.

(i) The study has hypothesised that if someone participates in physical activity, this activity lowers his/her stress, anxiety and depression levels, thereby improving his/her satisfaction (Norris et al., 1992), and developing his/her general emotional state in a favourable way. The existing literature shows that, among hyperactive impulsive children, physical activity is associated with global

satisfaction for boys specifically and an absence of depressive emotions for both sexes (Klein & Deffenbacher, 1977).

(ii) The study assumes that physical activity may increase students' confidence level through developing self-efficacy to regulate physical activity. According to the literature, one can develop one's self-confidence by developing efficacy in a particular area (Bandura, 2006). And Eyler et al. (2003) found a positive relationship between walking and self-confidence.

(iii) According to the assumption of the present study, the students can increase their relationships with peers, teachers, and school environment through raising their school bonding, connectedness and collective efficacy by engaging themselves in physical activity during school time, thus developing their school adjustment. Some studies show that people, by participating in physical activity, can strengthen their relationships and link with one another, build active communities, and enhance a safe and supportive environment in social life (Sport England, 1999; Bloom et al., 2005; Sport Matters Group, 2005). Hence, the continuance of good relationships with teachers and peers would increase students' desire to go to school and develop their school adjustment as well as minimise dropout rates. According to Rovio et al. (2005), the inclusion of physical activity in school curriculum decreases disruptive activities and dropout rates among the students without risk of diminishing academic attainment. On the other hand, by engaging in physical activity, the students may restrain themselves from high-risk activities such as drug and alcohol abuse and smoking. For example, smoking is negatively correlated with leisure time physical activity[59]. Hence, limiting high-risk activities, i.e., negative behaviour, may develop a better level of students' school adjustment.

At first, the indices of the variables such as general emotion, self-confidence and school adjustment have been constructed from the students' responses to capture their levels among the sample students and are discussed in sections 5.2, 5.4 and 5.6 respectively. Then, effects of physical activity self-efficacy/physical activity on these variables have been determined in sections 5.3, 5.5 and 5.7. Section 5.8 ends the chapter with concluding observations.

[59] www.ncbi.nlm.nih.gov/.

5.2 General emotion (GE)

This section discusses general emotion of the students. The study has hypothesised that engagement in physical activity lowers students' stress, anxiety and depression levels and enhances their satisfaction, which develops their general emotion. This transmission may be achieved through physical activity self-efficacy that helps the students to regulate themselves in a positive way. Depending on the students' responses to the questions related to general emotion, a reliability test has been undertaken to confirm at first whether all the questions asked of the students would be included in the construction of an index for general emotion. After the reliability test, the sufficiently reliable questions were considered for preparation of a combined index. Then, the study follows principal component analysis to construct the index of the variable. The multiple regression method has been applied to find out the effect of physical activity self-efficacy as well as physical activity on general emotion.

As discussed in Chapter 3, general emotion is defined as complicated psycho-physiological understanding of one's mind status, which is the outcome of interaction between biochemical (internal) and environmental (external) influences[60]. When the body perceives a stimulating fact, it changes accordingly, whereas individual's feeling for the same fact is known as emotion[61].

The study has assumed that a person in a positive emotional state concentrates his/her energies on his/her goal and is ready to face challenging situations. He/she is able to work efficiently and adequately, knowing that there are always some or alternative ways for self-improvement, and continuously striving to improve. He/she learns frustration tolerance and to inhibit expectations when they are not suitable and postpone satisfaction for a more favourable occasion. He/she has a certain freedom of emotional expression and self-control according to the situation. That is why he/she is free from excessive anxiety, depression, worry, and disturbing fears.

The literature has expressed general emotion as a person's general interpretation of his or her physiological or affective reactions (e.g., mood, anxiety, stress etc.). Emotional reactions include strategies to maintain, enhance, subdue, and/or inhibit emotions in

[60] http://www.jainworld.com/science/Metaphysics/Emotions.pdf.
[61] changingminds.org › Explanations › Theories.

attempting to accomplish goals. A scale for 'general emotion' (based on modified Bell Adjustment Inventory Method; adapted by Mohsin & Shamsad, 1970), which involves various feelings and reactions of the students in different situations or their degree of anxiety feeling under hypothetical problems, has been constructed. Table 5.1 presents the various questions asked to the sample students to assess their general emotion and variable (question) names denoted for further statistical analysis in this section.

Table 5.1: Questions and variables defined for general emotion

Question	Question name
1. Do you feel pessimistic at times?	*ge01pessimistic*
2. Do you feel scared of love and affection in your family?	*ge02love*
3. Do you feel tiredness at the end of the day?	*ge03tired_end*
4. Do you feel fear from the imagination of an earthquake or a fire break out?	*ge04earthquake*
5. Do you get tears for any small reason?	*ge05get_tears*
6. Do you face any problem because of your hesitation and shyness?	*ge06shyness*
7. Do you feel your parents consider you as childlike or immature?	*ge07immature*
8. Do you get fear very much from falling down when you are in a high place?	*ge08high_place*
9. Do you feel tiredness early in the morning?	*ge09tired_morn*
10. Do you get angry very quickly?	*ge10angry*
11. Do you feel helpless frequently?	*ge11helpless*
12. Are you confused very frequently?	*ge12confused*
13. Do you get sensitive very quickly?	*ge13sensitive*
14. Do you feel anxiety in thinking about possible future problems?	*ge14anxiety*
15. Do you feel problems due to irrelevant thoughts coming in your mind?	*ge15irrelevent*
16. Do you feel fear in the dark?	*ge16dark*

Students were asked these questions to assess their general emotion. But they are negative in sense and measured on a 10-point scale so the higher the value of the answers means the lower the value of general emotion. To relate a higher index for a higher level of general emotion, the values of all the answers have been converted into a positive direction by subtracting the assigned values from 10. For example, if someone assigns value 4 for any question, it means he will get 4 for a negative sense and 10 – 4 = 6 for a positive sense of general emotion. After subtracting, all the questions' names have been abbreviated by denoting with 2. For example, *ge01pessimistic* has been changed by *ge01pessimistic2, ge02love* by *ge02love2* etc.

After the questions were used in this way to capture the students' general emotion, a reliability test, Cronbach's alpha test, was applied to justify questions' reliability. The result is reported in Table 5.2, which shows that the signs of all the questions are positive, and item-test and item-rest correlations are sufficient to retain them in the derivation. Moreover, the overall Cronbach's alpha combining all questions is 0.808, which is greater than the critical value (0.7) and this value cannot be raised further by deleting any one of them. Therefore, all the questions are considered as reliable to explain the variable and have been taken for constructing a combined index to represent the level of general emotion for each student.

Table 5.2: Result of reliability test on the questionnaire used for general emotion

Item	Observation	Sign	item-test correlation	item-rest correlation	average interitem correlation	alpha
ge01pessimistic	873	+	0.371	0.257	0.219	0.808
ge02love	873	+	0.390	0.279	0.217	0.806
ge03tired_end	873	+	0.448	0.341	0.213	0.802
ge04earthquake	873	+	0.548	0.452	0.205	0.795
ge05get_tears	873	+	0.584	0.494	0.202	0.792
ge06shyness	873	+	0.568	0.475	0.203	0.793
ge07immature	873	+	0.455	0.349	0.212	0.802
ge08high_place	873	+	0.558	0.464	0.204	0.794
ge09tired_morn	873	+	0.528	0.430	0.207	0.796
ge10angry	873	+	0.442	0.335	0.213	0.803
ge11helpless	873	+	0.578	0.487	0.203	0.792
ge12confused	873	+	0.621	0.536	0.199	0.789
ge13sensitive	873	+	0.458	0.353	0.212	0.801
ge14anxiety	873	+	0.574	0.482	0.203	0.793
ge15irrelevent	873	+	0.567	0.474	0.204	0.793
ge16dark	873	+	0.432	0.324	0.214	0.803
Test scale					0.208	0.808

Source: Author's calculation, Field Survey.

Note: Same as Table 4.13

The next step involved the application of the principle component method considering all questions to construct the index of general emotion. The study considered the summarised statistics for each question (variable) under general emotion and the extent

of collinearity between them (see Table C5 and C6 in Appendix C for detailed results) before computing PCA. The result suggests that the questions are highly correlated.

Since the questions are highly correlated, the extraction of principal components is needed to derive their coefficients towards various dimensions. The PCA results have been presented in Tables 5.3 and 5.4. As shown in Table 5.3, the first component, with maximum eigenvalue 47.352, describes 26.90% of the total variance of the variables. This component has been considered for constructing the index. Coefficient of the component would be the projection of each question along its dimension. The complete information for the component has been represented in Table 5.4. From the table, it is seen that all coefficients for component 1 are statistically significant and hence, they can be considered as weights against the corresponding questions for constructing the index. According to their weights found in component 1*, ge05 get_tears2* is the most and *ge01 pessimistic2* is the least important question to represent the instrument for general emotion.

Table 5.3: Explained variance by component of variables in general emotion

Components	Eigenvalue	Proportion	SE_Prop
Component 1	47.352	0.269	0.010
Component 2	16.548	0.094	0.004
Component 3	12.305	0.070	0.003
Component 4	10.824	0.062	0.003
Component 5	10.525	0.060	0.003
Component 6	9.632	0.055	0.003
Component 7	9.476	0.054	0.003
Component 8	8.751	0.050	0.002
Component 9	7.922	0.045	0.002
Component 10	7.278	0.041	0.002
Component 11	7.097	0.040	0.002
Component 12	6.594	0.038	0.002
Component 13	6.165	0.035	0.002
Component 14	5.900	0.034	0.002
Component 15	5.155	0.029	0.001
Component 16	4.481	0.026	0.001

Source: Author's calculation, Field Survey.

Table 5.4: Principal component analysis of variables in general emotion

Component 1	Coef.	Std. Err.	p
ge01pessimistic	0.119***	0.017	0.00
ge02love	0.142***	0.018	0.00
ge03tired_end	0.188***	0.018	0.00
ge04earthquake	0.302***	0.018	0.00
ge05get_tears	0.341***	0.018	0.00
ge06shyness	0.276***	0.015	0.00
ge07immature	0.219***	0.019	0.00
ge08high_place	0.324***	0.018	0.00
ge09tired_morn	0.272***	0.020	0.00
ge10angry	0.215***	0.020	0.00
ge11helpless	0.234***	0.016	0.00
ge12confused	0.269***	0.014	0.00
ge13sensitive	0.181***	0.016	0.00
ge14anxiety	0.267***	0.016	0.00
ge15irrelevent	0.259***	0.017	0.00
ge16dark	0.275***	0.024	0.00

Note: Rho = 0.269; SE(Rho) = 0.010
LR test for independence (chi2(120) = 2523.68, p = 0.00)
LR test for sphericity (chi2(135) = 2724.25, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

The estimated coefficients of component 1 may not necessarily be statistically different from each other. Therefore, one has to be sure whether the coefficients are significantly different from each other. For this purpose, Chi-square test for equality of coefficients derived from the component has been undertaken and the results have been reported in Table C7 (see Appendix C). The probability value of Chi-square recognizes that the coefficients are significantly different from each other. Hence, they can be used for constructing the index.

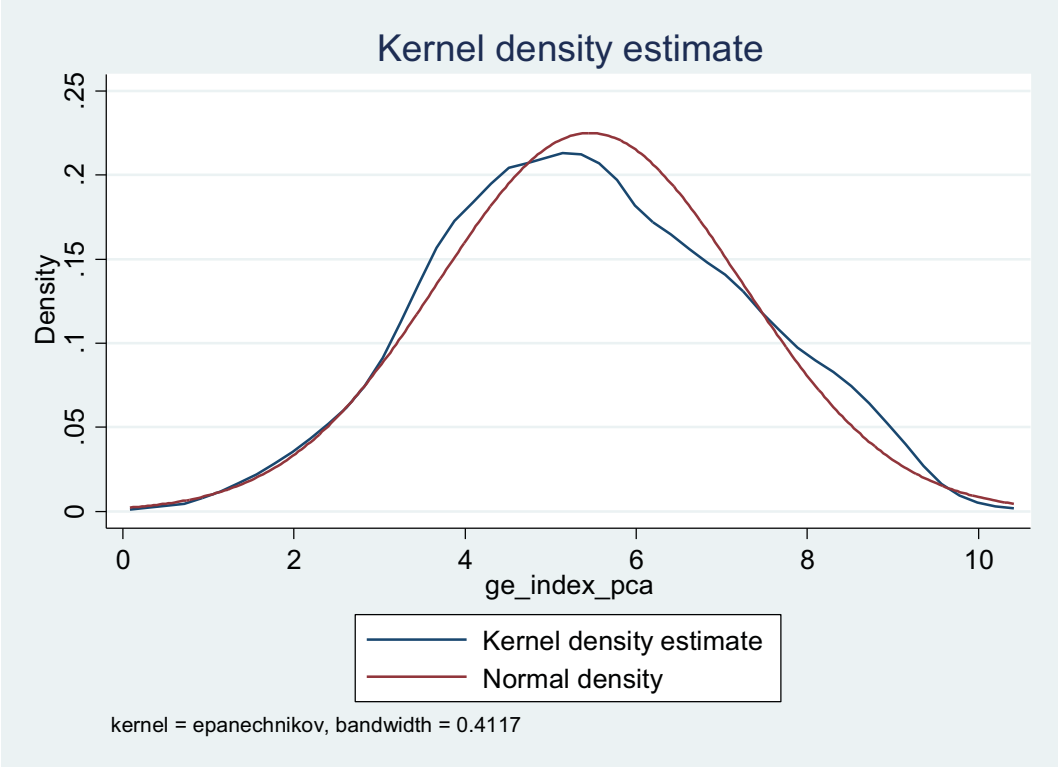
Therefore, the coefficients of component 1 have been used as the weights of the corresponding questions to combine them linearly for constructing an index of general emotion. In order to normalise, the shared and weighted value of each coefficient with respect to the total value of all coefficients is used so that the sum of the weights must be exactly equal to one.

$$level\ of\ general\ emotion = \frac{\sum_{i=1}^{16} \omega_i gei}{\sum_{i=1}^{16} \omega_i} \qquad \text{---------(5.1)}$$

where *gei* represents the value and ω_i is the coefficient of *i-th* variable (question) found in component 1 (see Table 5.4).

The distribution of the level of general emotion has been derived using the above method and plotted in Figure 5.1. As per two distributions (normal and Kernel), the highest density of the sample students lies more or less around the average value of general emotion (i.e., 5). Hence, they look almost the same. The greatest share of students has been found to fall on the average general emotion 5.

Figure 5.1: Estimated Kernel density function of the index of general emotion



Source: Author's calculation, Field Survey.

5.3 Physical activity self-efficacy (PSE) and general emotion (GE)

Of interest to the study is whether physical activity self-efficacy acquired from regular physical activity significantly influences general emotion. For this purpose, the variable, general emotion, will be regressed on PSE. Here, the general emotion is a function of PSE and other sociocultural factors like country and gender, where general emotion is the dependent variable, PSE is an independent variable and other factors are control variables. Apart from this, the study is also interested to know, for

robustness checking, the direct effect of physical activity on general emotion. Here, the general emotion will be regressed on physical activity along with other sociocultural factors like country, gender, learning activities, musical and cultural involvement. The regression models can be represented as follows (Box 5.1):

Box 5.1: Regression models of general emotion

level of general emotion = f (level of physical activity self-efficacy, country, gender) ---(5.2)

level of general emotion = f (level of physical activity, country, gender, share of time spent on household work, share of time spent on learning, share of time spent on music, singing, drawing) --- (5.3)

The results of multiple regression on general emotion (GE) for PSE have been represented in Table 5.5a. From the table, it is seen that the regression coefficient of PSE is 0.078, which is statistically significant at the 5% level. Therefore, it is observed that GE is increasing significantly with physical activity self-efficacy for overall sample students combining the two countries. This satisfies a part of the second hypothesis, suggesting that the PSE generated from physical activity positively improves students' general emotion.

When PSE is replaced by physical activity and regressed directly on general emotion, the result has been presented in Table 5.5b. From that table, it is observed that the regression coefficient of physical activity is 0.671, which is also statistically significant at the 5% level (approximately). Hence, the results of multiple regression on general emotion (GE) for physical activity show that GE is increasing significantly with physical activity. This satisfies a part of the study's second hypothesis, suggesting that the level of physical activity definitely improves students' general emotion.

The results revealed in the following two tables support the existing literature as well. Physical activity is associated with global satisfaction in boys and an absence of depressive emotions in both sexes (Klein & Deffenbacher, 1977). The present study also supports the findings of Evans et al. (1985), who argued that emotionally or behaviourally disturbed children, engaged in various sports like jogging and playing football, have a lower level of inconsistent talking. Other studies in the literature reveal the positive effects of physical activity on children's emotion (Norris et al., 1992; Duda et al., 2014) and support the finding of this study. But the present study has

further advanced the understanding by anatomically showing the route of this relationship. It suggests that physical activity develops the level of physical activity self- efficacy in a decreasing rate and then, that self-efficacy improves the level of general emotion. In other words, the study has proved the proper channel or pathway from physical activity to general emotion through physical activity self-efficacy.

Table 5.5a: Regression result of general emotion on the level of physical activity self-efficacy combined two countries

Variable	Coef.	Std. Err.	p
Physical activity self-efficacy	0.078**	0.038	0.04
Fiji	-0.429***	0.116	0.00
Boy	0.735***	0.122	0.00
Constant	4.984***	0.191	0.00

Note: Adj R^2= 0.066, F(3,869)=21.61 (p=0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

Table 5.5b: Regression results of general emotion on the level of physical activity combined two countries

Variable	Coef.	Std. Err.	p
Physical activity	0.671**	0.349	0.06
Fiji	-0.053	0.167	0.75
Boy	0.713***	0.129	0.00
Share of time spent on household work	-0.549	0.648	0.40
Share of time spent on learning	2.026***	0.669	0.00
Share of time spent on music, singing, drawing	0.395	0.736	0.59
Constant	4.447***	0.278	0.00

Note: Adj R^2= 0.0747, F(6,866)=12.73 (p=0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

5.4 Self-confidence

This section provides an understanding of self-confidence of the students. The study investigated whether someone's participation in physical activity increases his/her physical activity self-efficacy accordingly up to a certain limit (discussed in the previous chapter). Then, the study hypothesised that this increasing self-efficacy in a specific area also has positive effects on the students' general self-confidence. Here, the study assumes that students' specific strength of belief in a certain area can

influence their general strength of belief, which can also influence their specific strength of belief in another area like learning (this second part will be examined in the next chapter).

Self-confidence may be defined as a person's faith or belief in himself/herself. Confidence is referring to the general, not the specific, strength of belief. In this way it is different from self-efficacy, the belief in one's capability to achieve something specific (Bandura, 2006). Self-confidence describes how a person has belief about himself/herself in general.

The study assumes the following qualities. A confident person:

(i) is aware about his/her strengths and limitations.
(ii) can accept failure and learn how to work harder for success. Believing there is always some way for improvement, he/she continuously strives to improve.
(iii) knowing how to set goals, can face a challenging situation. Thus he/she often gains what he/she wants, i.e., success comes his/her way more often.
(iv) wins positive feedback from people for his/her success, which again increases his/her confidence level.
(v) always takes inspiration from those who struggle continuously for self-improvement.

A person, who has high self-confidence, can make decisions and take proper action according to the situation and lives life with passion and enthusiasm. To measure these qualities, a scale (developed by Mind Tools Corporate[62] based on Bandura, 2006) has been constructed to measure students' confidence level in which the students were asked how they face or manage various adverse situations or how they keep a positive attitude even during failure. The answers of the students have been measured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. Table 5.6 presents the various statements that were asked to the sample students and their names denoted for further statistical analysis in this section.

[62] http://www.mindtools.com/pages/article/newTCS_84.htm.

Table 5.6: Statement and its name defined for self-confidence

Statement	Statement name
1. I tend to do what I think is expected of me, rather than what I believe to be "right."	*sc01_expect*
2. I handle new situations with relative comfort and ease.	*sc02_situation*
3. I feel positive and energized about life.	*sc03_feel*
4. If something looks difficult, I do not avoid doing it.	*sc04_difficult*
5. I keep trying, even after others have given up.	*sc05_try*
6. If I work hard to solve a problem, I'll find the answer.	*sc06_hard*
7. I achieve the goals which I set for myself.	*sc07_goal*
8. When I face difficulty, I do not feel hopeless and negative.	*sc08_negative*
9. I relate to people who work very hard, and still don't accomplish their goals.	*sc09_accomplish*
10. People give me positive feedback on my work and achievements.	*sc10work*
11. Even if I don't experience success early in a process, I would continue.	*sc011success*
12. When I overcome an obstacle, I think about the lessons I've learned.	*sc012 obstacle*
13. I believe that if I work hard, I'll achieve my goals.	*sc013goals*
14. I have contact with people of similar skills and experience who I consider successful.	*sc014experience*

These were the statements put to the sample students to assess their self-confidence. At first, Cronbach's alpha test was undertaken to examine the reliability of each question and the result, reported in Table 5.7, indicates that all the questions' signs are positive and inter-test and inter-rest correlation between them are satisfactory enough for including them. The overall Cronbach's alpha combining all questions is 0.806 and this is greater than the critical value (0.7). The fact that one cannot raise the overall score of alpha by reducing any one of them justifies the high reliability of all questions to explain the variable and to consider them for constructing a combined index to represent the level of self-confidence for each student.

Table 5.7: Result of reliability test on the questionnaire used for self-confidence

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	alpha
sc01_expect	873	+	0.401	0.280	0.241	0.805
sc02_situation	873	+	0.526	0.419	0.230	0.795
sc03_feel	873	+	0.584	0.485	0.224	0.790
sc04_difficult	873	+	0.579	0.479	0.224	0.790
sc05_try	873	+	0.594	0.496	0.223	0.789
sc06_hard	873	+	0.589	0.491	0.223	0.789
sc07_goal	873	+	0.534	0.427	0.229	0.794
sc08_negative	873	+	0.573	0.472	0.225	0.791
sc09_accomplish	873	+	0.335	0.209	0.248	0.811
sc10work	873	+	0.485	0.372	0.233	0.798
sc011success	873	+	0.564	0.462	0.226	0.791
sc012 obstacle	873	+	0.622	0.529	0.220	0.786
sc013goals	873	+	0.588	0.489	0.224	0.789
sc014experience	873	+	0.487	0.375	0.233	0.798
Test scale					0.229	0.806

Source: Author's calculation, Field Survey.
Note: Same as Table 4.13

Next, the study applies the principal component method to construct an index of self-confidence. The study looked at the summarised statistics for each question (variable) and the extent of collinearity between them (see Table C8 and C9 in Appendix C for detailed results) before computing PCA. The result suggests that they are highly correlated.

As the coefficients are highly correlated, principal components of all questions were established towards one dimension by applying PCA and their coefficients have been obtained. Tables 5.8 and 5.9 show the results of the PCA. From Table 5.8, it is seen that component 1 has the maximum eigenvalue of 26.406 and it describes 27.9% of the total variance of the variables. This component has been taken to construct the index. The coefficient of component 1 would be the projection of each question along its dimension. Table 5.9 presents the detailed information for component 1. Here, it is seen that all coefficients of the component are statistically significant. Hence, they are considered as weights for the corresponding questions in constructing the index of self-confidence. According to their weights found in the component 1*, sc08_negative* is the most and *sc01_expect* is the least important questions to represent the instrument for self-confidence.

Table 5.8: Explain variance by component in self-confidence

Components	Eigenvalue	Proportion	SE_Prop
Component 1	26.406	0.279	0.010
Component 2	10.925	0.116	0.005
Component 3	7.393	0.078	0.004
Component 4	6.322	0.067	0.003
Component 5	6.220	0.066	0.003
Component 6	5.715	0.060	0.003
Component 7	5.160	0.055	0.003
Component 8	5.005	0.053	0.003
Component 9	4.501	0.048	0.002
Component 10	4.363	0.046	0.002
Component 11	3.585	0.038	0.002
Component 12	3.352	0.035	0.002
Component 13	3.184	0.034	0.002
Component 14	2.428	0.026	0.001

Source: Author's calculation, Field Survey.

Table 5.9: Principal component analysis of the variables on self-confidence

Component 1	Coef.	Std. Err.	p
sc01_expect	0.209***	0.023	0.00
sc02_situation	0.278***	0.019	0.00
sc03_feel	0.290***	0.017	0.00
sc04_difficult	0.309***	0.017	0.00
sc05_try	0.294***	0.017	0.00
sc06_hard	0.251***	0.015	0.00
sc07_goal	0.227***	0.016	0.00
sc08_negative	0.339***	0.019	0.00
sc09_accomplish	0.217***	0.034	0.00
sc10work	0.247***	0.020	0.00
sc011success	0.293***	0.018	0.00
sc012 obstacle	0.282***	0.015	0.00
sc013goals	0.219***	0.013	0.00
sc014experience	0.250***	0.021	0.00

Note: Rho = 0.2793; SE(Rho) = 0.01
LR test for independence (chi2(91) = 2235.81, p = 0.00)
LR test for sphericity (chi2(104) = 2519.31, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

Also a Chi-square test for equality of the coefficients derived from the component 1 has been undertaken and the results are reported in Table C10 (see Appendix C). The probability value of Chi-square is statistically significant at the 5% level and signifies

that the coefficients are significantly different from each other. Hence, they can be taken for constructing the index.

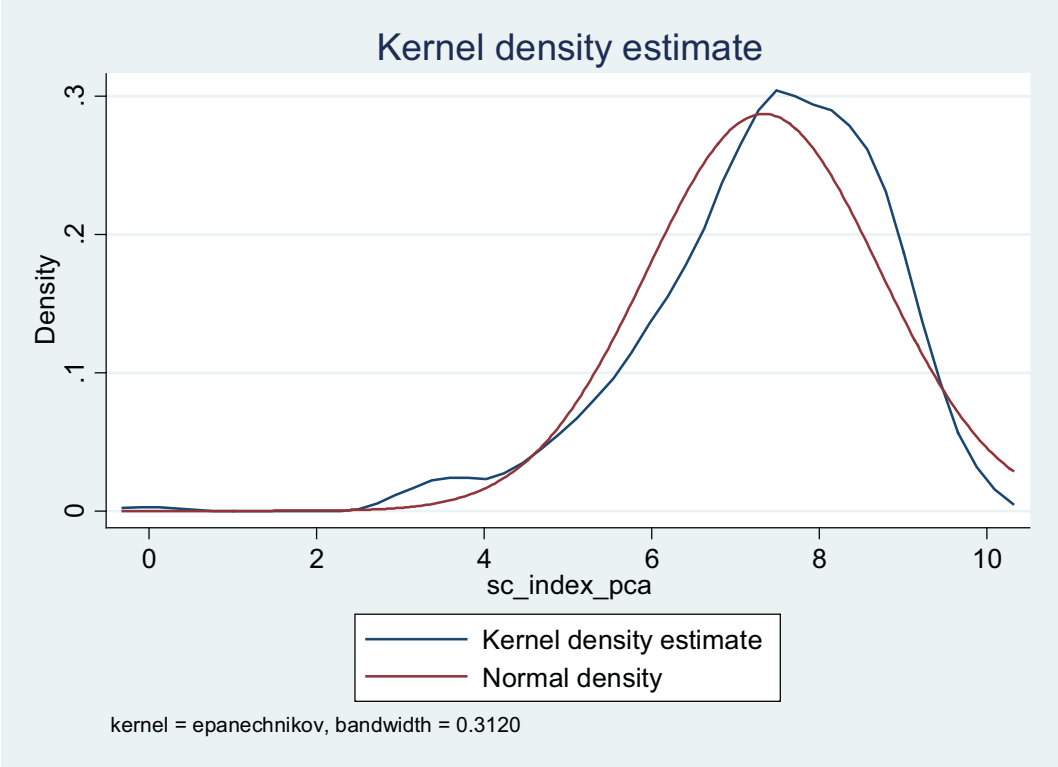
Coefficients of component 1 can be considered as the weights of the questions used for self-confidence and can be combined linearly for its index formation. For the purpose of normalisation, the shared value of each coefficient with respect to the total value of all coefficients is used.

$$\text{level of self-confidence} = \frac{\sum_{i=1}^{14} \omega_i scoi}{\sum_{i=1}^{14} \omega_i} \qquad \text{----------(5.4)}$$

Where sc0i represent value and ω_i is the coefficient of *i-th* variable (question) found in component 1 (see Table 5.9).

The distribution of self-confidence index against the sample students were examined using two types of plots, i.e., Kernel distribution and normal distribution, which have been represented in Figure 5.2. Both the distributions are almost identical and suggest that the highest peak lies near 7. Hence, the highest share of students has a self-confidence level of almost 7, which is higher than the mid-value of 5.

Figure 5.2: Kernel density distribution of the level of self confidence



Source: Author's calculation, Field Survey.

5.5 The effect of physical activity self-efficacy (PSE) on self-confidence (SC)

The next area of interest for the study was whether acquired physical activity self-efficacy from regular physical activity significantly affects students' self-confidence. In order to do this, the variable, self-confidence, was regressed on PSE where the self-confidence is a function of PSE and other sociocultural factors like country and gender. Besides, the study was also interested to know the direct effect of physical activity on self-confidence for robustness checking. Here, the self-confidence was regressed on physical activity instead of PSE along with other sociocultural factors like country, gender, learning activities, musical and cultural involvement and household activities. The regression models can be represented as follows (Box 5.2):

Box 5.2: Regression models of self-confidence

level of self-confidence = f (= level of physical activity self -efficacy, country, gender) ----------(5.5)

level of self-confidence = f (level of physical activity, country, gender, share of time spent on household work, share of time spent on learning, share of time spent on music, singing and drawing)----------(5.6)

The result of multiple regression on self-confidence (SC) for PSE has been presented in Table 5.10a, from which it is seen that the regression coefficient of PSE is 0.274 and it is statistically significant at the 5% level. Here, it can be explained that SC is significantly increasing with PSE for overall sample students combining the two countries. The result satisfies a part of the second hypothesis, suggesting that the acquired PSE from the physical activity positively improves students' self-confidence.

In order to see the direct effect of physical activity, the level of self-confidence is regressed on physical activity and the result is shown in Table 5.10b. From the table, it is observed that the regression coefficient of physical activity is 0.756 and is statistically significant at the 5% level. Therefore, the result of multiple regression on self-confidence (SC) for physical activity shows that SC is significantly increasing with physical activity. This satisfies the hypothesis, suggesting that the level of physical activity definitely improves students' self-confidence.

These results shown in Tables 5.10a and 5.10b support the findings of a study conducted by Eyler et al. (2003) that demonstrates the positive relationship between

walking and self-confidence. The present study improved the existing understanding, showing the proper channel or pathway from physical activity to self-confidence through physical activity self-efficacy, and is unique in focusing specifically on the adolescent student age group. This finding has been supported by the literature, developed by Mind Tools Corporate [63] based on Bandura (2006), showing that a person can develop his/her self-confidence by developing efficacy in a particular area. In the present case, the efficacy in a particular area refers to the physical activity self-efficacy.

Table 5.10a: Regression results of self-confidence on the level of physical activity self-efficacy both countries combined

Variable	Coef.	Std. Err.	p
Physical activity self-efficacy	0.274***	0.029	0.00
Fiji	-0.475***	0.088	0.00
Boy	0.123	0.092	0.18
Constant	6.212***	0.144	0.00

Note: Adj R^2= 0.130, F(3,869)=44.36 (p=0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

Table 5.10b: Regression result of self-confidence on the level of physical activity combined both countries

Variable	Coef.	Std. Err.	p
Physical activity	0.756***	0.274	0.01
Fiji	-0.057	0.131	0.66
Boy	0.235**	0.101	0.02
Share of time spent on household work	-2.294***	0.509	0.00
Share of time spent on learning	1.532***	0.525	0.00
Share of time spent on music, singing and drawing	0.404	0.578	0.49
Constant	6.807***	0.218	0.00

Note: Adj R^2= 0.0717, F(3,866)=12.22 (p=0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

[63] http://www.mindtools.com/pages/article/newTCS_84.htm.

5.6 School adjustment

This section discusses the sample students' level of school adjustment. As discussed earlier, the study has assumed that the students can increase their relationship with peers, teachers, and the school environment. Therefore, they can improve their school adjustment through developing school bonding, connectedness and collective efficacy by engaging themselves in physical activity during school time as well as acquiring physical activity self-efficacy. In other words, if that activity is not influenced by the school curriculum, it may not improve their school-bonding as well as school adjustment. Also, school bonding and adjustment might be dropped for those students who engage more in physical activity outside of school because the school community is markedly lacking a positive attitude towards that activity. Here, it should be noted that school curriculum is not in favour of engaging the sample students in physical activity, as observed in sub-section 4.2.5, Chapter 4.

According to the students' responses received on the questions related to school adjustment, at first, a reliability test has been undertaken. Then, the study follows principal component analysis to construct the index of the variable. Finally, a regression analysis has been followed to construct a relationship of physical activity self-efficacy as well as physical activity with school adjustment.

Let us define about school adjustment. As discussed in Chapter 3, the adjustment between two things means adaptation or modification of one or both to correspond to each other[64]. According to the present study, school adjustment represents mainly students' healthy and active participation in various group activities including learning and their relationship with peers and teachers in school. To capture these qualities, the study has constructed a school adjustment scale involving various adjustments of the students in school i.e., with teachers, peers, learning and other activities, based on a modified Bell Adjustment Inventory Method, adapted by Mohsin and Shamsad (1970). Accordingly, the questions have been chosen on how the students participate in various school activities or how they maintain relationship with peers and teachers. Table 5.11a presents the various questions that were asked to the sample students and their names denoted for further statistical analysis in this section.

[64] www.sciencepub.net/report/report0401/010_7976report0401_58_61.pdf.

Table 5.11a Questions and their names defined for school adjustment

	Question	Question name
1.	Can you share your problems with your peers?	*sa01share*
2.	Do you feel loneliness in your class-room?	*sa02loneliness*
3.	Can you make friends easily?	*sa03make friend*
4.	Do you enjoy singing and dancing with others in school?	*sa04enjoy*
5.	Do you think it is difficult for you to offer your suggestion/view in a group discussion?	*sa05group_disc*
6.	Do you feel difficulties in your class work?	*sa06class_work*
7.	Would you hesitate to offer your name to participate in any activity in the school?	*sa07participate*
8.	Do you get confused to see the teacher outside of the school?	*sa08confused*
9.	Do you feel hesitation to go to a teacher to solve any problem in school?	*sa09solve*
10.	Can you share any of your problem with your teacher?	*sa10teacher*

Not all the questions mentioned above are positive in sense. Questions no. 2, 5, 6, 7, 8 and 9 represent students' negative school adjustment on a 10-point scale. To find all the answers in a positive sense, the values of these answers have been converted into a positive direction of school adjustment by subtracting them from 10. After subtraction, these questions' names have been changed by denoting with 1, such as *sa02loneliness* has been changed by *sa02loneliness1, sa05group_disc* by *sa05group_disc1* etc. (see Table 5.11b). The higher value represents the higher school adjustment for all the questions.

Students were asked the questions mentioned above to measure their school adjustment. A reliability test (Cronbach's alpha test) was undertaken to justify the above mentioned questions' reliability. The result of the reliability test taking all the questions is not within the satisfactory range i.e., (0.7-1). Accordingly, some questions were deleted which results in the following five questions (see Table 5.11c) that are suitable for this analysis.

Table 5.11b: Questions and their names defined for school adjustment after changing in a positive direction

Question	Question name
1. Can you share your problems with your peers?	*sa01share*
2. Do you feel loneliness in your class-room?	*sa02loneliness1*
3. Can you make friends easily?	*sa03make friend*
4. Do you enjoy singing and dancing with others in school?	*sa04enjoy*
5. Do you think it is difficult for you to offer your suggestion/view in a group discussion?	*sa05group_disc1*
6. Do you feel difficulties in your class work?	*sa06class_work1*
7. Would you hesitate to offer your name to participate in any activity in the school?	*sa07participate1*
8. Do you get confused to see the teacher outside of the school?	*sa08confused1*
9. Do you feel hesitation to go to a teacher to solve any problem in school?	*sa09solve1*
10. Can you share any of your problems with your teacher?	*sa10teacher*

Table 5.11c: Questions and their names defined for school adjustment after first reliability test

Question	Question name
1. Do you think it is difficult for you to offer your suggestion/view in a group discussion?	*sa05group_disc1*
2. Do you feel difficulties in your class work?	*sa06class_work1*
3. Would you hesitate to offer your name to participate in any activity in the school?	*sa07participate1*
4. Do you get confused to see the teacher outside of the school?	*sa08confused1*
5. Do you feel hesitation to go to a teacher to solve any problem in school?	*sa09solve1*

Here, the study has again undertaken the reliability test with the questions mentioned above and the result has been reported in Table 5.12. It shows that the signs of all the questions are positive and item-test and item-rest correlations are sufficient enough to include them. Also, the overall Cronbach's alpha combining all questions is 0.733, i.e., within the satisfactory range (0.7–1). Even this cannot be raised further by dropping any one of them. Hence, they are considered as sufficiently reliable to explain the

variable, i.e. school adjustment and have been taken for constructing a combined index to represent the level of school adjustment for each student.

Table 5.12: Result of second reliability test on the questionnaire used for school adjustment

Item	Observation	Sign	item-test correlation	item-rest correlation	average interitem correlation	alpha
sa05group_disc1	873	+	0.668	0.455	0.370	0.702
sa06class_work1	873	+	0.733	0.548	0.333	0.666
sa07participate1	873	+	0.645	0.424	0.383	0.713
sa08confused1	873	+	0.704	0.506	0.349	0.682
sa09solve1	873	+	0.726	0.537	0.337	0.670
Test scale					0.354	0.733

Source: Author's calculation, Field Survey.
Note: Same as Table 4.13

After undertaking a reliability test for the questions, the study applies the principal component method to construct an index of school adjustment taking into consideration all the above mentioned questions. The study looks at the summarised statistics for each question (variable) and the extent of collinearity between them (see Table C11 and C12 in Appendix C for detailed results) before computing the PCA. The result suggests that they are highly correlated.

Since they are highly correlated, principal components of all questions were extracted and their coefficients towards one dimension were derived. The results of the PCA are reported in Tables 5.13 and 5.14. From Table 5.13, it is seen that component 1 has maximum eigenvalue 24.748 and it describes 48.80% of the total variance of the variables. This component has been considered to construct the index. All information for component 1 has been presented in Table 5.14. Here it should be noted that all the coefficients for component 1 are statistically significant and hence, they can be considered to assign weights against the corresponding questions for constructing the index of school adjustment. According to their weights found in the component *, sa08 confused1* is the most and *sa07 participate1* is the least important questions to represent the instrument for school adjustment.

Table 5.13: Explained variance by component among the variables on school adjustment

Components	Eigenvalue	Proportion	SE_Prop
Component 1	24.748	0.488	0.013
Component 2	8.563	0.169	0.008
Component 3	7.103	0.140	0.007
Component 4	5.585	0.110	0.006
Component 5	4.718	0.093	0.005

Source: Author's calculation, Field Survey.

Table 5.14: Principal component analysis of variables (questions) in school adjustment

Component 1	Coef.	Std. Err.	p
sa05group_disc1	0.406***	0.024	0.00
sa06class_work1	0.394***	0.017	0.00
sa07participate1	0.381***	0.024	0.00
sa08confused1	0.560***	0.023	0.00
sa09solve1	0.471***	0.019	0.00

Note: Rho = 0.488; SE(Rho) = 0.013
LR test for independence (chi2(10) = 816.80, p = 0.00)
LR test for sphericity (chi2(14) = 867.56, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

In order to make sure whether the coefficients are significantly different from each other, the Chi-square test for equality of coefficients derived from component 1 has been undertaken and the results are reported in Table C13 (see Appendix C). The probability value of Chi-square suggests that the coefficients are significantly different from each other. Hence, they can be used them for constructing the index.

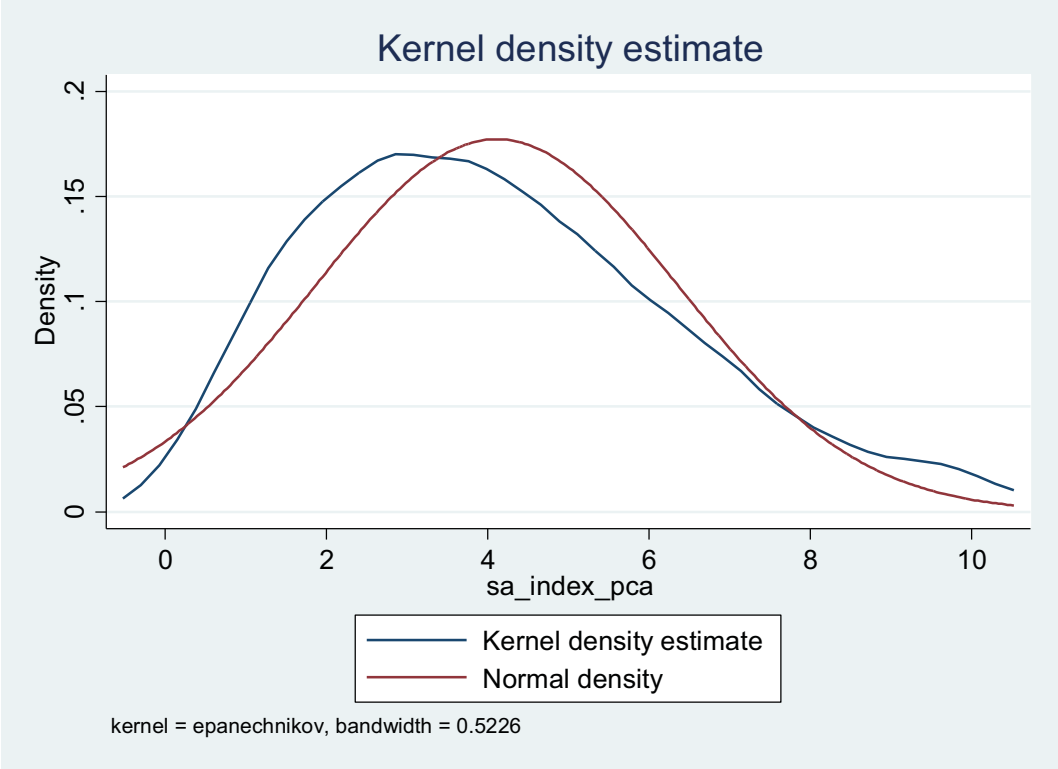
The coefficients of component 1 were considered as the weights of the questions used for school adjustment and these were combined linearly for index formation as follows. For the normalisation purpose, the shared value of each coefficient was used with respect to the total value of all coefficients so that the sum of the weights will be exactly equal to one.

$$level\ of\ school\ adjustment = \frac{\sum_{i=5}^{9} \omega_i sai}{\sum_{i=5}^{9} \omega_i} \qquad \text{------(5.7)}$$

where sai represents value and ω_i is the coefficient of *i-th* variable (question) found in component 1 (see Table 5.14).

The next step involved the examination of the distribution of the school adjustment index against the sample students using two plots, i.e., Kernel distribution and normal distribution (see Figure 5.3). They are more or less similar, suggesting that the highest density of the sample students lies on 3–4, that is, below the average level (i.e., 5). Hence, the largest share of students has school adjustment below the average level.

Figure 5.3: Distribution of school adjustment



Source: Author's calculation, Field Survey.

5.7 Effect of physical activity self-efficacy (PSE) on school adjustment (SA)

The study question is focused on whether the acquired physical activity self-efficacy from regular physical activity significantly influences students' school adjustment. Hence, school adjustment will be regressed on PSE. Therefore, the school adjustment is a function of PSE and other sociocultural factors like country and gender. Here, school adjustment is the dependent variable, PSE is the independent variable and other factors are control variables. Besides, the study aimed to know the direct effect of physical activity on school adjustment. Hence, school adjustment will be regressed on physical activity instead of PSE along with other sociocultural factors like country,

gender, learning activities, musical and cultural involvement and household activities. As a result, the regression models would be as follows (Box 5.3):

Box 5.3: Regression models of school adjustment

level of school adjustment = f (level of physical activity self -efficacy, country, gender) ----------(5.8)
level of school adjustment = f (level of physical activity, country, gender, share of time spent on household work, share of time spent on learning, share of time spent on music, singing and drawing)----------(5.9)

The results of multiple regression on school adjustment (SA) for PSE are shown in Table 5.15a, from which it is observed that the regression coefficient of PSE is –0.134, which is statistically significant at the 5% level. Here, it can be explained that SA is significantly decreasing with PSE for overall sample students combining the two countries.

When school adjustment is regressed directly for physical activity, the result is shown in Table 5.15b. From the table, it is observed that the regression coefficient of physical activity is –1.034, which is also statistically significant at the 5% level. Hence, SA is also decreasing significantly with physical activity.

Some studies show that people, by participating in physical activity, can strengthen their relationships and link with one another, build active communities and enhance a safe and supportive environment in the social life (Sport England, 1999; Bloom et al., 2005; Sport Matters Group, 2005). Also, Rovio et al. (2005) demonstrate that the inclusion of physical activity in the school curriculum decreases disruptive activities and dropout rates among the students without jeopardizing academic attainment. These studies support the hypothesis suggesting that the students may improve their school bonding and adjustment by participating in physical activity during school time. But, the findings of the following two Tables 5.15a and 5.15b are different and show that physical activity and acquired PSE decrease students' school adjustment. It can be explained that in the previous chapter, the study has revealed that the level of students' physical activity in both countries is not influenced by the school curriculum. That is why, the students, who are engaged more in physical activity, execute that activity mainly outside of school. Here, it can be argued that the students cannot build proper

bonding in school due to insufficient engagement in physical activity during school time. Moreover, the attitude of the school community towards such activity is not positive. Furthermore, sometimes those students who are more engaged in that activity outside of school cannot follow school routine or activity properly. Hence, they might face conflicts with the school system and cannot develop their school adjustment adequately.

Table 5.15a: Regression results of school adjustment on the level of physical activity self-efficacy combined both countries

Variable	Coef.	Std. Err.	p
physical activity self-efficacy	-0.134***	0.043	0.00
Fiji	2.180***	0.133	0.00
Boy	0.007	0.139	0.96
Constant	3.656***	0.219	0.00

Note: Adj R^2= 0.237, F(3,869)=91.35 (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

Table 5.15b: Regression results of school adjustment on the level of physical activity combined both countries

Variable	Coef.	Std. Err.	p
physical activity	-1.034***	0.403	0.01
Fiji	2.058***	0.193	0.00
Boy	0.043	0.149	0.77
Share of time spent on household work	-0.020	0.749	0.98
Share of time spent on learning	-0.404	0.773	0.60
Share of time spent on music, singing and drawing	0.476	0.851	0.57
Constant	3.377***	0.321	0.00

Note: Adj R^2= 0.233, F(6,866)=45.11 (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

From the overall analysis undertaken in Chapters 4 and 5, the study can conclude that regular physical activity executed by the students during their adolescent period regulates them in a favourable way and increases their physical activity self-efficacy. This acquired physical activity self-efficacy reduces their stress, depression and anxiety, and increases self-satisfaction and thereby, improves their positive general emotion. Moreover, this self-efficacy increases students' competitive and challenging spirit and enhances their self-confidence. The study also found that physical activity is

not significantly influenced by the school curriculum. Therefore, this activity and acquired self-efficacy in this area cannot build a physically active community and a supportive environment in school and hence, cannot increase students' school adjustment.

As an alternative method, the levels of general emotion , self-confidence and school adjustment have been regressed on the level of physical activity self-efficacy using the multivariate regression method in order to support the results found in the previous sections. The multivariate regression results are almost the same as those found before in this chapter (see Tables 5.5a, 5.10a and 5.15a). The result of multivariate regression is shown in Table C14 in Appendix C.

5.8 Concluding remarks

In summary, this chapter argues that physical activity significantly improves general emotion and self-confidence of adolescent students through physical activity self-efficacy that they acquire. But this activity as well as the acquired physical activity self-efficacy does not improve – rather, it decreases – their school adjustment as such activity is not positively reinforced by the school curriculum. This issue of the school curriculum has been addressed in Chapter 4 (see section 4.2.5).

Therefore, the results brought to light in this chapter partly satisfy the second hypothesis suggesting that the effect of physical activity significantly develops students' general emotion and self-confidence through acquired self-efficacy to regulate physical activity. But in the case of school adjustment, it does not satisfy the hypothesis that physical activity and acquired physical activity self-efficacy improve their school adjustment. Rather, this activity decreases their school adjustment, because such activity is not supported by the school curriculum during school time.

This study supports the existing literature (Klein & Deffenbacher, 1977; Evans et al., 1985; Norris et al., 1992; Duda et al., 2014) that shows physical activity is associated positively with children's emotion. The result of the present study also supports the study of Eyler et al. (2003) that determined the positive relationship between walking and self-confidence. But, the present study is more advanced than these studies since it has observed the positive influence of physical activity on both general emotion and self-confidence through the acquired physical activity self-

efficacy. In other words, the study has identified the proper channel or pathway from physical activity to general emotion and self-confidence through physical activity self-efficacy.

The next chapter will discuss the influence of general emotion, self-confidence and school adjustment on academic emotional state, learning self-efficacy and academic achievement.

CHAPTER 6: ACADEMIC EMOTIONAL STATE, LEARNING SELF-EFFICACY AND ACADEMIC ACHIEVEMENT OF ADOLESCENT STUDENTS: THE ROLE OF PHYSICAL ACTIVITY THROUGH VARIOUS SOCIOPSYCHOLOGICAL CHANNELS

6.1 Introduction

In the previous two chapters, physical activity self-efficacy acquired by the sample students from engaging in physical activity was seen to have a positive influence on their general emotion and self-confidence. The exception was that participation in physical activity decreased their school adjustment. This chapter investigates academic emotional state, learning self-efficacy and academic achievement during the adolescent period – drawing the student sample from two countries, India and Fiji – and the impact of physical activity on these variables through various sociopsychological channels. The study argues that as all characteristics of human development are interrelated, the sociopsychological states such as general emotion, self-confidence and school adjustment of adolescent students might have positive effects on academic aspects such as academic emotional state, learning self-efficacy and academic achievement. For this reason, the study investigates whether general emotion, self-confidence and school adjustment promote students' academic emotional state and learning self-efficacy as well as their academic achievement. By using a structural model, the chapter examines these issues and also the whole pathway originating from physical activity towards learning self-efficacy and academic achievement.

At first, a brief discussion of how physical activity influences academic aspects through sociopsychological channels is in order:

(i) The present study has already examined whether by engaging in physical activity, a student can enhance his/her general emotion and self-confidence, and reduce school-adjustment because the school administration lacks a positive attitude towards physical activity. The current study assumes that exercise and fitness can regulate stress, depression and anxiety and foster a competitive and challenging spirit. Thus, through their engagement in physical activity students can reduce their fear, anxiety and stress in the academic area and motivate

themselves in intellectual activity such as learning. The study hypothesises that general emotion, self-confidence, and school adjustment positively influence students' academic emotional state. The existing literature reports few studies on the interface showing relationships among sociopsychological states and academic emotional state. In the main, academic emotional state, associated with students' motivation, learning strategy, cognitive resources, self-regulation, and academic achievement, has been under-researched empirically in the field of educational psychology.

(ii) The study hypothesises that the academic emotional state exerts a positive influence on students' self-efficacy in overall learning, particularly in mathematics learning. Bandura (1986) regards the academic emotional state as the fourth source for developing learning self-efficacy, a theoretical conjecture that this chapter investigates empirically.

(iii) Finally, it is hypothesised that enhanced learning self-efficacy as well as mathematics learning self-efficacy definitely influence students' academic achievement. Mahyuddin et al. (2006) studied the association between students' self-efficacy in English language and their accomplishment in the subject and found a positive correlation between them. Caprara et al. (2008) conducted a similar study with similar result.

Some studies show that physical activity can develop students' concentration and memory; it also improves their cognitive function and increases levels of substances in the brain responsible for maintaining the health of neurons (Cocke, 2002). Dwyer et al. (1996), Kirkendall (1986), Shephard (1997), and Trudeau and Shephard (2008) have written papers that review the association between various types of physical activity and academic performance. They suggest a positive effect of physical activity on concentration, memory, and classroom behaviour as well as on cognitive function and intellectual performance. They recommend indirectly that physical activity can be brought into the school programme without causing deterioration of students' academic achievement. Moreover, not only was it found that accumulation of time for 'academic' purposes at the cost of students' engagement in a physical education program does not improve academic performance, but also it may cause deterioration in the health condition. On the other hand, some other studies in the literature were not able to show positive effects of physical activity on academic

performance (Shannonhouse, 2012; Taras, 2005 ; Keeley & Fox, 2009). These controversial results motivate further study in this area in different settings. However, the present study is very much limited to the effect of physical activity on sociopsychological states and academic aspects, with no real attempt at looking at its physiological and cognitive effects.

In order to test the hypotheses mentioned, the study has, as a first step, undertaken construction of suitable indices for various sources of learning self-efficacy, such as mastery experience, vicarious experience, social persuasions, and academic emotional state, and also for learning and mathematics learning self-efficacy of the sample adolescent students. Then, the various relationships have been drawn determined by statistical techniques.

The indices of various variables such as sources of learning self-efficacy (mastery experience, vicarious experience, social persuasions and academic emotional state) and self-efficacy (in overall and mathematics learning) have been constructed to capture their levels among the sample students; they are discussed in sections 6.2, 6.4 and 6.6 respectively. The effects of general emotion, self-confidence and school adjustment on academic emotional state have been examined in section 6.3. Sections 6.5 and 6.7 examine the relationship of academic emotional state with learning self-efficacy and mathematics learning self-efficacy respectively. Then, the effects of self-efficacy (in overall and mathematics learning) on academic achievement are established in section 6.8. Section 6.9 describes various structural models to analyse the overall pathway from physical activity to academic achievement. Finally, section 6.10 makes concluding observations.

6.2 Sources of learning self-efficacy

As discussed in Chapter 2, learning self-efficacy represents students' beliefs about their capabilities in learning activities. According to Bandura (1994), four sources are influential in developing learning self-efficacy of the students: mastery experience, vicarious experience, social persuasions, and academic emotional state. That participation in physical activity in the present case can develop students' general emotion and self-confidence, and at the same time decrease school adjustment, is examined (as discussed in Chapter 5). Then, the study hypothesises that general

emotion, self-confidence and school adjustment might increase students' positive academic emotional state and this academic emotional state may go further to develop their learning self-efficacy and academic achievement (to be discussed in the next sections). In order to investigate the effect of academic emotional state on learning self-efficacy, the other sources (mastery experience, vicarious experience, and social persuasions) must be controlled for in the statistical and regression analyses. By doing so, the study can also investigate the theoretical model of various sources contributing to learning self-efficacy, as defined by Bandura (1994). Section 6.5 discusses the extent of contribution by its sources in learning self-efficacy among the sample students. The undertaking has been to measure and quantify those sociopsychological variables using various questions which the sample students were asked to respond to using a 10-point scale. Depending on the students' responses on various sources of learning self-efficacy, a reliability test has been applied to confirm whether all the questions could be included in the construction of an index for each of those variables. After confirming the reliability of the questions, the study follows principal component analysis (PCA) to construct the index of the variables probed in this section, as was done for the sets of variables (questions) investigated in the previous chapters.

6.2.1 Mastery experience (ME)

Mastery experience is defined as a person's perception of his/her own learning outcome. For Bandura (2006), this ME is the strongest source of learning self-efficacy. If a student perceives his/her performance as successful, self-efficacy will increase in that area. Conversely, the self-efficacy will decrease, if someone perceives his/her performance as a failure (discussed in Chapter 2). The study has constructed a scale (based on Bandura, 2006 and modified by Thomas, 2013) to measure students' perception about their performance in various academic activities. The students have been asked how they think about their achievement in the previous report card or how they can perform in difficult tasks. The answers of the students have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. Table 6.1 presents the various questions asked to the sample students to capture their mastery experience, and the variable (here question) names for further statistical analysis.

Table 6.1: Questions and questions' names defined for mastery experience

Question	Question name
1. I do well in even the most difficult assignments.	*me1even*
2. I do well in my assignments.	*me2assignments*
3. I got good grades in academic achievement on my last report card.	*me3grade*
4. When I study very hard, I do well.	*me4well*
5. I have always been successful with my academic area.	*me5successful*
6. I make excellent grades on my academic tests.	*me6 academic test*

A reliability test (Cronbach's alpha test) was used to justify those questions. The value of Cronbach's alpha taking all the questions is not within the acceptable range, (0.7–1.0). From the result, it is clear that the value can be raised by deleting the fourth question. This question was eliminated and only five suitable questions were used in further analysis. The reliability test was done for all those five questions once again and the result is shown in Table 6.2, from which it is observed that the signs of all questions are positive and item-test and item-rest correlations are sufficient to allow their inclusion. Also, the overall Cronbach's alpha combining all questions is 0.732 and this is within the satisfactory range (0.7–1.0). Further, this value cannot be raised further by dropping any other question. Therefore, those five questions are considered as reliable to explain the variable, mastery experience, and have been taken for constructing a combined index of mastery experience for each student.

Table 6.2: Result of second reliability test on the questionnaire used for mastery experience

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	Alpha
me1even	873	+	0.655	0.436	0.376	0.707
me2assignments	873	+	0.741	0.559	0.326	0.659
me3grade	873	+	0.692	0.488	0.354	0.687
me5successful	873	+	0.658	0.441	0.374	0.705
me6 academic test	873	+	0.728	0.540	0.334	0.667
Test scale					0.353	0.732

Source: Author's calculation, Field Survey.
Note: Same as Table 4.13

Next, the study follows the principal component method to construct an index of mastery experience taking all the above mentioned five questions into consideration. The study considered the summarised statistics for each question before computing PCA. But, the results have not been reproduced here, to reduce the number of tables in this analysis. However, the results were seen and taken into account before further statistical analysis was undertaken. Correlation coefficients across all questions are shown in Table C15 of Appendix C. The result suggests that they are highly correlated.

Since the responses to the questions are highly correlated, principal components were extracted from all questions to find their relative importance towards the principal dimensions. The coefficient of each question in the PCA represents relative importance. The results of the PCA are reported in Tables 6.3 and 6.4. From Table 6.3, it is observed that component 1 has eigenvalue 13.042, which is the maximum among those of all components and explains 48.4% of the total variance of all questions. And from Table 6.4, all the coefficients for component 1 are statistically significant so this component can be considered to construct the index of mastery experience using its coefficients as weights for each corresponding question. According to their weights found in component 1, *me3grade* is the most and *me1even* is the least important question to represent the instrument for mastery experience.

Table 6.3: Explained variance by component among the variables on mastery experience

Components	Eigenvalue	Proportion	SE_Prop
Compoment 1	13.042	0.484	0.014
Component 2	4.741	0.176	0.008
Component 3	4.146	0.154	0.007
Component 4	2.575	0.096	0.005
Component 5	2.430	0.090	0.005

Source: Author's calculation, Field Survey.

Table 6.4: Principal component analysis of variables (questions) in mastery experience

Component1	Coef.	Std. Err.	p
me1even	0.398***	0.024	0
me2assignments	0.480***	0.020	0
me3grade	0.516***	0.023	0
me5successful	0.407***	0.025	0
me6academictest	0.423***	0.019	0

Note: Rho = 0.4842; SE(Rho) = 0.014
LR test for independence (chi2(10) = 883.75, p = 0.00)
LR test for sphericity (chi2(14) = 905.55, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

Before using the coefficients in the index formation, it was determined whether the coefficients are significantly different from each other. To do so study has undertaken the Chi-square test for equality of coefficients derived from component 1 and the results are shown in Table C16 (see Appendix C). The significance level of Chi-square suggests that the coefficients are significantly different from each other.

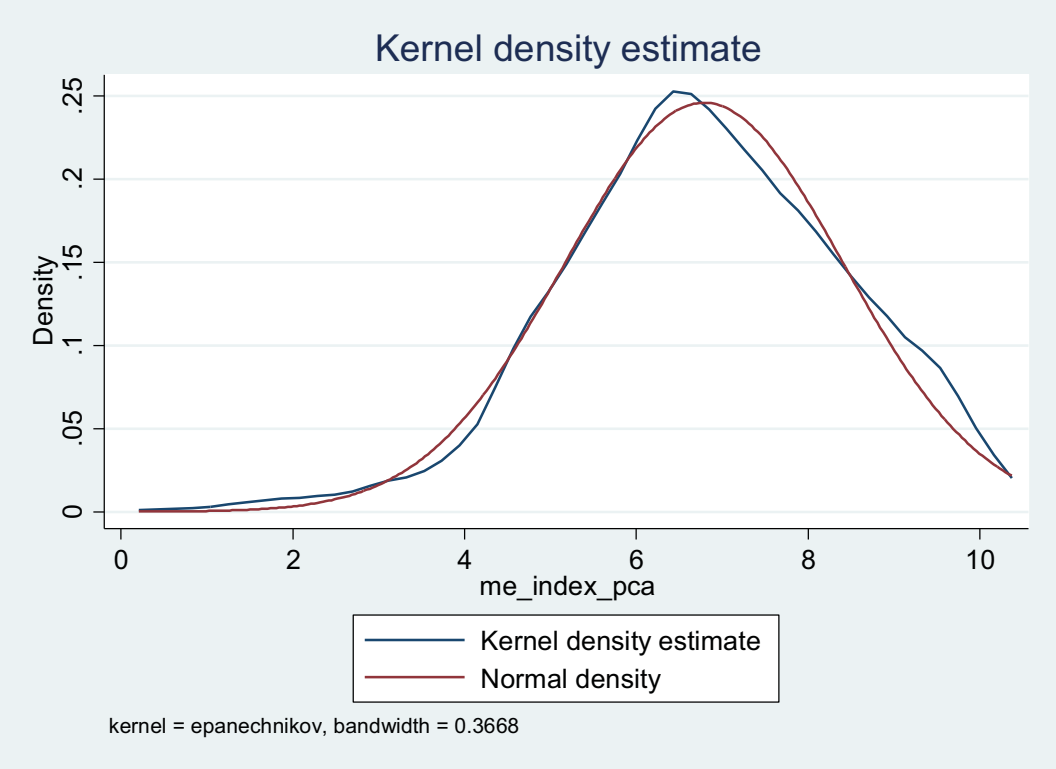
Since the coefficients are found to be significantly different, they can be used for constructing the index for mastery experience. Then, they have been combined linearly for index formation as follows: For the normalisation purpose, the shared value of each coefficient with respect to the total value adding all coefficients is used so that the sum of the weights will be exactly equal to one.

$$\text{level of mastery experience} = \frac{\sum_{i=1}^{6} \omega_i mei}{\sum_{i=1}^{6} \omega_i} \qquad (i \neq 4) \qquad \text{------(6.1)}$$

where mei represents value and ω_i is the coefficient of the *i-th* variable (question) found in component 1 (see Table 6.4).

The study is interested in the distribution of mastery experience index across the sample students using two plots, Kernel distribution and normal distribution (see Figure 6.1). The distributions are more or less similar, suggesting that the highest density of the sample students falls within the range of 6–7 and since that is above the mid-value (5) it can be concluded that the major share of the students has mastery experience above the mid-value.

Figure 6.1: Distributions of mastery experience



Source: Author's calculation, Field Survey.

6.2.2 Vicarious experience (VE)

Vicarious experience involves an individual's perception of others' actions or performance in the academic area. Looking at the success of a model, the individual typically finds that his/her own self-efficacy increases and decreases where the model fails. Mainly, people who have little or no previous experience with the tasks will be more influenced by this source (Bandura, 1997). The study has constructed a scale (based on Bandura, 2006 and modified by Thomas, 2013) to measure students' perception of others' actions or performances in this area. The students have been asked how they feel seeing others' efforts or involvement in any learning activity or success in learning. The answers of the students have been recorded on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. Questions the sample students were asked to confine their vicarious experience and variable (question) names denoted for further statistical analysis are shown in Table 6.5.

Table 6.5: Questions and questions' name defined for vicarious experience

Question	**Question name**
1. Seeing adults do well in learning helps me do better in learning.	*ve1adult*
2. Seeing others do better than me in learning helps me do better in learning.	*ve2other*
3. When I see how another student solves a learning problem, I can see myself solving the problem in the same way.	*ve3solve another*
4. When I see how my teacher solves a learning problem, I can see myself solving the problem in the same way.	*ve4solve teacher*
5. I imagine myself working through challenging learning problems successfully.	*ve5challenging*
6. I compete with myself in learning.	*ve6compete*

These questions were answered by the sample students to determine their vicarious experience. The results of the reliability test (Cronbach's alpha test) applied to justify the questions are shown in Table 6.6. From the table, it is observed that the signs of all the questions are positive and item–test and item–rest correlations are sufficient to allow for their inclusion. The overall Cronbach's alpha combining all questions is 0.799, which is within the satisfactory range (0.7–1.0). All the questions are considered as reliable to represent students' vicarious experience and taken for constructing a combined index of that variable.

Table 6.6: Result of reliability test on the questionnaire used for vicarious experience

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	Alpha
ve1adult	873	+	0.683	0.522	0.408	0.775
ve2other	873	+	0.749	0.612	0.380	0.754
ve3solve another	873	+	0.733	0.590	0.387	0.759
ve4solve teacher	873	+	0.753	0.617	0.378	0.753
ve5challenging	873	+	0.671	0.506	0.413	0.779
ve6compete	873	+	0.647	0.475	0.423	0.786
Test scale					0.398	0.799

Source: Author's calculation, Field Survey. ***Note:*** Same as Table 4.13

Next the study applied the principal component method to construct a suitable index for vicarious experience taking all the above questions. The study looked at the summarised statistics for each question (the results are not reproduced here) and the extent of collinearity between them (see Table C17 in Appendix C for detailed results) before computing PCA. The result suggests that they are highly correlated.

As the questions are highly correlated, their principal components were extracted and an index for vicarious experience was constructed using coefficients derived towards one dimension. The results of PCA are shown in Tables 6.7 and 6.8. From Table 6.7 it is observed that the eigenvalue of component 1 is the maximum (16.822). It describes 49.9% of the total variance of all questions. Table 6.8 shows that all the coefficients of component 1 across the questions are statistically significant. According to their weights found in component 1*, ve4solve teacher* is the most and *ve5challenging* is the least important question to represent the instrument for vicarious experience.

Table 6.7: Explained variance by component among the variables on vicarious experience

Components	Eigenvalue	Proportion	SE_Prop
Component 1	16.822	0.499	0.013
Component 2	5.116	0.152	0.007
Component 3	4.349	0.129	0.006
Component 4	2.905	0.086	0.004
Component 5	2.355	0.070	0.004
Component 6	2.138	0.064	0.003

Source: Author's calculation, Field Survey.

Table 6.8: Principal component analysis of variables (questions) in vicarious experience

Component 1	Coef.	Std. Err.	p
ve1adult	0.410***	0.019	0.00
ve2other	0.417***	0.015	0.00
ve3solveanother	0.434***	0.017	0.00
ve4solveteacher	0.443***	0.016	0.00
ve5challenging	0.361***	0.019	0.00
ve6compete	0.378***	0.021	0.00

Note: Rho = 0.499; SE(Rho) = 0.013
LR test for independence (chi2(15) = 1509.15, p = 0.00)
LR test for sphericity (chi2(20) = 1518.52, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

To be sure whether the coefficients are significantly different from each other, a Chi-square test for equality of coefficients of component 1 was undertaken; the results are shown in Table C18 (see Appendix C). The significance level of Chi-square confirms that the coefficients are significantly different from each other.

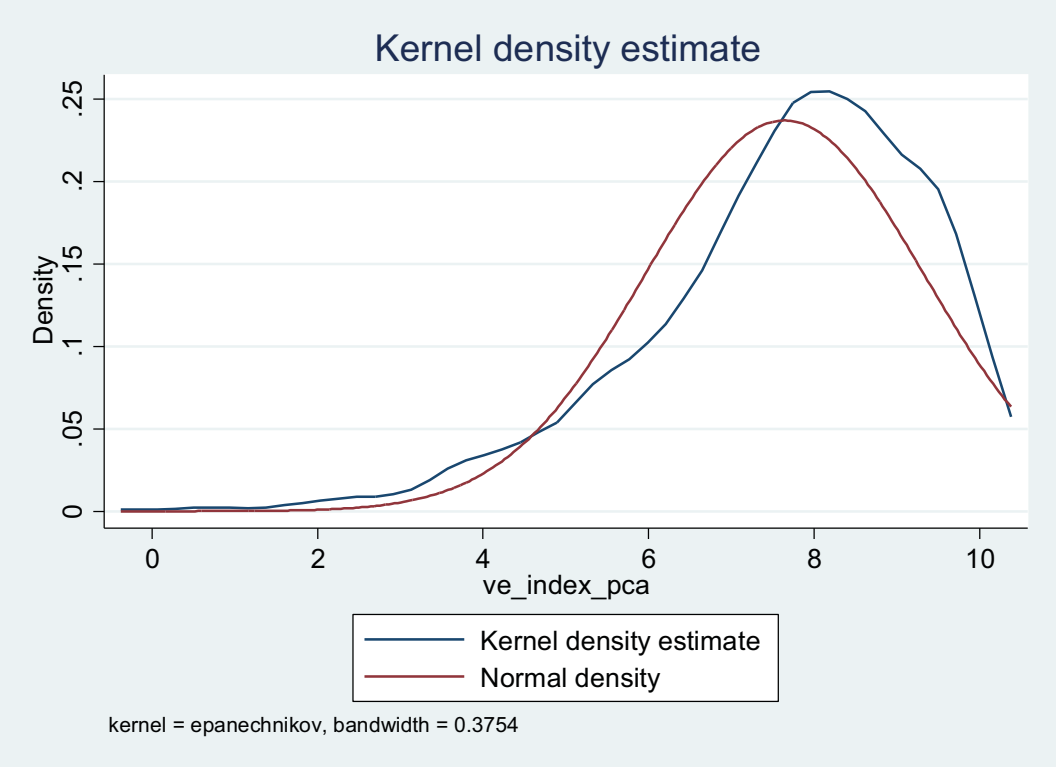
This component can be considered to construct the index for vicarious experience and its coefficients would be the projection or weighting of all corresponding questions for constructing the index. They are then combined linearly for index formation, as follows. For the purpose of normalisation, the shared value of each coefficient with respect to the total value of all coefficients was used. The sum of all weights will be exactly equal to one.

$$level\ of\ vicarious\ experience = \frac{\sum_{i=1}^{6} \omega_i vei}{\sum_{i=1}^{6} \omega_i} \qquad \text{------(6.2)}$$

Where vei represents value and ω_i is the coefficient of *i-th* variable (question) found in component 1 (see Table 6.8).

The next item of interest is the distribution of the vicarious experience index across all sample students. Here, the study uses two plots, Kernel distribution and normal distribution (see Figure 6.2). The two distributions are more or less similar and show that the highest density of the sample students, falling in the 7–8 range, above the middle level (5), have vicarious experience above the middle level.

Figure 6.2: Distributions of vicarious experience



Source: Author's calculation, Field Survey.

6.2.3 Social persuasions (SP)

As discussed in Chapter 3, social persuasions indicate other persons' verbal or nonverbal evaluative responses, which could be positive or negative feedback, compliments, and others' comments about a person. Based on Bandura (2006) and further modified by Thomas (2013), a social persuasion scale has been constructed involving other persons' verbal or nonverbal responses about the students' activities in learning. The students were asked how the teachers, parents and others give feedback on their academic activities or performances. The answers of the students have been captured on a 10-point scale, '0' representing '*not at all*' and '10', '*very often*'. These questions asked to assess the students' social persuasions, and their names denoted for further statistical analysis, are shown in Table 6.9.

Table 6.9: Questions and questions' names defined for social persuasions

Question	**Question name**
1. My teachers have told me that I am good at learning.	*sp1good at learning*
2. Adults in my family have told me what a good student I am.	*sp2good student*
3. Other students have told me that I'm good at learning.	*sp3other student*
4. People have told me that I have a talent for learning.	*sp4talent*
5. I have been complimented for my ability in learning.	*sp5complimented*
6. My classmates like to work with me in learning because they think I'm good at it.	*sp6classmates*

A reliability test (Cronbach's alpha test) was applied to the questions to confirm their reliability in explaining the variable, social persuasions. The results are shown in Table 6.10, from which it is seen that the signs of all the questions are positive and item–test and item–rest correlations are sufficiently high. Also the value of Cronbach's alpha for overall questions is 0.856, within the satisfactory limit (0.7–1.0) and as this value cannot be raised by dropping any one of the items, all the questions have been considered as reliable for the construction of an index of the variable, social persuasions.

Table 6.10: Result of reliability test on the questionnaire used for social persuasions

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	alpha
sp1good at learning	873	+	0.726	0.594	0.513	0.840
sp2good student	873	+	0.757	0.635	0.499	0.833
sp3other student	873	+	0.804	0.701	0.478	0.821
sp4_talent	873	+	0.771	0.655	0.493	0.829
sp5complimented	873	+	0.776	0.662	0.490	0.828
sp6classmates	873	+	0.738	0.610	0.508	0.837
Test scale					0.497	0.856

Source: Author's calculation, Field Survey.
Note: Same as Table 4.13

Next, the study follows the principal component method to construct an index of social persuasions taking all the above mentioned questions into consideration. The study

examined the summarised statistics for each question (the results are not reproduced here) and the extent of collinearity between them (see Table C19 in Appendix C for detailed results) before computing PCA. The result suggests that they are highly correlated.

Since the questions are highly correlated, their coefficients towards the principal dimensions can be developed by extracting their components. The results of the PCA are represented in Tables 6.11 and 6.12. Table 6.11 shows that component 1 has the maximum eigenvalue 21.334 and it explains 58.1% of the total variance of the questions. Also from Table 6.12 it is observed that all the coefficients for component 1 are statistically significant. According to their weights found in the component , *sp4talent* is the most and *sp1good at learning* is the least important question to represent the instrument for social persuasions.

Table 6.11: Explained variance by component among the variables on social persuasions

Components	Eigenvalue	Proportion	SE_Prop
Component 1	21.334	0.581	0.013
Component 2	4.396	0.120	0.006
Component 3	3.331	0.091	0.005
Component 4	2.946	0.080	0.004
Component 5	2.446	0.067	0.004
Component 6	2.301	0.063	0.003

Source: Author's calculation, Field Survey.

Table 6.12: Principal component analysis of variables (questions) in social persuasions

Component 1	Coef.	Std. Err.	p
sp1good at learning	0.381***	0.015	0.00
sp2good student	0.403***	0.014	0.00
sp3other student	0.418***	0.012	0.00
sp4_talent	0.425***	0.014	0.00
sp05complimented	0.410***	0.013	0.00
sp06classmates	0.411***	0.015	0.00

Note: Rho = 0.581; SE(Rho) = 0.013
LR test for independence (chi2(15) = 2016.34, p = 0.00)
LR test for sphericity (chi2(20) = 2022.28, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

Because it is important to be sure whether the coefficients are significantly different from each other, a Chi-square test for equality of coefficients of component 1 was undertaken and the results are shown in Table C20 (see Appendix C). The probability value of Chi-square suggests that the coefficients are not significantly different from each other.

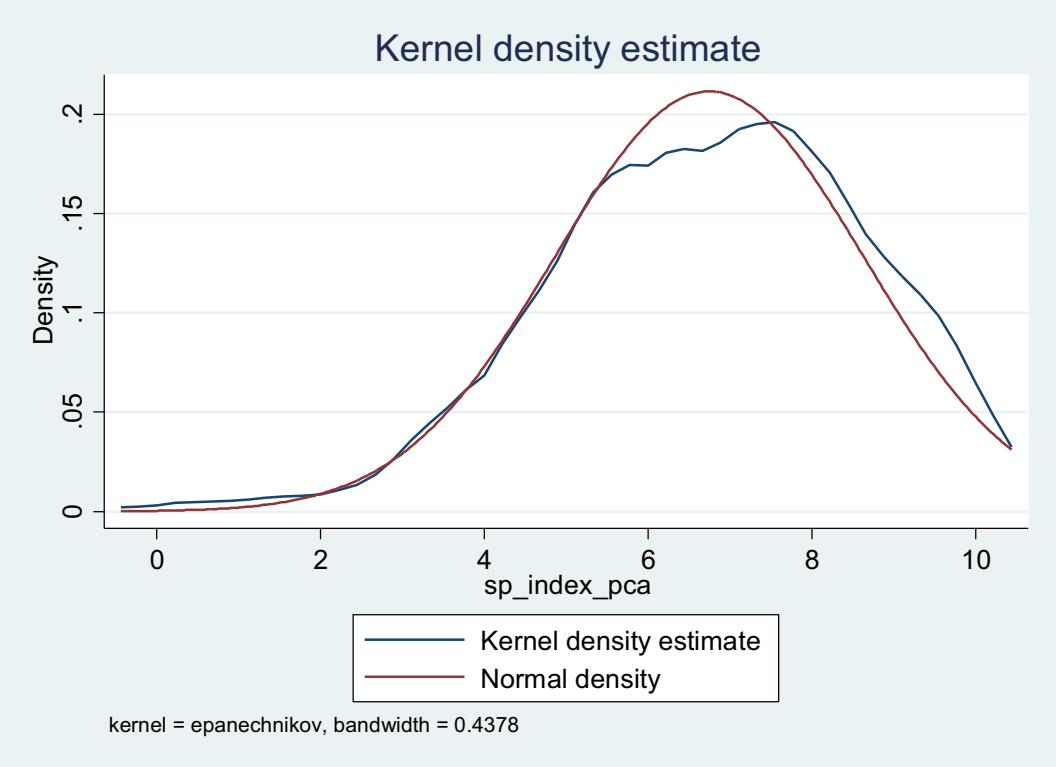
As the coefficients are not found to be significantly different from each other, the equal weight one can be considered for all questions used for constructing the index of social persuasions. Then, these can be combined linearly for index formation as follows:

For the normalisation purpose, it is divided by 6, the total number of questions.

$$\text{level of social persuasion} = \frac{\sum_{i=1}^{6} spi}{6} \qquad \text{------(6.3)}$$

where spi represents value of i-th question. To focus on the distribution of social persuasions index across the student sample, the study used two plots, Kernel distribution and normal distribution (see Figure 6.3). The figure depicts the curves' high degree of similarity, suggesting that the highest density of the sample students lies in the 7–8 range, that is above the mid-value, 5. Therefore, the overwhelming number of students have social persuasions above the mid-value.

Figure 6.3: Distributions of social persuasions



Source: Author's calculation, Field Survey.

6.2.4 Academic emotional state (AE)

The academic emotional state (AE) is the fourth source of learning self-efficacy. The study assumes that if somebody participates in physical activity, his/her academic emotional state will be enhanced through developing various sociopsychological statuses such as general emotion, self-confidence and school adjustment. Pekrun, et al. (2002) have done work on academic emotional state. The authors suggest that academic emotional state is notably associated with students' motivation, learning strategy, cognitive resources, self-regulation, and academic achievement. This area has, unfortunately, been neglected in the field of educational psychology. As a first step academic emotional state is defined.

AE consists of a person's interpretation of his/her physiological or affective reactions (e.g., mood, anxiety, stress) related to academic activities, for these can influence his/her learning self-efficacy (Bandura, 1997). Based on Bandura (2006) and further modified by Thomas (2013), a scale for academic emotional state has been constructed involving various emotional feelings and moods of the students related to

academic activities. The students have been asked how they feel when thinking about or participating in various learning activities. The various questions asked to assess their academic emotional state, and the variable (question) names denoted for further statistical analysis, are shown in Table 6.13.

Table 6.13: Questions and their names defined for academic emotional state

Question	**Question name**
1. Just being in learning class makes me feel stressed and nervous.	*ae1stressed*
2. Doing learning work takes all of my energy.	*ae2energy*
3. I start to feel stressed-out as soon as I begin my learning work.	*ae3begin learning*
4. My mind goes blank and I am unable to think clearly when doing learning work.	*ae4mind blank*
5. I get sad when I think about learning.	*ae5sad*
6. My whole body becomes tense when I have to do academic activities.	*ae6tense*

All the questions are negative in sense and measured on a 10-point scale. The higher the value of the answers, the lower is the value of academic emotional state. To find a higher value of the index for the higher positive academic emotional state, the values of all answers have been changed into a positive direction of emotion by subtracting them from 10: for instance, if someone assigns value 2 for any question, it means he will get 2 for a negative sense of academic emotional state and 10 – 2 = 8 for a positive sense. After subtraction, all the questions' names have been changed by denoting with 1, such as *ae1stressed* has been changed by *ae1stressed1, ae2energy* by *ae2energy1* etc.

After this, the reliability test (Cronbach's alpha test) was undertaken to justify the questions' reliability and the results are reported in Table 6.14. The signs of all the questions were positive and item–test and item–rest correlations are sufficient to allow their inclusion in the questionnaire. Moreover, the overall Cronbach's alpha combining all questions was 0.837, which is greater than the critical value (0.7) and this value cannot be raised further by deleting any one of them. Hence, all the questions are considered as reliable to explain the variable and have been taken for constructing a combined index to represent the level of academic emotional state for each student.

Table 6.14: Result of reliability test on the questionnaire used for academic emotional state

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	alpha
ae1stressed	873	+	0.674	0.520	0.491	0.828
ae2energy	873	+	0.740	0.609	0.462	0.811
ae3begin learning	873	+	0.813	0.711	0.429	0.790
ae4mind blank	873	+	0.756	0.630	0.455	0.807
ae5sad	873	+	0.732	0.597	0.465	0.813
ae6tense	872	+	0.738	0.605	0.463	0.812
Test scale					0.461	0.837

Source: Author's calculation, Field Survey.
Note: Same as Table 4.13

The principal component method was used considering all questions to construct an index of academic emotional state. The study considered the summarised statistics for each question (variable) and the extent of collinearity between them (see Table C21 and C22 in Appendix C for detailed results) before computing PCA. The result suggests that they are highly correlated.

As the questions are highly correlated, their coefficients towards one dimension can be developed by extracting their principal components. The PCA results are shown in Tables 6.15 and 6.16. From Table 6.15, it is observed that component 1 has maximum eigenvalue 31.242 and it describes 55% of the total variance of all questions. It should also be noted from Table 6.16 that all the coefficients for component 1 are statistically significant. According to their weights found in component 1*, ae3begin learning1* is the most and *ae5sad1* is the least important question to represent the instrument for academic emotional state.

Table 6.15 Explained variance by component among the variables on academic emotional state

Components	Eigenvalue	Proportion	SE_Prop
Component 1	31.242	0.550	0.013
Component 2	7.990	0.141	0.007
Component 3	5.547	0.098	0.005
Component 4	4.858	0.086	0.004
Component 5	3.860	0.068	0.004
Component 6	3.274	0.058	0.003

Source: Author's calculation, Field Survey.

Table 6.16 Principal component analysis of variables (questions) in academic emotional state

Component1	Coef.	Std. Err.	p
ae1stressed1	0.383***	0.018	0.00
ae2energy1	0.408***	0.015	0.00
ae3beginlearning1	0.436***	0.012	0.00
ae4mindblank1	0.422***	0.015	0.00
ae5sad1	0.368***	0.015	0.00
ae6tense1	0.428***	0.016	0.00

Note: Rho = 0.550; SE(Rho) = 0.013
LR test for independence (chi2(15) = 1838.86, p = 0.00)
LR test for sphericity (chi2(20) = 1855.20, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

To determine whether the coefficients are significantly different from each other, the Chi-square test for equality of coefficients of the component 1 was undertaken. The results are represented in Table C23 (see Appendix C), from which it is seen that the coefficients are significantly different from each other.

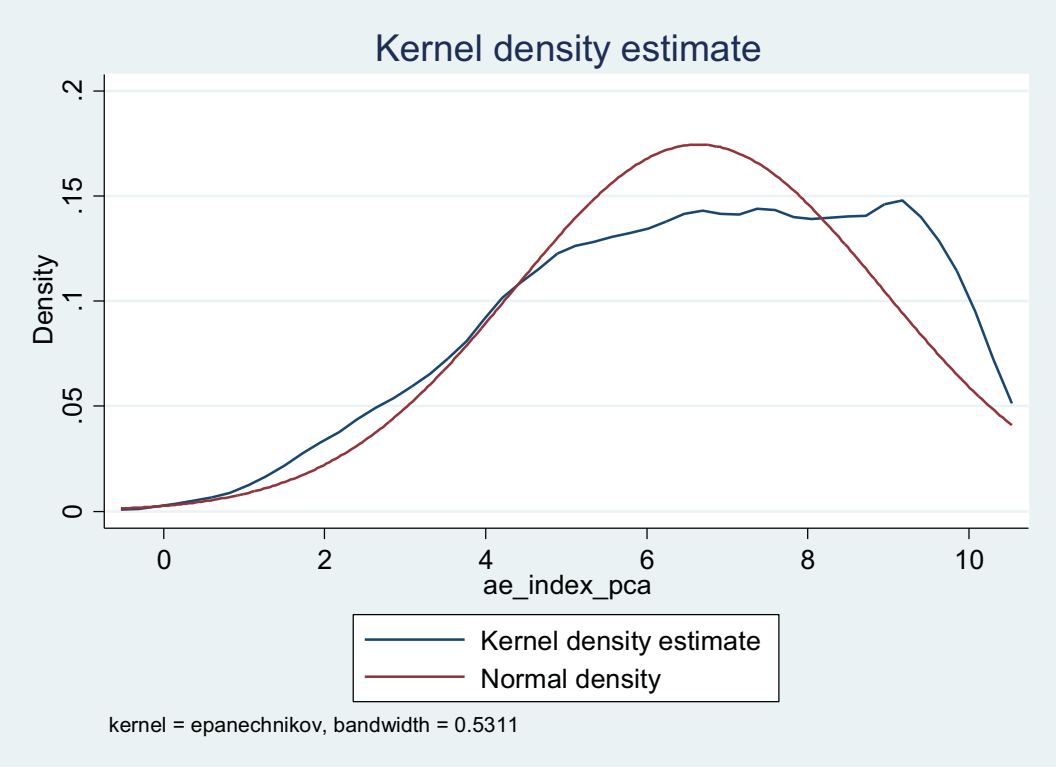
The coefficients of component 1 can be used for constructing the index for academic emotional state and consider them as the weights of the questions used for the index formation. Then, those can be combined linearly for index formation as follows: For the normalisation purpose, the shared value of each coefficient with respect to the total value of all coefficients is used so that the sum of the weights will be exactly equal to one.

$$\text{level of academic emotional state} = \frac{\sum_{i=1}^{6} \omega_i aei}{\sum_{i=1}^{6} \omega_i} \qquad \text{------(6.4)}$$

where aei represents value and ω_i is the coefficient of the *i-th* variable (question) found in component 1 (see Table 6.16).

The study considered the distribution of the academic emotional state index across the sample students using two plots, Kernel distribution and normal distribution (see Figure 6.4). The distributions are not very similar. Normal distribution suggests that the highest density of the sample students falls on 7 and that is above the middle level (5), whereas it falls in the range 4–9 in the Kernel distribution.

Figure 6.4: Distributions of academic emotional state



Source: Author's calculation, Field Survey.

6.3 Academic emotional state (AE) and its relationship with general emotion (GE), self-confidence (SC) and school-adjustment (SA)

The study was interested to know whether students' general emotion, self-confidence and school adjustment significantly influence their academic emotional state. For this purpose, the variable, academic emotional state, was regressed on GE, SC, and SA. Here, the academic emotional state is a function of GE, SC, SA and other sociocultural factors such as country and gender, where academic emotional state is the dependent

variable, GE, SC, and SA are independent variables and other factors are control variables. The regression model can be represented as follows:

Box 6.1: Regression model of academic emotional state

level of academic emotional state = f (level of general emotion, level of self-confidence, level of school adjustment, country, gender) --------(6.5)

The results of multiple regression of academic emotional state (AE) on GE, SC, and SA are represented in Table 6.17. From the table, it is seen that the regression coefficients of GE , SC and SA are 0.482, 0.288, and 0.108 respectively; all of them are statistically significant at the 5% level and positive. Hence, it is observed that AE increases significantly with GE, SC, and SA for the overall sample of students from both countries combined. This satisfies a part of the third hypothesis, suggesting that GE, SC, and SA positively improve students' academic emotional state. But there is a dearth of research undertaken on the relationship between mental health (like general emotion, self-confidence and school adjustment) and academic emotional state.

Table 6.17: Regression results of the level of academic emotional state on general emotion, self-confidence and school adjustment, combining two countries

Variable	Coef.	Std. Err.	p
general emotion	0.482***	0.040	0.00
self-confidence	0.288***	0.051	0.00
school adjustment	0.108***	0.035	0.00
Fiji	-0.793***	0.159	0.00
Boy	-0.650***	0.143	0.00
Constant	2.127***	0.454	0.00

Note: Adj R^2= 0.215, F(5,866)=48.83 (p=0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

6.4 Learning self-efficacy (LSE)

This section provides discussion about sample students' learning self-efficacy. The study has examined and proved that participation in physical activity increases a person's general emotion and self-confidence, and decreases his/her school adjustment accordingly, through developing his/her physical activity self-efficacy (discussed in

Chapters 4 and 5). Then, general emotion, self-confidence, and school adjustment improve his/her academic emotional state (discussed in the previous section). According to Bandura (1997), academic emotional state is the fourth source of learning self-efficacy and can positively or negatively influence his/her academic or learning self-efficacy. The present enquiry is an empirical study of this theoretical model for the sample adolescent students and has hypothesised that students can promote their learning self-efficacy significantly through developing their academic emotional state.

Learning self-efficacy is concerned with one's belief about one's capability in learning activity. Students, who have beliefs about their skill and performance in learning activity as well as for making effective use of self-regulatory learning strategies such as organizing their work and managing their time, are more likely to have higher academic self-efficacy and achievement (Usher & Pajares, 2008). The study has constructed a learning self-efficacy scale (based on Bandura, 2006 and modified by Thomas, 2013) for assessing students' confidence in the area of learning in three different ways (as discussed in Chapter 3). The students' answers for each part under learning self-efficacy have been obtained by using a 10-point scale, where '0' is '*not at all*' and '10' is '*very often*'. The higher the value means the greater will be the LSE value.

(i) The first part, general learning self-efficacy (GLSE), includes the questions that are about students' general confidence in the learning area, such as how they can learn all subjects or how they think about their abilities to learn in all subjects. There are four questions in this part.

(ii) The second part, learning skills self-efficacy (LSSE), includes some questions in which the students were asked to identify their confidence in skills in various particular academic areas such as mathematics, science, language, and social studies. The study has divided them in two specific academic areas – science and arts – and then taken the average of all subjects over the two areas of LSSE.

(iii) The third part is self-efficacy for self-regulated learning (SESR). The study has assumed that students, who have belief in themselves for using self-regulatory learning strategies effectively, such as organizing their work and managing their time, have higher academic self-efficacy and achievement (Usher & Pajares, 2008). In this part the students have been asked about how they plan, organize

and concentrate on their learning activities in different situations. This part contains a total of ten questions related to SESR. Table 6.18 represents the sixteen questions that the sample students were asked and their names denoted for further statistical analysis.

Table 6.18: Question and its name defined for learning self-efficacy

Question	**Question name**
1. In general, how confident are you in your abilities in learning?	*glse1ability*
2. How confident are you that you will do well in learning?	*glse2well*
3. How confident are you that you can learn all the subjects?	*glse3subjects*
4. How confident are you that you will get an A (or Above 75%) in all subjects this year?	*glse4get A*
5. How confident are you that you can perform successfully in science?	*lsse_science*
6. How confident are you that you can perform successfully in arts?	*lsse_arts*
7. How well can you finish your homework assignments by deadlines?	*sesr01deadlines*
8. How well can you perform your study when there are other interesting things to do?	*sesr02perform*
9. How well can you concentrate on school subjects during class?	*sesr03concentrate*
10. How well can you take good notes during class instruction?	*sesr04good notes*
11. How well can you use the library/internet to get information for class assignments?	*sesr05 libr/internet*
12. How well can you plan your schoolwork for the day?	*sesr06plan*
13. How well can you organize your schoolwork?	*sesr07organize*
14. How well can you remember information presented in class and text books?	*sesr08remember*
15. How well can you arrange a place to study without distractions?	*sesr09arrange*
16. How well can you get yourself to do school work?	*sesr010get yourself*

These questions were used to ascertain their learning self-efficacy. First, Cronbach's alpha test was undertaken to examine the reliability of each question and the result is reported in Table 6.19. From the table, it is seen that all the questions' signs are positive and inter–test and inter–rest correlations between them were acceptable for their inclusion. The overall Cronbach's alpha combining all questions was 0.881 and this is greater than the critical value (0.7). One cannot raise the value of the overall alpha score by reducing any one of them. This justifies sufficiently high reliability of all the questions to explain the variable and to consider them for constructing a combined index to represent the level of learning self-efficacy for each student.

Table 6.19: Result of reliability test on the questionnaire used for learning self-efficacy

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	Alpha
glse1ability	873	+	0.596	0.522	0.317	0.874
glse2well	873	+	0.624	0.554	0.314	0.873
glse3subjects	873	+	0.589	0.514	0.318	0.875
glse4get_A	873	+	0.620	0.549	0.315	0.873
lsse_science	873	+	0.662	0.597	0.311	0.871
lsse_arts	873	+	0.648	0.582	0.312	0.872
sesr01deadlines	873	+	0.616	0.545	0.315	0.873
sesr02perform	873	+	0.523	0.441	0.324	0.878
sesr03concentration	873	+	0.609	0.536	0.316	0.874
sesr04goodnotes	873	+	0.549	0.470	0.321	0.877
sesr05libr/internet	873	+	0.458	0.370	0.329	0.881
sesr06plan	873	+	0.569	0.492	0.319	0.876
sesr07organize	873	+	0.664	0.599	0.311	0.871
sesr08remember	873	+	0.658	0.593	0.311	0.871
sesr09arrange	873	+	0.604	0.531	0.316	0.874
sesr010getyourself	873	+	0.602	0.529	0.316	0.874
Test scale					0.317	0.881

Source: Author's calculation, Field Survey.
Note: Same as Table 4.13

Next, the study follows the principal component method to build an index of learning self-efficacy. The study looked at the summarised statistics for each question (variable) and the extent of collinearity between them (see Table C24 and C25 in Appendix C

for detailed results) before computing PCA. The result suggests that they are highly correlated.

As the coefficients are highly correlated, principal components of all questions towards one dimension can be established and obtain its coefficients. The results of the PCA are shown in Tables 6.20 and 6.21. From Table 6.20, it is seen that component 1 has the maximum eigenvalue 25.553 and it describes 34.9% of the total variance of all variables. Also, it is seen from Table 6.21 that all coefficients of component 1 are statistically significant. According to their weights found in component 1*, sesr05 libr/internet* is the most and *lsse_science* is the least important question to represent the instrument for learning self-efficacy.

Table 6.20: Explain variance by component among the variables on learning self-efficacy

Components	Eigenvalue	Proportion	SE_Prop
Component 1	25.553	0.349	0.011
Component 2	8.470	0.116	0.005
Component 3	5.703	0.078	0.004
Component 4	4.637	0.063	0.003
Component 5	4.067	0.056	0.003
Component 6	3.749	0.051	0.003
Component 7	3.191	0.044	0.002
Component 8	2.936	0.040	0.002
Component 9	2.671	0.037	0.002
Component 10	2.181	0.030	0.002
Component 11	2.123	0.029	0.002
Component 12	1.998	0.027	0.001
Component 13	1.955	0.027	0.001
Component 14	1.630	0.022	0.001
Component 15	1.320	0.018	0.001
Component 16	1.047	0.014	0.001

Source: Author's calculation, Field Survey.

Table 6.21: Principal component analysis of the variables on learning self-efficacy

Component1	Coef.	Std. Err.	p
glse1ability	0.194***	0.012	0.00
glse2well	0.204***	0.011	0.00
glse3subjects	0.212***	0.013	0.00
glse4get_A	0.245***	0.014	0.00
lsse_science	0.175***	0.008	0.00
lsse_arts	0.179***	0.008	0.00
sesr01deadlines	0.260***	0.013	0.00
sesr02perform	0.253***	0.017	0.00
sesr03concentrate	0.218***	0.011	0.00
sesr04goodnotes	0.238***	0.014	0.00
sesr05libr_internet	0.346***	0.027	0.00
sesr06plan	0.273***	0.015	0.00
sesr07organize	0.294***	0.012	0.00
sesr08remember	0.269***	0.012	0.00
sesr09arrange	0.295***	0.015	0.00
sesr010getyourself	0.277***	0.014	0.00

Note: Rho = 0.349; SE(Rho) = 0.011
LR test for independence (chi2(120) = 4254.95, p = 0.00)
LR test for sphericity (chi2(135) = 5233.55, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

Then, a Chi-square test for equality of the coefficients derived from component 1 was undertaken and the results are reported in Table C26 (see Appendix C). The probability value of Chi-square is statistically significant at the 5% level, which signifies that the coefficients are significantly different from each other. Hence, component 1 has been considered to construct the index and its coefficient will be the projection of each question along the dimension of component 1.

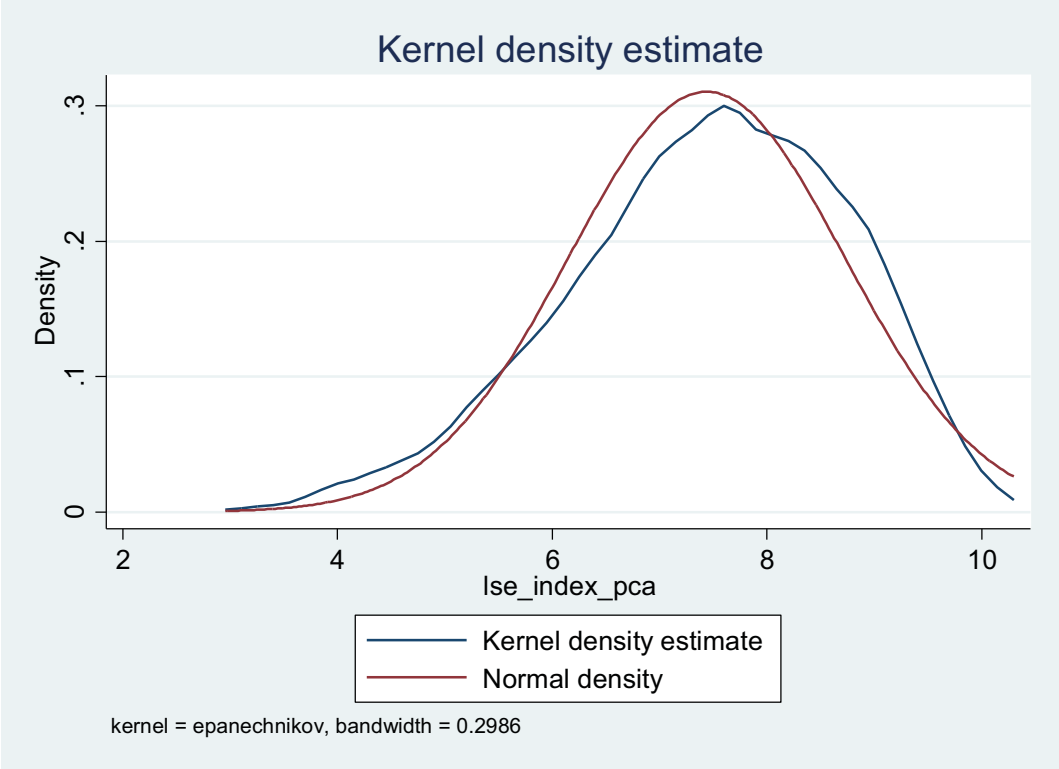
The coefficients of component 1 are considered as the weights of the questions used for learning self-efficacy and they are combined linearly for its index formation. For normalisation purpose, the shared value of each coefficient with respect to the total value of all coefficients is used so that the sum of the weight will be exactly equal to one.

$$level\ of\ learning\ self-efficacy = \frac{\sum_{i=1}^{16} \omega_i lsei}{\sum_{i=1}^{16} \omega_i} \qquad \text{-----(6.6)}$$

Where *lsei* represents value and ω_i is the coefficient of *i-th* variable (question) found in component 1 (see Table 6.21).

To look at the distribution of the learning self-efficacy index for the sample students employed two types of plots, Kernel distribution and normal distribution are represented in Figure 6.5. Both distributions are highly similar and suggest that the highest peak falls around 7–8. Hence, the highest share of students has a learning self-efficacy level above 7, which is higher than the mid-value.

Figure 6.5: Kernel and normal density distribution of the level of learning self-efficacy



Source: Author's calculation, Field Survey.

6.5 Learning self-efficacy (LSE) and academic emotional state (AE)

According to the hypothesis, the study is interested to know whether students' academic emotional state significantly influences their learning self-efficacy. In order to do so, the variable, learning self-efficacy, will be regressed on academic emotional state. The learning self-efficacy is a function of academic emotional state (AE), mastery experience (ME), vicarious experience (VE), social persuasions (SP), and other sociocultural factors such as country and gender. Here, LSE is the dependent

variable, AE is an independent variable and ME, VE, SP, and other factors are control variables. The regression model can be represented as follows:

Box 6.2: Regression model of learning self-efficacy

level of learning self-efficacy = f (level of academic emotional state, level of mastery experience, level of vicarious experience, level of social persuasions, country, gender) ------(6.7)

Equation 6.7 in this box is considered to regress LSE on AE. The results of multiple regression on LSE for AE are shown in Table 6.22, from which it is seen that the regression coefficient of AE is 0.059, positive and also statistically significant at the 5% level. Therefore, it is clearly observed that LSE is significantly increasing with AE for overall sample students combining the two countries. This satisfies a part of the third hypothesis, suggesting that the academic emotional state improves students' learning self-efficacy. From the table it should be noted that LSE is significantly increasing with each of its sources such as ME, VE, SP, and AE, while controlling others. This also satisfies the theoretical model of Bandura (1994) about the sources for developing learning self-efficacy. Thus, the study supports Bandura's theoretical model.

Table 6.22: Regression results of the level of learning self-efficacy on academic emotional state combining two countries

Variable	Coef.	Std. Err.	p
level of academic emotional state	0.059***	0.015	0.00
level of mastery experience	0.193***	0.025	0.00
level of vicarious experience	0.194***	0.023	0.00
level of social persuasions	0.189***	0.022	0.00
Fiji	0.353***	0.068	0.00
Boy	0.116*	0.064	0.07
Constant	2.752***	0.182	0.00

Note: Adj R^2= 0.471, F(6,865)=129.97 (p=0.00)* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

6.6 Mathematics learning self-efficacy (MLSE)

Mathematics is essential not only in daily life, but also for science, engineering, and research. Proper ability in mathematics is compulsory for many jobs and it helps to build up one's character. It is an important subject in learning for adolescent students

and a subject area in which they need to have well-developed self-efficacy. This section discusses mathematics learning self-efficacy of the sample adolescent students. The study was interested to examine whether students' academic emotional state can also promote their learning self-efficacy in mathematics significantly (to be discussed in section 6.7). MLSE is concerned with people's beliefs about their capabilities for learning activities in the particular subject area of mathematics (Bandura, 2006). As discussed in Chapter 3, a mathematics learning self- efficacy scale (based on Bandura, 2006 and modified by Thomas, 2013) has been constructed to assess students' confidence level in mathematics learning in two different ways. The students' answers for each part under mathematics learning self-efficacy (MLSE) have been captured on a 10-point scale, on which '0' is '*not at all*' and '10' is '*very often*'. The higher the value means the greater will be the MLSE value.

(i) The first part, general mathematics learning self-efficacy (GMLSE)**,** includes some questions that are about students' general confidence in mathematics, such as how they can learn mathematics or how they think about their abilities in mathematics. There are four questions in this part.

(ii) The second part is self-efficacy for self-regulated learning in mathematics (SESRLM). It is suggested that students who have belief about their ability to use self-regulatory learning strategies for mathematics effectively, such as organizing their work and managing their time for mathematics, are more likely to have higher mathematics learning self-efficacy and achievement in that area (Usher & Pajares, 2008). To determine this, the students were asked how they plan, organize and pay attention in their mathematics learning activities in different situations. This part contains a total of eleven questions related to SESRLM. Table 6.23 lists the questions that were asked to the sample students to assess their MLSE, and their names denoted for further statistical analysis.

The reliability (Cronbach's alpha) test was used to examine the reliability of each question and the result is reported in Table 6.24. Here, it can be observed that all the questions' signs are positive and inter–test and inter–rest correlations between them are sufficient to justify including them. Also the overall Cronbach's alpha taking all those questions is 0.927, much greater than the critical value (0.7). Hence, the questions are sufficiently reliable to explain the variable and have been considered for

constructing a combined index to represent the level of mathematics learning self-efficacy for each student.

Table 6.23: Question and its name defined for mathematics learning self-efficacy

Question	Question name
1. In general, how confident are you in your ability in maths learning?	*gmlse01ability*
2. How confident are you that you will do well in maths?	*gmlse02well*
3. How confident are you that you can learn the maths subject?	*gmlse03learn*
4. How confident are you that you will get an A in maths this year?	*gmlse04 get A*
5. How well can you finish your maths homework on time?	*sesrlm01finish*
6. How well can you do maths work if there are other interesting things to do?	*sesrlm02math work*
7. How well can you concentrate on your maths work?	*sesrlm03concentrate*
8. How well can you remember information that is presented in maths class and in your maths text books?	*sesrlm04remember*
9. How well can you get yourself to do maths?	*sesrlm05get yourself*
10. How well can you participate in maths class?	*sesrlm06participate*
11. How well can you arrange a place to do maths at home where you won't get distracted?	*sesrlm07arrange*
12. How well can you get help with maths work if you need it?	*sesrlm08get help*
13. How well can you check over your maths work to make sure it's correct?	*sesrlm09check*
14. How well can you get back on track with your maths work if you are distracted?	*sesrlm010get back*
15. How well can you organize your maths work this year?	*sesrlm011organize*

Table 6.24: Result of reliability test on the questionnaire used for mathematics learning self-efficacy

Item	Obs	Sign	item-test correlation	item-rest correlation	average interitem correlation	alpha
gmlse01ability	873	+	0.749	0.703	0.454	0.921
gmlse02well	873	+	0.726	0.676	0.457	0.922
gmlse03learn	873	+	0.746	0.699	0.455	0.921
gmlse04getA	873	+	0.692	0.638	0.461	0.923
sesrlm01finish	873	+	0.702	0.649	0.460	0.923
sesrlm02math work	873	+	0.682	0.626	0.462	0.923
sesrlm03concentrate	873	+	0.800	0.761	0.448	0.919
sesrlm04remember	873	+	0.734	0.685	0.456	0.922
sesrlm05get yourself	872	+	0.782	0.740	0.450	0.920
sesrlm06participate	873	+	0.743	0.696	0.455	0.921
sesrlm07arrange	873	+	0.667	0.609	0.464	0.924
sesrlm08get help	873	+	0.540	0.467	0.478	0.928
sesrlm09check	873	+	0.651	0.591	0.466	0.924
sesrlm10get back	873	+	0.663	0.605	0.464	0.924
sesrlm11organize	873	+	0.683	0.627	0.462	0.923
Test scale					0.459	0.927

Source: Author's calculation, Field Survey.

Note: Same as Table 4.13

The study follows the principal component method to establish a suitable index of mathematics learning self-efficacy. The study looked at the summarised statistics for each question (variable) and the extent of collinearity between them (see Table C27 and C28 in Appendix C for detailed results) before computing PCA. The result suggests that they are highly correlated.

Their principal components towards one dimension were established and its coefficients were obtained. The results of the PCA are shown in Tables 6.25 and 6.26. From Table 6.25 it is seen that component 1 has the maximum eigenvalue 40.090 and it explains 49.8% of the total variance of the variables. Also, all the coefficients of component 1 are statistically significant (see Table 6.26). According to their weights found in component 1*, sesrlm06participate* is the most and *sesrlm08get help* is the least important question to represent the instrument for mathematics learning self-efficacy.

Table 6.25: Explain variance by component among the variables on mathematics learning self-efficacy

Components	Eigenvalue	Proportion	SE_Prop
Component 1	40.090	0.498	0.013
Component 2	5.936	0.074	0.004
Component 3	4.715	0.059	0.003
Component 4	4.057	0.050	0.003
Component 5	3.602	0.045	0.002
Component 6	3.319	0.041	0.002
Component 7	2.926	0.036	0.002
Component 8	2.712	0.034	0.002
Component 9	2.647	0.033	0.002
Component 10	2.080	0.026	0.001
Component 11	2.018	0.025	0.001
Component 12	1.935	0.024	0.001
Component 13	1.782	0.022	0.001
Component 14	1.557	0.019	0.001
Component 15	1.171	0.015	0.001

Source: Author's calculation, Field Survey.

Table 6.26: Principal component analysis of the variables on mathematics learning self-efficacy

Component 1	Coef.	Std. Err.	p
gmlse01ability	0.264***	0.009	0.00
gmlse02well	0.230***	0.008	0.00
gmlse03learn	0.237***	0.008	0.00
gmlse04geta	0.254***	0.010	0.00
sesrlm01finish	0.251***	0.009	0.00
sesrlm02mathwork	0.276***	0.011	0.00
sesrlm03concentrate	0.297***	0.008	0.00
sesrlm04remember	0.265***	0.009	0.00
sesrlm05getyourself	0.293***	0.008	0.00
sesrlm06participate	0.307***	0.010	0.00
sesrlm07arrange	0.250***	0.010	0.00
sesrlm08gethelp	0.195***	0.012	0.00
sesrlm09check	0.245***	0.011	0.00
sesrlm10get back	0.240***	0.010	0.00
sesrlm11organize	0.245***	0.010	0.00

Note: Rho = 0.4977; SE(Rho) = 0.013
LR test for independence (chi2(105) = 6829.57, p = 0.00)
LR test for sphericity (chi2(119) = 6925.07, p= 0.00)
* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

Chi-square test for equality of the coefficients of component 1 was applied and the results are shown in Table C29 (see Appendix C). The probability value of Chi-square is statistically significant at the 5% level, which signifies that the coefficients are significantly different from each other. This component has been considered to construct the index and its coefficient would be the projection of each question along its dimension

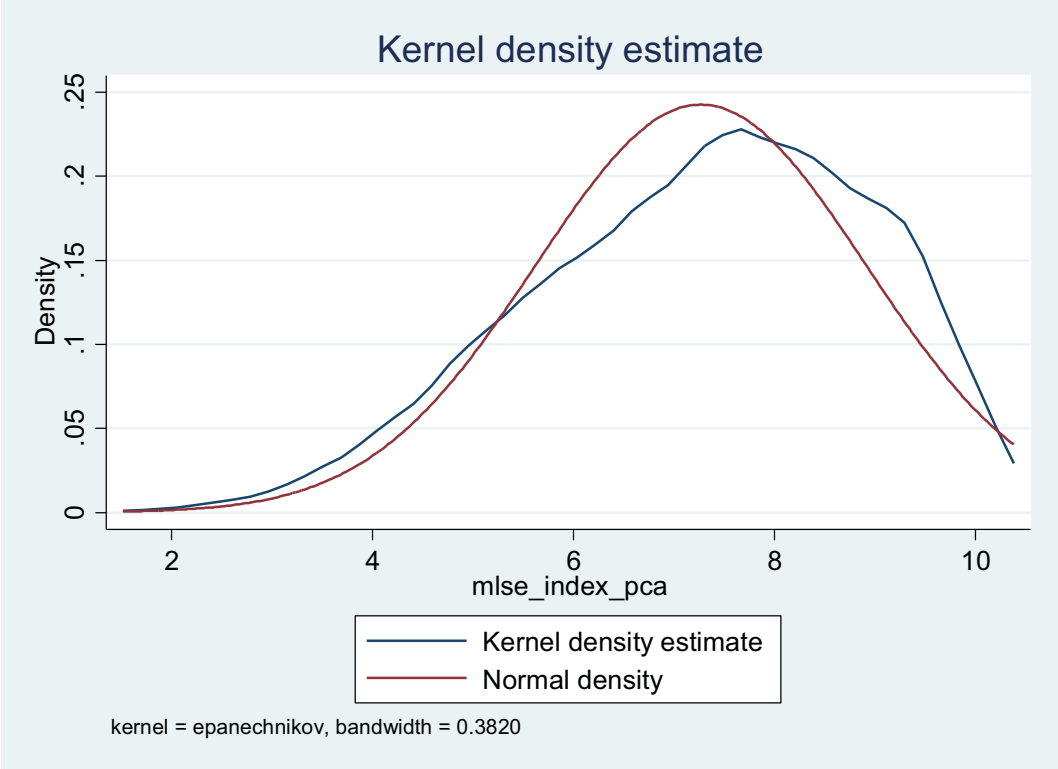
The coefficients of component 1 as the weights of all questions used for mathematics learning self-efficacy and combine them linearly for its index formation. Here, for normalisation purpose the shared value of each coefficient with respect to the total value of all coefficients is used so that, the sum of the weights will be exactly equal to one.

$$level\ of\ mathematics\ learning\ self-efficacy = \frac{\sum_{i=1}^{15} \omega_i mlsei}{\sum_{i=1}^{15} \omega_i} \quad \text{----(6.8)}$$

Where mlsei represents value and ω_i is the coefficient of *i-th* variable (question) of component 1 (see Table 6.26).

The study looked at the distribution of mathematics learning self-efficacy index for the sample students and uses two types of plots, Kernel distribution and normal distribution, which have been represented in Figure 6.6. From the figure it can be observed that they are remarkably similar and suggest that the highest peak lies on 7–8. Hence, the highest share of students has a mathematics learning self-efficacy level above 7, which is well above the mid-value.

Figure 6. 6: Kernel and normal density distribution of level of mathematics learning self-efficacy



Source: Author's calculation, Field Survey.

6.7 Mathematics learning self-efficacy (MLSE) and academic emotional state (AE)

Previously in this chapter, it was seen that academic emotional state significantly improved students' learning self-efficacy. The study was also interested to know whether this academic emotional state significantly influenced their learning self-efficacy in mathematics. The variable, mathematics learning self-efficacy, was regressed on academic emotional state. Mathematics learning self-efficacy (MLSE) is a function of academic emotional state (AE), mastery experience (ME), vicarious experience (VE), social persuasions (SP), and other sociocultural factors like country and gender. Here, MLSE is the dependent variable, AE is an independent variable, and ME, VE, SP, and other factors are control variables. The regression model can be represented as follows:

Box 6.3: Regression model of mathematics learning self-efficacy

level of mathematics learning self-efficacy = f (level of academic emotional state, level of mastery experience, level of vicarious experience, level of social persuasions, country, gender) ---(6.9)

The results of multiple regression on MLSE for AE are shown in Table 6.27. From the table, it is seen that the regression coefficient of AE is 0.115 and positive, and also statistically significant at the 5% level. Therefore, it is observed that MLSE increases significantly with AE for overall sample students, combining the two countries. This satisfies a part of the third hypothesis, suggesting that the AE positively improves the students' mathematics learning self-efficacy as well. From the table it should be noted that MLSE is significantly increasing with each of its sources (ME, VE, SP, and AE), while controlling others. This also satisfies the theoretical model of Bandura (1994) about the sources for developing mathematics learning self-efficacy. Thus the study supports Bandura's theoretical model.

Table 6. 27: Regression results of the level of mathematics learning self-efficacy on academic emotional state, two countries combined

Variable	Coef.	Std. Err.	p
level of academic emotional state	0.115***	0.020	0.00
level of mastery experience	0.207***	0.035	0.00
level of vicarious experience	0.256***	0.031	0.00
level of social persuasions	0.181***	0.030	0.00
Fiji	0.287***	0.093	0.00
Boy	0.474***	0.088	0.00
Constant	1.573***	0.251	0.00

Note: Adj R^2= 0.387, F(6,864)=92.47 (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

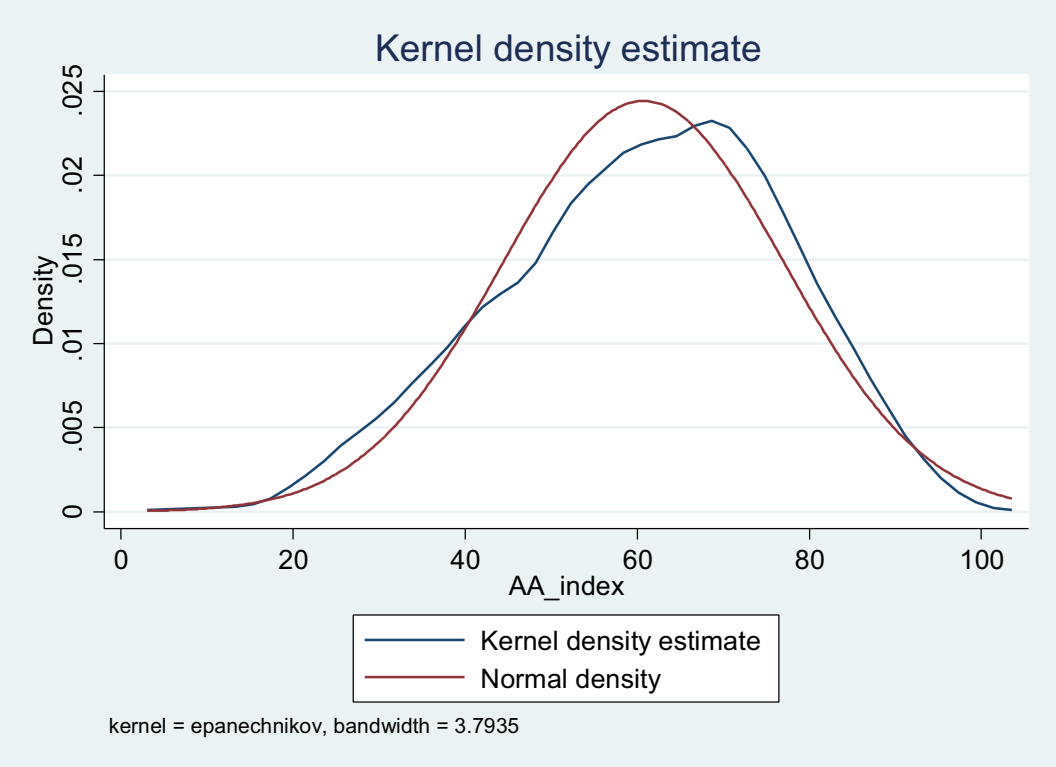
Source: Author's calculation, Field Survey.

6.8 Academic achievement (AA) and its relationship with learning and mathematics learning self-efficacy

This chapter has already examined the phenomenon that students can raise their academic emotional state and learning self-efficacy by improving various sociopsychological states such as general emotion, self-confidence, and school adjustment. This learning self-efficacy is expected to promote their academic achievement markedly. This section provides discussion about academic achievement of adolescent students and its relationship with self-efficacy in learning. The study has

collected the record of the examination marks obtained by the students in various subjects during the previous year (2013). Here, the study includes various common subjects – Mathematics, Science, Biology, Agriculture, Mother language, English, History, Geography, Social studies, and Home economics – as available in various schools and has taken students' academic scores (percentages) in those respective subjects at the end of their 9th standard. The average percentage of scores combining all subjects has, for this analysis, been considered as students' academic achievement. The distribution of the level of academic achievement of the sample students has been plotted (see Figure 6.7). As per two distributions (normal and Kernel plots), the highest density of the sample students falls more or less around 60–70. Therefore, the highest share of students has been found to obtain an academic achievement beyond the middle level.

Figure 6.7: Estimated Kernel and normal density function of the index of academic achievement



Source: Author's calculation, Field Survey.

It is of particular interest to the study to know whether learning self-efficacy significantly influences students' academic achievement. For this purpose, the variable, academic achievement has been regressed separately on learning self-

efficacy (LSE) and on mathematics learning self-efficacy (MLSE). Here, the academic achievement is a function of LSE and MLSE separately, and other sociocultural factors like country and gender, where academic achievement is the dependent variable, LSE and MLSE are independent variables, and other factors are control variables. The regression model can be represented as follows:

Box 6.4a: Regression model of academic achievement

level of academic achievement = f (level of learning self-efficacy, country, gender) --(6.10)

level of academic achievement = f (level of mathematics learning self-efficacy, country, gender) --(6.11)

The results of multiple regression of academic achievement (AA) on LSE and MLSE are represented in Tables 6.28a and 6.28b separately. From these two tables, it is seen that the regression coefficients of LSE and MLSE are 4.081 and 4.268 respectively. Both of them are statistically significant at the 5% level, so it is clearly observed that AA is increasing significantly with learning self-efficacy and mathematics learning self-efficacy for overall sample students combining the two countries. This satisfies a part of the third hypothesis, suggesting that the LSE and MLSE positively improve students' academic achievement.

The results revealed in the two Tables 6.28a and 6.28b support the existing literature reported by Caprara, et al. (2008). They examined the influence of self-efficacy for self-regulated learning on learning outcome. The results showed a positive association between self-efficacy and school achievement of junior high school students. The present study also supports the finding made by Mahyuddin et al. (2006) who showed a positive correlation among self-efficacy and achievement in the English language.

Table 6. 28a: Regression results of the level of academic achievement on learning self-efficacy combining two countries

Variable	Coef.	Std. Err.	p
learning self-efficacy	4.081***	0.389	0.00
Fiji	6.623***	0.998	0.00
Boy	7.206***	0.991	0.00
Constant	23.952***	2.913	0.00

Note: Adj R^2= 0.213, F(3,869)=79.49 (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

Table 6.28b: Regression results of the level of academic achievement on mathematics learning self-efficacy combining two countries

Variable	Coef.	Std. Err.	p
mathematics learning self-efficacy	4.268***	0.286	0.00
Fiji	7.032***	0.936	0.00
Boy	5.735***	0.945	0.00
Constant	23.707***	2.132	0.00

Note: Adj R^2= 0.294, F(3,868)=121.61 (p=0.00)
* p<0.10, **p<0.05 and *** p<0.01
Source: Author's calculation, Field Survey.

From all statistical analyses (Chapters 4, 5 and 6), the study shows that academic achievement is a function of learning self-efficacy, which is also a function of academic emotional state. This academic emotional state depends on general emotion, self-confidence and school adjustment and all of them further depend upon physical activity self-efficacy. Physical activity self-efficacy is a function of physical activity. Ultimately, the present study demonstrates that academic achievement is a function of physical activity. Therefore, academic achievement can be regressed on physical activity for robustness checking. But, the study has not run regression analysis between them, because Chapter 4 shows a non-linear relationship between physical activity and physical activity self-efficacy. Here, the study was interested to examine the influence of physical activity (PA) on academic achievement through acquired physical activity self-efficacy (PSE, already proved in Chapter 4 to be significantly affected by PA). Since physical activity self-efficacy is more important in this context, the academic achievement will be regressed on physical activity self-efficacy (PSE) along with other sociocultural factors like country and gender. The regression model can be represented as follows:

Box 6.4b: Regression model of academic achievement

level of academic achievement = f (level of physical activity self-efficacy, country, gender) ----6.12

The result of regressing academic achievement (AA) on PSE is represented in Table 6.29. From that table, it is observed that the regression coefficient of physical activity self-efficacy is 1.344, which is statistically significant at the 5% level. The result of multiple regression of academic achievement on physical activity self-efficacy shows that AA increases significantly with PSE. This proves the hypothesis, suggesting that

the acquired physical activity self-efficacy from physical activity definitely improves students' academic achievement.

Table 6.29: Regression results of the level of academic achievement on physical activity self-efficacy, combining two countries

Variable	Coef.	Std. Err.	p
Physical activity self-efficacy	1.344***	0.337	0.00
Fiji	8.363***	1.033	0.00
Boy	6.081***	1.082	0.00
Constant	47.488***	1.697	0.00

Note: Adj R^2= 0.129, F(3,869)=43.90 (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

The study has proved the pathway from physical activity to academic achievement following the hypothetical schematic diagram in section 1.1 of Chapter 1 executing step by step analyses from one variable to the next variable. Here, the study has examined only the relationship between two variables (dependent and independent) in each set – and from almost all (except school adjustment) the positive and significant results – reaching the conclusion that by engaging in physical activity students can improve their academic achievement. This analysis could not consider the effect of PSE explained by PA on GE, SC, and SA. Similarly, the effects of GE, SC, and SA explained by estimated PSE have not been considered. This is purely the problem of running regression analysis with a single equation. In order to overcome this problem, a set of structural equations has been formulated to establish their sequential relationships. Therefore, to estimate the effect of physical activity on academic achievement through various channels, the study must follow a structural framework for pathway analysis

6.9 Pathway analysis from physical activity to academic achievement

The study has already examined the possibility that physical activity and physical activity self-efficacy improve students' general emotion and self-confidence, which influence students' academic emotional state positively; then, academic emotional state develops their learning self-efficacy; and finally, learning self-efficacy improves their academic achievement. Therefore, ultimately, the study shows the positive association, through various channels, of physical activity with students' academic achievement. Now, the study's interest is to confirm, using a structural model, the

whole pathway from physical activity to academic achievement through various sociopsychological channels. This will provide the various step by step relationships from physical activity to academic achievement according to the hypothetical schematic diagram (given in Chapter 1, Sec 1.1). In other words, the structural model considers only the explained part of PSE by PA while estimating the relationship of PSE with GE or SC or SA; then, only the explained parts of GE, SC, and SA by PSE while estimating the relationship of GE or SC or SA with AE; and so on. Here, the study applies two types of structural models: one for learning self-efficacy and other for mathematics learning self-efficacy. Various formulas used for structural models to establish these can be represented as follows.

Box 6.5: Various formulas for structural models from physical activity to academic achievement through learning and mathematics learning self-efficacy

level of physical activity self-efficacy
= f (level of physical activity, country, gender, share of time spent on household works, share of time spent on learning activities, share of time spent on music, singing and drawing) --------(6.13)

level of general emotion = f (level of physical activity self-efficacy, country, gender) --------(6.14)

level of self-confidence = f (level of physical activity self-efficacy, country, gender) --------(6.15)

level of school adjustment = f (level of physical activity self-efficacy, country, gender) --------(6.16)

level of academic emotional state = f (level of general emotion, level of self-confidence, level of school adjustment, country, gender) ----------(6.17)

level of learning self-efficacy = f (level of academic emotional state, level of mastery experience, level of vicarious experience, level of social persuasions, country, gender) ----------(6.18a)

level of mathematics learning self-efficacy = f (level of academic emotional state, level of mastery experience, level of vicarious experience, level of social persuasions, country, gender) --------(6.18b)

level of academic achievement = f (level of learning self-efficacy, country, gender) ---------(6.19a)

level of academic achievement = f (level of mathematics learning self-efficacy, country, gender) ----(6.19b)

The above structural model has been estimated using the simultaneous regression method discussed in Chapter 3 (section 3.5). Similar model has been used to investigate the extent of relationship between physical activity and academic achievement through learning self-efficacy (LSE) and mathematics learning self-efficacy (MLSE) separately. The results of the structural model for LSE and MLSE are shown in Tables 6.30 and 6.31 respectively. From Table 6.30, it is seen that first, PSE has been regressed on PA and the regression coefficient of PA is 2.123, which is

positive and statistically significant at the 5% level. Similarly, each of GE, SC, and SA separately has been regressed on the estimated PSE and the regression coefficients of PSE for GE, SC, and SA are 0.487, 1.279, and –0.825 respectively. All of them are statistically significant at the 5% level. Only the coefficient of SA is negative. Then, AE has been regressed on the estimated GE, SC, and SA and the values of their regression coefficients are 0.491, 1.470, and 1.158 respectively, all statistically significant at the 5% level and positive. After that, LSE has been regressed on the estimated AE and the regression coefficient of AE is 0.488, which is positive and statistically significant at the 5% level. Finally, AA has been regressed on the estimated LSE and the regression coefficient of LSE is 8.678 and it is positive and statistically significant at the 5% level. Almost similar results have been found from Table 6.31 for estimated PSE, GE, SC, SA, and AE in the case of MLSE. When MLSE has been regressed on the estimated AE, the regression coefficient of AE is 0.595, another that is positive and statistically significant at the 5% level (see Table 6.31). Finally in this table, AA has been regressed on the estimated MLSE and the regression coefficient of MLSE is 7.699, which is positive and statistically significant at the 5% level.

From the two tables, it is seen that all except one of the relationships according to the hypothetical schematic diagram are significantly positive, which means each variable of the diagram influences the next one positively, the exception being the case of school adjustment. Therefore, the adolescent students can acquire physical activity self-efficacy by participating in physical activity. The acquired physical activity self-efficacy improves their general emotion and self-confidence, and beyond that, this acquired general emotion and self-confidence promote their academic emotional state. The boosted academic emotional state improves their learning and mathematics learning self-efficacy, which ultimately increase their academic achievement. The variable school adjustment is decreasing with physical activity self-efficacy because the school curriculum and the ambient attitude of the school environment may not be in favour of this activity.

Table 6.30: Results of structural model from physical activity to the level of academic achievement through learning self-efficacy, combining two countries

Equation	Variable	Coef.	Std. Err.	p	Equation Chi^2
Equation 1	**Level of physical activity self-efficacy**				36.11 (p=0.00)
	Level of physical activity	2.123***	0.677	0.00	
	(Level of physical activity)^2	-1.502*	0.842	0.08	
	Share of time spent on household works	-1.574***	0.442	0.00	
	Share of time spent on learning activities	1.001**	0.447	0.03	
	Share of time spent on music, singing and drawing	0.341	0.487	0.48	
	Fiji	0.395***	0.131	0.00	
	Constant	4.057***	0.201	0.00	
Equation 2	**Level of general emotion**				32.08, (p=0.00)
	Level of physical activity self-efficacy	0.487***	0.110	0.00	
	Fiji	-0.492***	0.122	0.00	
	Constant	3.379***	0.525	0.00	
Equation 3	**Level of self-confidence**				190.26, (p=0.00)
	Level of physical activity self-efficacy	1.278***	0.097	0.00	
	Fiji	-0.610***	0.112	0.00	
	Constant	1.534***	0.462	0.00	
Equation 4	**Level of school adjustment**				298.52, (p=0.00)
	Level of physical activity self-efficacy	-0.825***	0.116	0.00	
	Fiji	2.276***	0.138	0.00	
	Constant	6.915***	0.554	0.00	
Equation 5	**Level of academic emotional state**				151.31, (p=0.00)
	Level of self-confidence	1.470***	0.160	0.00	
	Level of general emotion	0.491**	0.244	0.04	
	Level of school adjustment	1.158***	0.408	0.01	
	Fiji	-2.536***	0.794	0.00	
	Constant	-10.316***	3.253	0.00	
Equation 6	**Level of learning self-efficacy**				672.13, (p=0.00)
	Level of academic emotional state	0.488***	0.099	0.00	
	Level of mastery experience	0.084**	0.035	0.02	
	Level of vicarious experience	0.114***	0.022	0.00	
	Level of social persuasions	0.131***	0.020	0.00	
	Fiji	0.819***	0.128	0.00	
	Constant	1.452***	0.439	0.00	
Equation 7	**Level of academic achievement**				253.66, (p=0.00)
	Level of learning self-efficacy	8.678***	0.628	0.00	
	Fiji	4.343***	1.111	0.00	
	Constant	-5.998	4.584	0.19	

Note: figures in parentheses represent chi-square of the particular regression on the concerned variables within the structural model; * p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

Table 6.31: Results of structural model from physical activity to the level of academic achievement through mathematics learning self-efficacy, combining two countries

Equation	Variables	Coef.	Std. Err.	p	Equation Chi^2
Equation 1	Level of physical activity self-efficacy				34.74 (p=0.00)
	Level of physical activity	2.209***	0.683	0.001	
	(Level of physical activity)^2	-1.645**	0.851	0.050	
	Share of time spent on household works	-1.562***	0.445	0.000	
	Share of time spent on learning activities	0.962**	0.452	0.033	
	Share of time spent on music, singing and drawing	0.245	0.492	0.619	
	Fiji	0.392***	0.131	0.003	
	Constant	4.068***	0.203	0.000	
Equation 2	Level of general emotion				33.07 (p=0.00)
	Level of physical activity self-efficacy	0.499***	0.111	0.000	
	Fiji	-0.499***	0.122	0.000	
	Constant	3.330***	0.529	0.000	
Equation 3	Level of self-confidence				189.98 (p=0.00)
	Level of physical activity self-efficacy	1.279***	0.097	0.000	
	Fiji	-0.610***	0.112	0.000	
	Constant	1.534***	0.463	0.001	
Equation 4	Level of school adjustment				295.41 (p=0.00)
	Level of physical activity self-efficacy	-0.808***	0.117	0.000	
	Fiji	2.277***	0.139	0.000	
	Constant	6.832***	0.561	0.000	
Equation 5	Level of academic emotional state				153.16 (p=0.00)
	Level of self-confidence	1.495***	0.160	0.000	
	Level of general emotion	0.527**	0.248	0.033	
	Level of school adjustment	1.229***	0.408	0.003	
	Fiji	-2.668***	0.795	0.001	
	Constant	-10.918***	3.264	0.001	
Equation 6	Level of mathematics learning self-efficacy				440.53 (p=0.00)
	Level of academic emotional state	0.595***	0.142	0.000	
	Level of mastery experience	0.083*	0.052	0.100	
	Level of vicarious experience	0.176***	0.032	0.000	
	Level of social persuasions	0.121***	0.029	0.000	
	Fiji	0.806***	0.182	0.000	
	Constant	0.189	0.630	0.764	
Equation 7	Level of academic achievement				293.63 (p=0.00)
	Level of learning self-efficacy	7.699***	0.517	0.000	
	Fiji	5.741***	1.020	0.000	
	Constant	1.876	3.731	0.615	

Note*: * p<0.10, **p<0.05 and *** p<0.01; ***Source: Author's calculation, Field Survey.

The sample adolescent students, then, cannot improve their academic achievement through developing school adjustment by engaging in physical activity outside of schools. Still, there are other channels, such as general emotion and self-confidence, through which they can expand their academic emotional state and learning self-efficacy, as well as their academic achievement, by engaging in physical activity. Here, it should be noted that if the school curriculum offers sufficient advantages for physical activity, through building an active and conducive school environment, the students may develop their academic emotional state, learning self-efficacy and academic achievement even more, through improved school adjustment. However, the study has successfully examined and proved the positive effect of physical activity on academic emotional state, learning self-efficacy and academic achievement of adolescent students through various sociopsychological channels; only school adjustment does not share the full benefits.

The current study ultimately supports the existing literature such as the studies of Dwyer et al. (1996), Kirkendall (1986), Shephard (1997), and Trudeau and Shephard (2008), who reviewed in their papers the association between various types of physical activity and academic performance. The present study is more advanced and significant in that it examines the step by step relationships from physical activity to academic achievement through various sociopsychological channels; and is also unique in paying special attention to the developmentally highly significant years of adolescence.

6.10 Concluding remarks

This chapter has investigated the effect of general emotion, self-confidence, and school adjustment (discussed in the previous chapter) on academic emotional state, learning self-efficacy and academic achievement of adolescent students. In summary, this chapter argues first, that general emotion, self-confidence, and school adjustment significantly improve the academic emotional state of adolescent students. Secondly, the academic emotional state significantly improves the students' learning self-efficacy and mathematics learning self-efficacy. Thirdly, the learning self-efficacy and mathematics learning self-efficacy have a significant and positive influence on their academic achievement. Fourthly, from the structural model the study has proved robustly that physical activity definitely improves academic emotional state, learning,

and mathematics learning self-efficacy, and academic achievement of adolescent students through enhancing their positive sociopsychological states such as general emotion and self-confidence, but not through school adjustment, because of the stifling lack of a positive attitude in the school administration towards this activity.

These findings of the chapter satisfy the third hypothesis, suggesting that general emotion, self-confidence, and school adjustment improve academic emotional state and learning self-efficacy of adolescent students; and that the improved AE and LSE definitely promote their academic achievement. Additionally, the chapter has reviewed the whole pathway from physical activity to academic achievement through various sociopsychological channels. Here, the present study has provided more advanced and significant understanding than other studies in the existing literature because it:

- has shown the relationship of academic emotional state with general emotion, self-confidence and school adjustment of adolescent students. But research on these relationships is extremely rare;
- satisfies the theoretical model of Bandura (1994) about the sources (mastery experience, vicarious experience, social persuasions, and academic emotional state) for developing self-efficacy in learning. In this respect, the study has both proved anatomically and supported Bandura's theoretical model;
- has examined various channels or routes of the pathways from physical activity to academic achievement of the students through developing their positive psychological status and various aspects of the academic area; and
- pays special attention to the adolescent group.

The final chapter summarises the whole study, noting also its strengths, limitations, and contribution. It also makes recommendations for possible future scope for research in this field of study.

CHAPTER 7: SUMMARY AND CONCLUDING OBSERVATIONS

7.1 Introduction

The growing problems of physical and mental health in modern life require particular and specific attention to deal with them from the early stages of life, and demand more participation in deliberately undertaken physical activity as part of one's personal lifestyle. In virtually all societies it is usual that as an individual grows, he/she participates in intense academic activities during the years of adolescence to prepare themselves for future working life in an increasingly competitive and challenging global environment. All too often, this concentration on the academic area compromises the attention paid to the less important need for physical activity. The growing literature seems to be suggesting that regular participation in sustained and reasonably energetic physical activity brings improvement not only in general and mental health but also in cognitive performance involving such matters as attention and concentration, and academic outcomes (though many still find this claim contentious). WHO (2004a) states that participation in physical activity is the 'fundamental means of improving the physical and mental health of individuals'. Norris et al. (1992) suggest that during the adolescent period, high intensity aerobic exercise has positive effects on well-being; it seems, for instance, to contribute to lowering stress and depression levels. Some research shows a positive association of physical activity with self-esteem (Tremblay et al., 2000), school satisfaction and school connectedness, which diminish dropping out of school (Brown & Evans, 2002). Moreover, some studies show the direct effect of physical activity on cognitive skills and academic performance. According to Kramer et al. (2006), physical activity has a constructive effect on learning and memory. Voss et al. (2013) review three separate studies before reaching the conclusion that throughout adulthood physical activity develops cognitive and brain function and also protects from neurodegenerative diseases. They suggest that physical activity is an economical management strategy that might bring considerable and curative benefits for cognitive and brain function. Dwyer et al. (1996), Kirkendall (1986), Shephard (1997), and Trudeau and Shephard (2008) have all reviewed the association between various types of physical activity and academic performance. They suggest that physical activity has a positive effect on concentration, memory and classroom behaviour as well as on cognitive function and

intellectual academic performance (discussed in Chapter 2). However, not all studies support the positive effect of physical activity on academic performance (e.g., Shannonhouse, 2012; Taras, 2005; Keeley & Fox, 2009). Though research investigating the effects of physical activity on various aspects of human life, particularly physical and mental health, and academic performance, has been intensifying, still the pathway from physical activity to performance in the academic area through developing various sociopsychological states is under-researched, specifically in the developing societies as they are drawn further into the global economy. It is assumed that if physical activity builds and strengthens adolescent students' self-efficacy to take part in regular physical activity, then it can directly promote their general emotion, self-confidence and school adjustment by regulating the students in a favourable way. Further, these positively influenced psychological states may flow on to affect the students' academic emotional state, learning self-efficacy and academic achievement. Therefore, the current study investigated whether the physical activity had any negative consequence for the mental state and academic outcomes of adolescent students in a typical developing society, with special reference to India and Fiji. Based on the positivist research paradigm, the detailed statistical analyses (using quantitative methods) on the data collected from a field-level survey have been undertaken to establish various relationships. For this purpose, the study has adopted the following systematic approach (see details in Chapter 3).

(1) First, a structured questionnaire was prepared for physical activity and other sociopsychological and socioeconomic variables capturing their various characteristics. In total, 873 adolescent sample students (including 497 girls and 376 boys) studying at 10^{th} standard from a total of 16 schools in rural, semi-urban and urban areas of India and Fiji were asked to respond to this questionnaire designed to capture the variables to be used in regression analysis.

(2) Then, suitable indices were constructed for the variables. For psychological variables the study used the following scientific methods to construct their more suitable indices.

    (i) First, a reliability test was conducted to examine the presence and sufficient influence of each question to be considered in the indexation of a psychological variable.

(ii) After this reliability testing of the questions, the study applied principal component analysis for index formation of the variable.

(3) The indices, once derived, provided the variables used in ANOVA and regression analysis to establish the various relationships.

(4) Finally, a structural analysis was undertaken to confirm the robust understanding for the pathway from physical activity to academic achievement through various psychological and academic states.

In this study, three chapters (from Chapter 4 to Chapter 6) were devoted to statistical analysis to elicit the various relationships among the variables. In Chapter 4, as a first step, the different types and levels of physical activity have been drawn from the survey data. Then, an index of the level of physical activity has been prepared and its extent across sample students and variation across various socioeconomic conditions (country, gender, and parental income and educational status) has been analysed. Next, an index of 'physical activity self-efficacy' has been constructed following reliability testing and PCA to assess its level among the sample students. Finally, the study has established the relationship between them. In Chapter 5, indices of 'general emotion', 'self- confidence' and 'school adjustment' have been constructed using these same methods and then, their relationships with the level of physical activity self-efficacy as well as physical activity have been examined objectively using multiple regression analyses. In Chapter 6, the study has constructed the indices for various sources of learning self-efficacy such as mastery experience, vicarious experience, social persuasions and academic emotional state, and also for learning self-efficacy and mathematics learning self-efficacy, following similar methods. Then, the relationships between the proposed variables have been examined using multiple and multivariate regression methods. Finally, a structural model has been applied to confirm the whole pathway from physical activity to academic achievement through various psychological channels.

This final chapter summarises the whole study and its implications for individual and social life. Section 7.2 discusses the key findings of the study in detail, section 7.3 draws concluding observations, section 7.4 highlights necessary policy changes arising from the findings, section 7.5 describes the limitations of the study and section 7.6

points to directions and areas deserving of future research. Finally, section 7.7 rounds off the concluding remarks.

7.2 Findings of the study

The findings of this study are summarised as follows:

(i) The first observation is that the highest share (more than 50%) of sample adolescent students is engaged in physical activity within the lower range (0–1.4 hours per day) and 23% of the students are found to be engaged even less than 30 minutes. The main activities comprise walking, bicycling and nationally popular sports, like cricket in India and volleyball and rugby in Fiji. Walking is widely and commonly observed as a communication means (a usual means of getting around) in both countries. There is no significant difference between the average levels of physical activity performed by Indian and Fijian students. The observation supports part of the first hypothesis suggesting that moderate to high levels of physical activity are limited to only a few adolescent students. Most of the students are more focused on academic subjects and not engaged in physical activity, perhaps due to lack of consciousness about its benefits. Moreover, in both countries schools have not made any significant contribution in students' participation in physical activity, having been negligent about including this activity effectively into the school curriculum and engaging all students efficiently into such activity during school hours.

(ii) The average level of physical activity is significantly lower for girls than for boys and this variation between genders is more marked in India than in Fiji. The significantly lower level of physical activity of girl students relates to their greater involvement in household activities and the many societal expectations and constraints that surround girls in both countries. This result satisfies part of the first hypothesis.

(iii) Father's occupation and mother's education significantly increase students' physical activity in India, but not in Fiji. Parental role is found to be an important matter for students' participation in physical activity in India. On the other hand, children in Fiji tend to get more support and encouragement for participation

from the community rather than the narrow parental circle, because the pre-existent communal cultures are strong in this society.

(iv) It is found that household activity significantly decreases the level of physical activity self-efficacy whereas learning activity and music/singing/drawing do not influence it. Boys' physical activity self-efficacy is significantly higher than that of girls, in both countries. This means that, in spite of doing the same physical activity, girl students cannot develop the same level of confidence about fitting regular physical activity into their schedules as boys can, due to various forms of social constraints and greater involvement in household tasks.

(v) Physical activity raises the level of physical activity self-efficacy significantly, but at a decreasing rate. In other words, physical activity self-efficacy increases sharply with the level of physical activity at first, but gradually reaches saturation point. This result supports Stimpson's (2000) study, which shows that the engagement in exercise on a regular basis develops high confidence in one's ability to exercise in challenging situations. Moreover, physical activity significantly improves general emotion and self-confidence of adolescent students through physical activity self-efficacy. Yet physical activity self-efficacy does not improve school adjustment; rather it decreases it, because such activity is not featured in the school curriculum and also school administrations generally lack a positive attitude towards this activity, in order to pay more attention to the learning content of the academic program. The observations support the study undertaken by Klein and Deffenbacher (1977), whose study shows that physical activity is associated with global satisfaction specifically for boys and an absence of depressive emotions for both sexes among hyperactive impulsive children. The result also supports the study of Eyler et al. (2003) demonstrating a positive relationship between walking and self-confidence. However, the present study advanced the understanding further, building on these studies and showing the positive influence of physical activity on both general emotion and self-confidence through physical activity self-efficacy. These results satisfy the second hypothesis, with the exception of the case of school adjustment.

(vi) General emotion, self-confidence and school adjustment significantly improve the academic emotional state of adolescent students. It was argued that physical activity significantly promotes student's academic emotional state through

developed self-efficacy to regulate physical activity and then, general emotion and self-confidence; but this positive effect does not follow through to school adjustment, because physical activity cannot improve it (as discussed in point v). Research in the field relating to these relationships is rare. Then, academic emotional state significantly improves learning self-efficacy and mathematics learning self-efficacy of adolescent students. The present finding supports Bandura's (1994) theoretical model about the sources (mastery experience, vicarious experience, social persuasions and academic emotional state) for developing self-efficacy in learning. All the findings mentioned here partly satisfy the third hypothesis.

(vii) The improved learning self-efficacy and mathematics learning self-efficacy significantly promote academic achievement of adolescent students. These findings satisfy the third hypothesis in part. The results also support the study of Mahyuddin et al. (2006) who showed a positive correlation between self-efficacy and achievement in the English language. A similar study was conducted by Caprara et al. (2008).

(viii) Finally, the study confirms the whole pathway from students' physical activity to academic emotional state, learning self-efficacy and academic achievement through enhancing their positive psychological states such as physical activity self-efficacy and then, general emotion and self-confidence, but not through school adjustment. The study supports the findings of existing literature (e.g., Dwyer et al., 1996; Kirkendall, 1986; Shephard, 1997; Trudeau & Shephard, 2008). These researchers reviewed only the association between various types of physical activity and academic performance. But the present study examined various channels or routes of the pathways from physical activity to academic achievement of adolescent students through developing their mental health and various aspects of the academic area. Methodology used in the study to address each hypothesis and research findings are summarised in Table 7.1.

Table 7.1: Summarised methodology used against each hypothesis and findings

Sl. No.	Hypothesis	Methodology (positivist/quantitative paradigm)	Outcome/findings
1.	Moderate to high levels of physical activity are limited to a few adolescent students. The level is significantly influenced by various socioeconomic factors.	Various types of physical activity the adolescent students take part in during one week have been captured by a self-recall and report measurement instrument. Distribution of physical activity by types and its level (per day) has been calculated from each country setting. Mean tests of the levels among various socioeconomic conditions (country, gender, parental occupation, and education) are conducted by ANOVA.	Empirical observation indicates that the physica activity mainly includes walking, bicycling an nationally popular sports, like cricket in India an volleyball and rugby in Fiji. The highest share (more than 50%) of adolescer students is engaged in physical activity for within th lowest range (0–1.4 hours per day) and 23% are a lower than 30 minutes. There is no significant difference between the averag levels of physical activity performed by students i India and Fiji, and the level is lower for girls in bot countries. Father's occupation and mother's educatio significantly increase students' physical activity i India, but not in Fiji.
2	The effect of physical activity is to improve physical activity self-efficacy, but at a decreasing rate. The physical activity self-efficacy significantly promotes students' general emotion, self-confidence, and school adjustment.	A structured questionnaire has been prepared for physical activity self-efficacy, general emotional state, self-confidence and school adjustment. A reliability test was done to justify the questions. Then the indices of various variables have been constructed following PCA. Finally, multiple regression analysis has been used to establish the various relationships.	Physical activity raises the level of PSE significantly but at a decreasing rate. Moreover, this activit significantly improves general emotion and self confidence of adolescent students through the acquire physical activity self-efficacy. But this activity, as we as acquired physical activity self-efficacy, does no improve students' school adjustment; rather, decreases it.
3	General emotion, self-confidence and school adjustment improve academic emotional state and learning self-efficacy of adolescent students, which definitely promotes their academic achievement.	Various indices have been constructed for academic emotional state, learning self-efficacy and academic achievement following the methods previously mentioned. Then, multiple regression analyses have been used to establish the various relationships. Finally, a simultaneous regression has been undertaken to confirm the robust understanding for the pathway from physical activity to academic achievement through various sociopsychological states and academic aspects.	General emotion, self-confidence and schoo adjustment improve students' academic emotional stat that develops their learning self-efficacy as well a academic achievement. Physical activity definitel improves academic emotional state, learning self efficacy and academic achievement of adolescer students through enhancing their positive psychologica states like physical activity self-efficacy and ther general emotion and self-confidence.

The present study highlights the following contributions to the existing literature and understanding:

- The study has contributed to an appreciation of how physical activity influences academic aspects of adolescent students through various psychological states. All aspects of human development are interrelated and one cannot improve the academic qualities without proper psychological well-being. The study is extremely important in regard to the attitude of teachers and parents towards this activity, particularly in developing societies where the children are focused too much only on academic activities to prepare themselves for a future successful working life and are often seen to suffer various psychological problems after a certain period.
- The study used quantitative methodological framework. The quantitative answers on an ordinal scale of the questions for various psychological variables are used for indexation following principal component analysis, after undertaking the reliability test. Moreover, ANOVA, multiple regression and structural model have been applied to draw different relationships and pathways using those indices. Such methods are rarely applied in existing literature on these areas.
- The students' physical activity is more or less significantly influenced by parents' education and occupation in India, but not in Fiji. These are important socioeconomic factors influencing students' participation in physical activity.
- The average level of physical activity is significantly lower for girls than boys and the variation is more apparent in India than in Fiji. This gender dimension is an extremely important issue in modern societies, where girls face many challenging situations for their competency due to the prevalence of gender discrimination.
- General emotion, self-confidence and school adjustment significantly improve students' academic emotional state. The research in the existing literature is still paying too little attention to showing the relationship between mental health and various aspects of academic area. The contemporary research shows various positive effects of physical activity on mental states like general emotion, self-confidence and academic performance separately. They have examined the relationships of these issues independently. The present study has established the

channel or pathway originated from physical activity to academic achievement. This understanding must be more effective to improve people's attitude towards this activity.

- Physical activity increases the level of physical activity self-efficacy significantly, but at a decreasing rate. This is an important observation to find the critical value of physical activity above which physical activity self-efficacy will not be improved. It indicates that unlimited physical activity may not benefit mental health through physical activity self-efficacy.
- Physical activity positively influences students' self-efficacy to regulate physical activity and then, general emotion and self-confidence. This finding provides a solution of the current problems of modern societies where the adolescents suffer various mental health problems such as depression, stress, anxiety, frustration, attention problems, delinquency, dropping out of school, and suicidal tendency, as well as being engaged in high-risk activities like drug addiction, including alcohol ingestion and smoking. From the study it has also been found that in both countries, the school curriculum does not make any significant contribution for students' physical activity. The study suggests improving the awareness of school administration for the placement and sound management of physical activity in the school curriculum to protect today's youth (the future generation) from high-risk behaviours and to strengthen them in preparation for struggling in the competitive and challenging world.

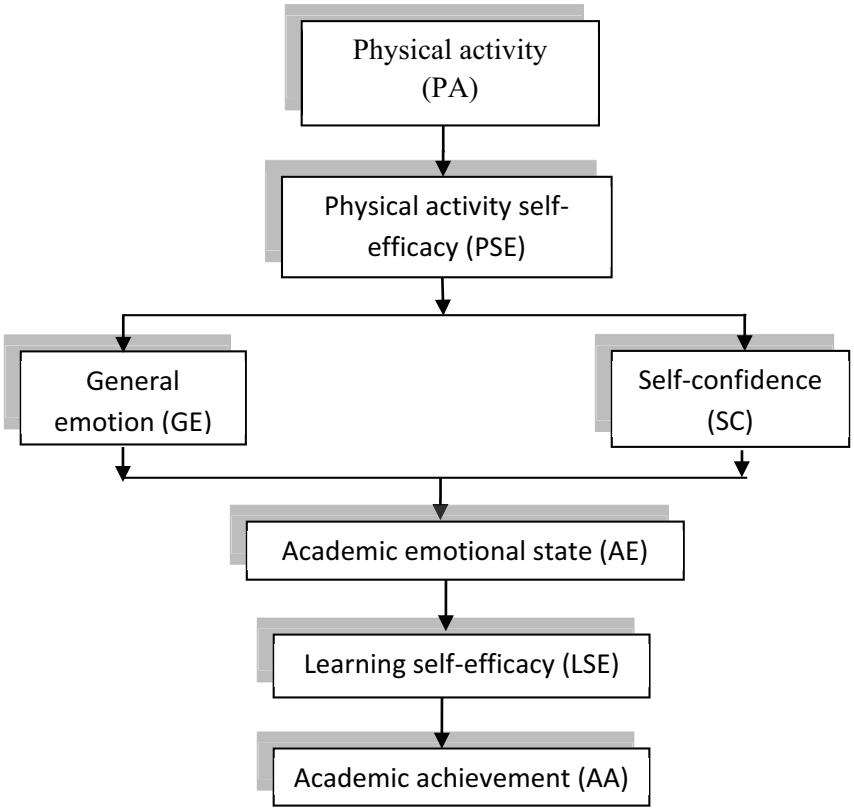
7.3 Concluding observations

The adolescent period is the stage at which to prepare an individual intensively for the rigours of their future working life. In order to do so, the adolescent students are, at present, largely confined to learning activities, coloured with the perception that regular engagement in physical activity will divert their attention and time from learning activity, particularly in a developing society where the competition for decent jobs has been severe. Therefore, adolescent students in the study are found to participate in lower levels of physical activity to a large extent, in both countries, and schools do not offer any significant contribution to students' physical activity, the school curriculum already being heavily crowded with various academic subjects that are regarded as more important. Physical activity is found to be even lower for girls because they are more involved in household tasks and many societal expectations and

constraints existing in both countries endeavour to keep them trapped in these models of appropriate female roles.

While the conventional understanding suggests that physical activity diverts students' attention and time from learning activity, this study provides contrary evidence of its positive effects on various academic aspects and performance. Physical activity definitely improves academic emotional state, learning and mathematics learning self-efficacy, and academic achievement of adolescent students through enhancing their positive psychological states such as physical activity self-efficacy and then, general emotion and self-confidence. Hence, the study has established the logical flow in the relationships among the sociopsychological variables and academic performance originating from physical activity. This is shown in a schematic diagram as follows:

Diagram 2: Schematic Presentation of the effect of Physical Activity on Academic Emotional State, Learning Self-efficacy and Academic Achievement of Adolescent Students



7.4 Policy implications

From the results, the study suggests the desirability of adopting some policies to improve attitudes towards physical activity among the adolescent students, as follows:

(i) Among policy makers, educators, teachers and parents, an improved consciousness of the positive influences of physical activity not only on physical health, but also on mental health as well as various academic areas, must be developed. To this end, conferences and workshops should be organised to improve their presently negative attitudes towards physical activity.

(ii) Parents' awareness of the substantial benefits of physical activity should be increased so that they can encourage their children appropriately to engage in constructive physical activity. This is especially the case in India, where parents often neglect the need for their children to be engaged in physical activity and want to make them focus on academic subjects to give them a sound basis for success in their future working life. In searching for balance, society must take necessary steps for raising parents' and students' awareness.

(iii) The school curriculum is growing day by day with the introduction of various 'new' academic subjects in secondary schools. This is done at the cost of physical activity in the school system. School administration must be led to understand the need for physical activity during school time for deriving its positive effects not only on physical and mental health of the students but also on effective students' connectedness with school. This improves their school adjustment, reduces the dropout rate and also raises the level of academic performance. Therefore, the length of the school day must be increased and the burden of academic subjects must be cut down. At the same time, physical education should be placed in the school curriculum with due emphasis and care. Ministries of Education must accept responsibility regarding this.

(iv) The highest share of adolescent students is engaged within lower levels of physical activity and they prefer to engage more in nationally popular sports. Therefore, school and community must encourage and give support to them for these activities to elevate their level of physical activity.

(v) Girl adolescent students need to recognise the necessity of physical activity to deal with the challenging problems for their competency; more attention should be paid to developing their awareness of the importance of physical activity and

overcoming various social insecurities and constraints that restrict their engagement in more physical activity. Ministries of Health and Education and the community can organize special programs to raise the physical activity level among girls.

7.5 Limitations of the study

- The level of physical activity has been measured by the time devoted for such purpose. It has not been estimated using scientific caloric, muscular, skeletal or aerobic expenditures.
- The physical activity questionnaire (PAQ) that has been used here does not distinguish between various intensities of physical activity, i.e., moderate and vigorous activities, and structural and common physical activity; it simply captures time spent on each activity.
- The physical activity questionnaire is appropriate to use only during the school periods, not in the summer or holiday periods.
- The levels of estimated physical activity for sample students are divided into five categories by equal range. There is no biological reason behind it. Those levels only show the variation of physical activity among the students.
- The study does not analyse the relationships of various sociopsychological variables across different types of physical activity. It analyses the relationships only within a physical activity total.
- The study does not examine the critical level of physical activity above which physical activity self-efficacy can be decreased.
- Academic performance has been calculated as an average mark across all subjects, not analyzed in separate subjects.
- The study has drawn the field survey data only from some concentrated regions near Kolkata in India, and Suva and suburbs in Fiji. It is not clear how sound a basis this is for generalisation of the results.
- The study did not distinguish between various physical activities according to the purpose in doing such activities (entertainment, health consciousness, career development, school induced and compulsion) and also made no

comparisons between them. The study has combined those physical activities that the adolescent students usually perform in day-to-day life. The lower level of this activity performed by them includes also walking and bicycling, which mainly they carry out as the means of transport rather than as physical activity per se. In other words, they perform a much smaller amount of physical activity because of health consciousness and enjoyment. But the study makes no enquiry into the reasons for the choice of physical activity.

- The study did not investigate anything on the interface of the effect of physical activity on cognitive development such as memory and concentration.

7.6 Future scope of research

From the present study some other directions for future research are suggested as follows:

(i) Future research may assess caloric expenditure to measure physical activity.

(ii) The levels of physical activity may be divided more precisely according to some biological rationale.

(iii) The effect of physical activity may be investigated across its degree, i.e., moderate and vigorous activity, and across the structural and common activity.

(iv) The various relationships can be measured according to the types of physical activity, i.e., walking, bicycling, dance etc. and various types of sports.

(v) The effect of physical activity can be measured or compared according to its minimum requirement of health benefit.

(vi) Future research can compare the effects of physical activity below and above the critical value of it up to which physical activity self-efficacy can be increased.

(vii) Research can be done comparing the influence of physical activity on academic performances of various subjects separately.

(viii) Future research can compare the effects of various co-curricular activities on various aspects and performance in the academic area.

(ix) Future study can be undertaken taking samples from other vast places in India and Fiji. The present study represents only a small base for generalisations.

(x) Future study can investigate the various effects of physical activity according to the purposes of doing such activity.

7.7 Concluding remarks

Due to the increasing problems of physical and mental health in modern life, particularly in the adolescent period, the contemporary literature suggests that youth need to engage in regular physical activity. But the conventional educational and administrative understanding does not support sufficiently the notion that participation in such activity is beneficial; rather, it frowns on it because it may divert teenagers' attention and time from academic activity. The present research study has investigated the effect of physical activity on academic emotional state, learning self-efficacy and academic achievement of adolescent students through influencing their sociopsychological states such as physical activity self-efficacy and then, general emotion, self-confidence and school adjustment in a typical developing society, with special reference to India and Fiji. The results of statistical analyses show that physical activity definitely improves academic emotional state, learning self-efficacy and academic achievement of adolescent students through enhancing their positive psychological states like physical activity self-efficacy and then, general emotion and self-confidence.

The present research study comes to the conclusion that adolescent students must be encouraged to participate moderately in physical activity in regular basis to protect themselves from growing general and mental health problems associated with the stresses of contemporary life. This activity has not been shown to have any adverse effect on academic aspects and performance. Rather, this activity should also help them to be stronger in struggling with ever changing societies as well as finding a better future by developing themselves academically.

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APPENDIX

Appendix A: Questionnaire
Survey (January–May 2014)

On
Physical Activity, Learning Self-efficacy and Achievement of Adolescent Students: The Field-Level Study in India and Fiji

School of Education

Faculty of Arts, Law and Education

The University of the South Pacific, Laucala Campus
Private Mail Bag, Suva, Fiji Islands
www.usp.ac.fj

Section A: School details
(to be asked school administration)

1. Name of School: _____
2. School Affiliation: ☐

Government/ Government-aided – 1, Private -2, Ashram -3, Madrasa – 4, missionary -5, Other (specify)-6

3. Location: ☐

Village– 1, municipality/town – 2, City - 3

4. School types: ☐

Boys - 1, girls – 2, co-educated - 3

5. School Category: ☐

Secondary -1, higher-secondary -2

6. Does the school possess? Yes – 1, No - 0
   a. Playground : ☐
   b. Indoor game hall: ☐
   c. Physical education teacher: ☐
   d. Gymnasium facility: ☐
   e. Others (specify) : ☐
7. Number of Student in the following standard:
   a. 7th Standard: _____
   b. 8th Standard: _____
   c. 9th Standard: _____
   d. 10th Standard: _____

8. The Result of Secondary Examination in the following years:

Year	Number of Examinee	Number of A Grade Student (60% and above)

9. Record of Students' Academic Achievement (photocopy for Marks for current year and previous two years):
10. List of Students of class 10 with their roll no.

Section B: General information of students

1. Name of school: _____
2. Schedule code: _____ (for investigator)
3. Roll Number: _____ 4. Age: _____
5. Class: _____
6. Gender: _____; Boy -1, Girl -2
7. Number of brothers: _____
8. Number of sisters: _____
9. A) Father is alive or not _____ (Yes-1, No-2).
   B) Mother is alive or not_____ (Yes-1, No-2).
10. Number of family members: _____
11. Occupation of father: _____
12. Occupation of mother: _____
13. Any other income:
    a) : _____
    b) : _____
    c) : _____
    d) : _____

(For 11,12 and 13 use the key below)
Unemployed -1;
cultivation in other's/lease land – 2;
cultivation in own land – 3;
Any other informal works – 4;
Primary School Teacher – 5;
High School Teacher – 6;
Local Businessman-7;
Govt. Employed –8;
Doctor and Lecturer-9,
National Businessman-10;
International Businessman-11;

14. The things which have in your family? (specify in number)

(a) Radio: ___	(b) Tap recorder : ___	(c) Bycycle: ____	(d)Cell phone:___
(e) Computer/Laptop:_	(f) T.V. : ____	(g) Refrigerator:___	(h) Motor byke: ____
(i) Tube Well : ____	(j) Four Wheeler:____	(k) Brick House : ____	(l) Tender House:____
(m) other:_____			

(For 15 and 16 use the key below:)

Illiterate -1	Form 6 passed– 4	Other – 7
4^{th} passed – 2	Graduate -5	Doctorate – 8
Form 4 passed – 3	Master degree – 6	Engineer/Doctor -9

15. Education of father: _____
16. Education of mother: _____
17. The most Qualified person in the Family and his/her qualification:_____

Section C: Physical activity

(Source: Based on Kowalski et al., 2004)

We are trying to find out about your level of physical activity from ***the last 7days***. This includes sports or dance, physical exercise that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing and other.

1. First list: Physical activity in your spare time: Have you done any of the following activities in the past 7days? If yes, how many hours/Minute?

Physical Activity	**Hour/Minute**
Walking for exercise (including Jogging or running)	
Bi-cycling	
Swimming	
Baseball, softball	
Dance	
Football	
Badminton	
Hockey	
Volleyball	
Basketball	
Physical exercise, yoga	
Cricket	
Rugby	
Other (specify)	

2. Second list: Physical Activity during different periods of the days in the last 7 days

SL No.	**Question**	**Hour/ Minute**
(i)	In the last 7 days, during your physical education (PE) classes, how many hour / minute were you very active (playing hard, running, jumping, throwing, physical exercise)?	
(ii)	In the last 7 days, how many hour / minute did you do physical activities like sports, dance, physical exercise or play games *at lunch* (besides eating lunch)?	
(iii)	In the last 7 days, on how many hour / minute *right after school*, did you do sports, dance, physical exercise or play games in which you were very active?	
(iv)	In the last 7days, on how many hour / minute in *evenings* did you do sports, dance, physical exercise or play games in which you were very active?	
(v)	*On the last weekend*, how many hour / minute did you do sports, dance physical exercise, or play games in which you were very active?	

3. Write the number of hour/ minute you did the following activities for each day last week.

Day	**date**	**Learning**		**music/singing/drawing**		**video/computer game**		**indoor game (without moderate to vigorous Physical Activities)**	
		Home	School	*Home*	*School*	Home	School	Home	School
Monday									
Tuesday									
Wednesday									
Thursday									
Friday									
Saturday									
Sunday									

4. Specify your **purpose** of doing physical activity.

Rank the purpose for your engagement in physical activity i.e., write **1** for the most important purpose, **2** for the next most important purpose and so on.

Purpose	**Rank(1-5)**
Leisure Time/entertainment	
Health consciousness	
Career development	
School induced	
Compulsion	

5. Write the number of hour / minute that you did these activities (household works) each day in the last week.

Activities	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Mopping							
Sweeping							
Washing clothes							
Washing dishes							
Cooking							
Bringing water							
Marketing							
Agriculture							
Gardening							

6. Were you sick in the last week, or did anything prevent you from doing your normal physical activities? (Check one.) ☐ ☐

If Yes, what prevented you? _____

Illness:-1
Physically Disable:-2
For attending in any function:-3
For nursing care to any of the family member:-4
Any Social Work:-5
For Natural Calamities:-6
Others (Mention):-7

Section D: Physical activity self-efficacy

(Source: Bandura, 2006)

Directions: A number of situations is described below that can make it hard to stick to a physical activity routine. Rate using a score of 0 to 10 to show how certain you are that you can get yourself to perform your physical activity routine regularly , three or more times in a week.

0 1 2 3 4 5 6 7 8 9 10
Cannot Do at all — **Moderately can do** — **Highly certain can do**

Question: How certain you are that you can get yourself to perform your physical activity routine regularly	***Confidence score (0-10)***
1. when you are feeling tired?	
2. when you are feeling under pressure from work?	
3. during bad weather?	
4. after recovering from an injury that caused you to stop exercising?	
5. during or after experiencing personal problems?	
6. when you are feeling depressed?	
7. when you are feeling anxious?	
8. after recovering from an illness that caused you to stop exercising?	
9. when you feel physical discomfort when you exercise?	
10. after a vacation?	
11. when you have too much work to do at home?	
12. when visitors are present?	
13. when there are other interesting things to do?	
14. if you don't reach your exercise goals?	
15. without support from your family or friends?	
16. during a vacation?	
17. when you have other time commitments?	
18. after experiencing family problems?	

Section E: General emotion

(Source: Modified Bell Adjustment Inventory Method, adapted by Mohsin & Shamsad, 1970)

Direction: Rate using a score of 0 to 10 how each of the statements describes you best.

0 1 2 3 4 5 6 7 8 9 10
Not at all **Sometimes** **very often**

Question	Answer (0-10)
1. Do you feel pessimistic at times?	
2. Do you feel scared of love and affection in your family?	
3. Do you feel tiredness at the end of the day?	
4. Do you get fear from the imagination of an earthquake or a fire break out?	
5. Do you get tears for any small reason?	
6. Do you face any problem because of your hesitation and shyness?	
7. Do you feel your parents consider you as childlike or immature?	
8. Do you get fear very much from falling down when you are in a high place?	
9. Do you feel tiredness early in the morning?	
10. Do you get angry very quickly?	
11. Do you feel helpless frequently?	
12. Are you confused very frequently?	
13. Do you get sensitive very quickly?	
14. Do you feel anxiety in thinking about possible future problems?	
15. Do you feel problems due to irrelevant thoughts coming in your mind?	
16. Do you get fear in the dark?	

Section F: Self-confidence

(Source: Mind Tools Corporate based on Bandura, 2006)

Directions: For each statement, rate yourself using a score of 0 to 10 that best describes you. Please answer questions as you actually are, rather than how you think you should be.

0 1 2 3 4 5 6 7 8 9 10

Not at all **Sometimes** **Very often**

Statement	Confidence (0-10)
1. I tend to do what I think is expected of me, rather than what I believe to be "right."	
2. I handle new situations with relative comfort and ease.	
3. I feel positive and energized about life.	
4. If something looks difficult, I do not avoid doing it.	
5. I keep trying, even after others have given up.	
6. If I work hard to solve a problem, I'll find the answer.	
7. I achieve the goals which I set for myself.	
8. When I face difficulty, I do not feel hopeless and negative.	
9. I relate to people who work very hard, and still don't accomplish their goals.	
10. People give me positive feedback on my work and achievements.	
11. Even if I don't experience success early in a process, I would continue.	
12. When I overcome an obstacle, I think about the lessons I've learned.	
13. I believe that if I work hard, I'll achieve my goals.	
14. I have contact with people of similar skills and experience who I consider successful.	

Section G: School adjustment

(Source: Based on modified Bell Adjustment Inventory Method, adapted by Mohain-Shamshad, 1968)

Direction: A number of situations in school are described below. Rate using a score of 0 to 10 how each of the statements describes you best.

0 1 2 3 4 5 6 7 8 9 10
Not at all **Sometimes** **very often**

Question	**Answer(0-10)**
1. Can you share your problems with your peers?	
2. Do you feel loneliness in your class-room?	
3. Can you make friends easily?	
4. Do you enjoy singing and dancing with others in school?	
5. Do you think it is difficult for you to offer your suggestion /view in a group discussion?	
6. Do you feel difficulties in your class work?	
7. Would you hesitate to offer your name to participate in any activity in the school?	
8. Do you get confused to see the teacher outside of the school?	
9. Do you feel hesitation to go to a teacher to solve any problem in school?	
10. Can you share any of your problems with your teacher?	

Section H: Learning self-efficacy

(i) General learning self-efficacy

(Source: Bandura, 2006 and modified by Thomas, 2013)

Directions: Rate your degree of **confidence** using a score of 0 to10 for each of the statements below.

0 1 2 3 4 5 6 7 8 9 10

Not at all **Moderate** **Very often**

Question	**Confidence (0-10)**
1. In general, how confident are you in your abilities in learning?	
2. How confident are you that you will do well in learning?	
3. How confident are you that you can learn all the subjects?	
4. How confident are you that you will get an A (or Above 75%) in all subjects this year?	

(ii) Learning skills self-efficacy

(Source: Bandura, 2006 and modified by Thomas, 2013)

Directions: A number of learning areas are described below. Rate your degree of **confidence** using a score of 0 to 10 for each of these cases:

0 1 2 3 4 5 6 7 8 9 10

Not at all **Moderate** **Very often**

Question: How confident are you that you can perform successfully in the following academic areas	**Confidence (0-10)**
1. General mathematics	
2. Algebra	
3. Science (physical science)	
4. Biology	
5. Reading, writing and language skills	
6. Computers	
7. Foreign language	
8. Social studies	
9. English grammar	
10. Others(Mention)	

(iii) Self-efficacy for self-regulated learning

(Source: Bandura, 2006 and modified by Thomas, 2013)

Directions: A number of learning situations are described below. Rate using a score of 0 to 10 to show how **confident** you are that you can get yourself to regulate/perform your learning activity regularly in different situations.

0 1 2 3 4 5 6 7 8 9 10
Cannot Moderately Highly certain
Do at all can do can do

Question	Confidence (0-10)
1. How well can you finish your homework assignments by deadlines?	
2. How well can you perform your study when there are other interesting things to do?	
3. How well can you concentrate on school subjects during class?	
4. How well can you take good notes during class instruction?	
5. How well can you use the library/internet to get information for class assignments?	
6. How well can you plan your schoolwork for the day?	
7. How well can you organize your schoolwork?	
8. How well can you remember information presented in class and textbooks?	
9. How well can you arrange a place to study without distractions?	
10. How well can you get yourself to do school work?	

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Section I: Mathematics learning self-efficacy

(Source: Bandura, 2006 and modified by Thomas, 2013)

(i) General mathematics learning self-efficacy:

Directions: Rate your degree of **confidence** using a score of 0 to 10 for each of the statements below.

0 1 2 3 4 5 6 7 8 9 10

Not at all often **Moderate** **Very**

Question	Confidence (0-10)
1. In general, how confident are you in your ability in maths learning?	
2. How confident are you that you will do well in maths ?	
3. How confident are you that you can learn the maths subject?	
4. How confident are you that you will get an A in maths this year?	

(ii) Self-efficacy for self-regulated learning in mathematics

(Source: Bandura, 2006 and modified by Thomas, 2013)

Directions: A number of mathematics learning situations are described below. Rate using a score of 0 to 10 to show how **confident** you are that you can get yourself to regulate/perform your mathematics learning activity regularly in different situations.

0 1 2 3 4 5 6 7 8 9 10

Cannot certain Do at all **Moderately can do** **Highly can do**

Question	Confidence (0-10)
1. How well can you finish your maths homework on time?	
2. How well can you do maths work if there are other interesting things to do?	
3. How well can you concentrate on your maths work?	
4. How well can you remember information that is presented in maths class and in your maths textbooks?	
5. How well can you get yourself to do maths?	
6. How well can you participate in maths class?	
7. How well can you arrange a place to do maths at home where you won't get distracted?	
8. How well can you get help with maths work if you need it?	
9. How well can you check over your maths work to make sure it's correct?	
10. How well can you get back on track with your maths work if you are distracted?	
11. How well can you organize your maths work this year?	

Section J: Sources of adolescent student's learning self-efficacy
(Source: Bandura, 2006 and modified by Thomas, 2013)

Direction: A number of statements are described below. Rate using a score of 0 to 10 how each of the statements describes you best.

0 1 2 3 4 5 6 7 8 9 10
Not often at all **Sometimes** **very**

Question	**Answer (0-10)**
i. *Mastery experience*	
1. I do well in even the most difficult assignments.	
2. I do well in my assignments.	
3. I got good grades in academic achievement on my last report card.	
4. When I study very hard, I do well.	
5. I have always been successful with my academic area.	
6. I make excellent grades on my academic tests.	
ii. ***Vicarious experience***	
1. Seeing adults do well in learning helps me do better in learning	
2. Seeing others do better than me in learning helps me do better in learning.	
3. When I see how another student solves a learning problem, I can see myself solving the problem in the same way.	
4.When I see how my teacher solves a learning problem, I can see myself solving the problem in the same way.	
5. I imagine myself working through challenging learning problems successfully.	
6. I compete with myself in learning.	
iii. Social persuasions	
1. My teachers have told me that I am good at learning.	
2. Adults in my family have told me what a good student I am.	
3. Other students have told me that I'm good at learning.	
4. People have told me that I have a talent for learning.	
5. I have been complimented for my ability in learning.	
6. My classmates like to work with me in learning because they think I'm good at it.	
iv. Academic emotional state	
1. Just being in learning class makes me feel stressed and nervous.	
2. Doing learning work takes all of my energy.	
3. I start to feel stressed-out as soon as I begin my learning work.	
4. My mind goes blank and I am unable to think clearly when doing learning work.	
5. I get sad when I think about learning.	
6. My whole body becomes tense when I have to do academic activities.	

Section K: Academic achievements of the students in the last year

Direction: Fill up the following table for the marks (average percentage) in the relevant section what you have obtained in form 3/class 9.

Subjects	Marks	Percentage
General mathematics		
Physical science		
Biology/Agriculture		
Mother Language		
English		
Social studies		
History		
Home Economics		
Geography		
Overall		

Specify your purpose of learning.

Direction: Rank the **purpose** for your engagement in learning activity i.e., write **1** for the most important purpose, **2** for the next most important purpose and so on.

Statement	**Rank(1-5)**
I am interested in learning	
Learning helps me to acquire knowledge.	
Learning helps me to be prepared for a Career later in life.	
My school expects me to engage in learning.	
My parents expect me to engage in learning.	

Remark (if any):

APPENDIX B: Statistical methods

Reliability test

Variables are called reliable only when they are offered stable and reliable responses from the respondent after repeated administration (Cortina, 1993)

Suppose we consider a variable of n components. Here, we can express the variable as X where $X = Y_1 + Y_2 + ... + Y_n$ (Y_i = values of i-th question)

The Cronbach's *alpha* is the reliability coefficient of the variable. Cronbach's basic equation for *alpha* (α) is as follows:

$$\alpha = \frac{n}{n-1}\left(1 - \frac{\sum V_i}{V_{all}}\right)$$

where n = number of questions, V_i = variance of scores on each question

V_{all} = total variance of overall scores on all questions in the entire test

According to Cronbach (1951), an eminent psychologist, the value of *alpha* varies from 0 to 1. The higher the value of *alpha*, the higher will be the reliability of the questionnaire. The most important part of *alpha* is V_{all}. If V_{all} is larger, *alpha* will be also larger from the above formula and so, the reliability of the questionnaire will be higher. Actually high variance V_{all} means the test has large variation of scores. It means the sample students are able to differentiate the set of questions asked for one particular psychological variable. On the other hand, low variance means the scores for the class are close together. Unless the sample students are truly close in ability, the test will not be useful. Then, the particular question has been dropped for the analysis.

We have to find out the reliability of a question in a questionnaire in terms of *alpha*. The popular statistical software (like SPSS and Stata) gives a report on *alpha* if the item (i.e., question) is deleted. It shows how *alpha* would be changed if that particular question could be cancelled from the test or questionnaire. There are two options:

(1) Low *alpha* if item deleted means the question is good for the test because deleting that question would reduce the overall *alpha* and it seems to have high inter-item correlations (Pearson's r). Hence, the question could be added to the test questionnaire that represents the proxy of the variable.

(2) High *alpha* if item deleted means the question tends to have low inter-item correlations (Pearson's r) and hence, this question could be cancelled from the questionnaire.

Steps for PCA computation

- First, the covariance (or correlation) of all the original variables is calculated and it creates the covariance (or correlation) matrix of size *n x n*.
- For this covariance (or correlation) matrix, now the eigenvectors and eigenvalues are calculated.
- Each eigenvector would be a column vector with *n* elements as the number of variables in the original dataset. Thus, the eigenvectors will be *n x 1*.
- The eigenvalues for each of the eigenvectors represent the amount of variance that the given eigenvector accounts for. We arrange the eigenvectors in decreasing order of the eigenvalues and pick the top 1 (*comp 1*) for proxy.
- Then the coefficients of *comp1* are considered as the weights of the questions used in the analysis and combine linearly for index formation.

ANOVA

It is assumed that the mean and variance of population *j* (*j = 1,2,----k*) are labelled as u_j and σ_j^2 respectively and both parameters are unknown. From each sample n_j one can derive sample means and variances $\bar{x}_j$ and γ_j^2, where $n = \sum n_j$.

The null hypothesis will state that there is no difference between the population means. Hence $H_0 : \mu_j = \mu_r$ ($j \neq r$), for all *j* and *r*.

ANOVA determines whether there is enough evidence to show that the null hypothesis is wrong. Consequently, an alternative hypothesis will always specify the following:

H_1: At least two means differ.

The following table explain the variation between groups. F-statistic here represents the ratio of mean square variation between groups and mean square error. If this is higher than the critical value for given degrees of freedom and level of significance, the null hypothesis is rejected. In other words, population means are significantly different from each other.

Table B 1: Structure of ANOVA

Source of variation	Degree of freedom (df)	Sums of squares (SS)	Mean squares (MS)	F-statistic
Group	k-1	$SSG = \sum_{j=1}^{k} n_j(\bar{x}_j - \bar{x})^2$	$MSG = \frac{SSG}{k-1}$	$F = \frac{MSG}{MSE}$
Error	n-k	$SSE = \sum_{j=1}^{k}\sum_{i=1}^{n_j}(x_{ij} - \bar{x}_j)^2$	$MSE = \frac{SSE}{n-k}$	

Note: SSG = Sums of squares within Groups; SSE = Sums of squares within Errors; MSG = Mean squares within Groups; MSE = Mean squares within Errors.

Source: (Keller, 2013)

APPENDIX C: Statistical results and tables

Table C1: Summarised statistics of variables (questions) under PSE

Variable	Obs	Mean	Std. Dev.	Min	Max
pse01_tired	873	4.322	2.760	0	10
pse02_work	873	3.934	2.979	0	10
pse03_weather	873	4.025	3.363	0	10
pse04_injury	873	4.702	3.248	0	10
pse05_personal	873	4.700	3.084	0	10
pse06_depress	873	4.055	2.987	0	10
pse07_axious	873	4.017	2.953	0	10
pse08_ill	873	4.792	3.178	0	10
pse09_discomf	873	4.518	3.020	0	10
pse10_Af_vacatn	873	6.560	3.336	0	10
pse11_hm_wk	873	4.822	3.174	0	10
pse12_visitors	873	5.088	3.547	0	10
pse13_oth_int	873	5.032	3.449	0	10
pse14_goals	873	5.432	3.263	0	10
pse15_fam_sup	873	5.400	3.313	0	10
pse16_vacatn	873	6.099	3.690	0	10
pse17_oth_comnt	873	4.320	3.181	0	10
pse18_fam_prob	873	3.974	3.450	0	10

Source: Author's calculation, Field Survey.

Look at the summarised statistics for each question (i.e., variable) from Table C1 before proceeding further. All the questions have 873 observations, varying from 0 to 10. Their mean values assigned by all students have been running from 3 to 7. Variations around these means (measured by Std Dev) are observed to vary from 2 to 4.

Table C2: Correlation matrix of variables on physical activity self-efficacy

	pse01_tired	*pse02_work*	*pse03_weather*	*pse04_injury*	*pse05_personal*	*pse06_depress*	*pse07_axious*	*pse08_ill*	*pse09_discomf*	*pse10_Af_vacatn*	*pse11_hm_wk*	*pse12_visitors*	*pse13_oth_int*	*pse14_goals*	*pse15_fam_sup*	*pse16_vacatn*	*pse17_oth_comnt*	*pse18_fam*
pse01_tired	1																	
pse02_work	0.33*	1																
pse03_weather	0.26*	0.31*	1															
pse04_injury	0.29*	0.25*	0.14*	1														
pse05_personal	0.22*	0.26*	0.24*	0.25*	1													
pse06_depress	0.18*	0.24*	0.20*	0.14*	0.39*	1												
pse07_axious	0.17*	0.20*	0.25*	0.13*	0.30*	0.46*	1											
pse08_ill	0.20*	0.21*	0.22*	0.435*	0.28*	0.22*	0.23*	1										
pse09_discomf	0.289*	0.24*	0.17*	0.20*	0.20*	0.19*	0.14*	0.35*	1									
pse10_Af_vacatn	0.17*	0.13*	0.08*	0.22*	0.14*	0.12*	0.13*	0.24*	0.22*	1								
pse11_hm_wk	0.16*	0.23*	0.15*	0.16*	0.17*	0.15*	0.17*	0.22*	0.28*	0.23*	1							
pse12_visitors	0.14*	0.20*	0.17*	0.14*	0.13*	0.07*	0.17*	0.18*	0.22*	0.18*	0.39*	1						
pse13_oth_int	0.13*	0.15*	0.18*	0.12*	0.12*	0.11*	0.17*	0.15*	0.24*	0.09*	0.27*	0.41*	1					
pse14_goals	0.19*	0.21*	0.16*	0.11*	0.19*	0.20*	0.19*	0.23*	0.32*	0.19*	0.21*	0.23*	0.33*	1				
pse15_fam_sup	0.17*	0.20*	0.14*	0.14*	0.28*	0.17*	0.15*	0.23*	0.23*	0.21*	0.18*	0.16*	0.19*	0.31*	1			
pse16_vacatn	0.14*	0.11*	0.07	0.16*	0.12*	0.10*	0.08*	0.19*	0.14*	0.29*	0.13*	0.12*	0.12*	0.148*	0.19*	1		
pse17_oth_comnt	0.10*	0.12*	0.15*	0.09*	0.19*	0.19*	0.13*	0.19*	0.19*	0.08*	0.23*	0.24*	0.21*	0.13*	0.21*	0.18*	1	
pse18_fam_prob	0.14*	0.18*	0.19*	0.13*	0.23*	0.26*	0.22*	0.19*	0.23*	0.06	0.22*	0.25*	0.22*	0.21*	0.20*	0.09*	0.30*	

Source: Author's calculation, Field Survey.
Note: * represents significant at the 5% level.
Correlation coefficients across all questions have been represented in Table C2. Most of the coefficients have been found statistically significant, which suggests that they are highly correlated.

Table C3: Test results for using component 1 in physical activity self-efficacy

1	[Comp1]pse01_tired	+	[Comp1]pse02_work = 0
2	[Comp1]pse01_tired	+	[Comp1]pse03_weather = 0
3	[Comp1]pse01_tired	+	[Comp1]pse04_injury = 0
4	[Comp1]pse01_tired	+	[Comp1]pse05_personal = 0
5	[Comp1]pse01_tired	+	[Comp1]pse06_depress = 0
6	[Comp1]pse01_tired	+	[Comp1]pse07_axious = 0
7	[Comp1]pse01_tired	+	[Comp1]pse08_ill = 0
8	[Comp1]pse01_tired	+	[Comp1]pse09_discomf = 0
9	[Comp1]pse01_tired	+	[Comp1]pse10_af_vacatn = 0
10	[Comp1]pse01_tired	+	[Comp1]pse11_hm_wk = 0
11	[Comp1]pse01_tired	+	[Comp1]pse12_visitors = 0
12	[Comp1]pse01_tired	+	[Comp1]pse13_oth_int = 0
13	[Comp1]pse01_tired	+	[Comp1]pse14_goals = 0
14	[Comp1]pse01_tired	+	[Comp1]pse15_fam_sup = 0
15	[Comp1]pse01_tired	+	[Comp1]pse16_vacatn = 0
16	[Comp1]pse01_tired	+	[Comp1]pse17_oth_comnt = 0
17	[Comp1]pse01_tired	+	[Comp1]pse18_fam_prob = 0

Note: Chi^2 (17) = 38.09, p= 0.002; ***Source:*** Author's calculation, Field Survey.

Table C4: Relationship between various levels of physical activity (PA) and physical activity self-efficacy (PSE)

PA	India			Fiji		
	Gender	Number	PSE	Gender	Number	PSE
0.0–0.20	Boys	60	5.10	boys	105	4.98
	Girls	191	4.14	girls	186	4.52
	Total	251	4.37	total	291	4.69
0.21–0.40	Boys	68	5.40	boys	42	5.33
	Girls	45	4.31	girls	44	5.13
	Total	113	4.97	total	86	5.22
0.41–0.60	Boys	41	5.52	boys	20	5.29
	Girls	7	4.22	girls	19	4.59
	Total	48	5.33	total	39	4.95
0.61–0.80	Boys	15	5.91	boys	14	6.05
	Girls	2	6.92	girls	2	4.23
	Total	17	6.03	total	16	5.82
0.81–1.0	Boys	6	5.58	boys	5	4.65
	Girls	0	0	girls	1	2.92
	Total	6	5.58	total	6	4.36

Source: Author's calculation, Field Survey.

Table C4 reports average level of physical activity self-efficacy (PSE) that is seen across countries by gender against various levels of physical activity defined previously. For the Indian data, it rises sharply with the level of physical activity up to fourth category and drops at the highest level of physical activity. Similarly, in Fiji, it increases more-or-less with physical activity, except the fifth category. It is also seen that boy students have more or less better PSE, rather than girls for the same physical activity. However, the results indicate that self-efficacy to regulate physical activity rises more or less with the level of physical activity and declines after a critical level.

Table C5: Summarised statistics of variables (questions) in general emotion

Variable	Obs	Mean	Std. Dev.	Min	Max
ge01pessimistic	873	6.968	2.867	0	10
ge02love	873	7.553	3.077	0	10
ge03tired_end	873	4.300	3.147	0	10
ge04earthquake	873	5.387	3.519	0	10
ge05get_tears	873	6.261	3.639	0	10
ge06shyness	873	5.392	3.241	0	10
ge07immature	873	5.267	3.416	0	10
ge08high_place	873	4.412	3.629	0	10
ge09tired_morn	873	5.977	3.571	0	10
ge10angry	873	4.337	3.448	0	10
ge11helpless	873	6.559	3.022	0	10
ge12confused	873	5.724	3.008	0	10
ge13sensitive	873	4.430	2.960	0	10
ge14anxiety	873	4.892	3.218	0	10
ge15irrelevent	873	5.194	3.243	0	10
ge16dark	873	5.718	3.871	0	10

Source: Author's calculation, Field Survey.

The summarised statistics for each question (treated as a variable) are shown in Table C5. All questions have 873 observations and range from 0 to 10. Mean values of all questions assigned by students have been found to vary between 4 and 8. Variation around these means (measured by Std Dev) fluctuates from 2 to 4.

Table C6: Correlation matrix of variables in general emotion

	ge01 pessimistic	*ge02 love*	*ge03 tired_end*	*ge04 earthquake*	*ge05 get_tears*	*ge06 shyness*	*ge07 immature*	*ge08 high_place*	*ge09 tired_morn*	*ge10 angry*	*ge11 helpless*	*ge12 confused*	*ge13 sensitive*	*ge14 anxiety*	*ge15 irrelevent*	*ge16 dark*
ge01pessimistic	1															
ge02love	0.210*	1														
ge03tired_end	0.166*	0.209*	1													
ge04earthquake	0.089*	0.145*	0.251*	1												
ge05get_tears	0.080*	0.140*	0.187*	0.379*	1											
ge06shyness	0.125*	0.144*	0.157*	0.292*	0.402*	1										
ge07immature	0.136*	0.095*	0.129*	0.181*	0.196*	0.246*	1									
ge08high_place	0.089*	0.089*	0.262*	0.374*	0.354*	0.319*	0.224*	1								
ge09tired_morn	0.193*	0.198*	0.245*	0.223*	0.179*	0.248*	0.197*	0.257*	1							
ge10angry	0.076*	0.099*	0.091*	0.156*	0.248*	0.156*	0.134*	0.202*	0.178*	1						
ge11helpless	0.263*	0.295*	0.215*	0.200*	0.240*	0.252*	0.178*	0.153*	0.299*	0.252*	1					
ge12confused	0.206*	0.141*	0.177*	0.312*	0.344*	0.309*	0.189*	0.263*	0.309*	0.230*	0.437*	1				
ge13sensitive	0.036	0.076*	0.105*	0.156*	0.179*	0.206*	0.195*	0.176*	0.158*	0.243*	0.215*	0.260*	1			
ge14anxiety	0.130*	0.097*	0.198*	0.199*	0.248*	0.294*	0.238*	0.259*	0.238*	0.196*	0.246*	0.307*	0.303*	1		
ge15irrelevent	0.133*	0.184*	0.189*	0.185*	0.212*	0.258*	0.199*	0.188*	0.274*	0.195*	0.333*	0.297*	0.299*	0.489*	1	
ge16dark	0.071*	0.040	0.049	0.298*	0.347*	0.193*	0.148*	0.312*	0.078*	0.129*	0.110*	0.249*	0.107*	0.211*	0.160*	1

Source: Author's calculation, Field Survey.

Note: * represents significant at the 5% level.

Correlation coefficients across all questions displayed in Table C6 show that most of the coefficients have been found statistically significant and suggest that they are highly correlated.

Table C7: Test results for using component 1 in general emotion

1	[Comp1]ge01pessimistic2	+	[Comp1]ge02love2 = 0
2	[Comp1]ge01pessimistic2	+	[Comp1]ge03tired_end2 = 0
3	[Comp1]ge01pessimistic2	+	[Comp1]ge04earthquake2 = 0
4	[Comp1]ge01pessimistic2	+	[Comp1]ge05get_tears2 = 0
5	[Comp1]ge01pessimistic2	+	[Comp1]ge06shyness2 = 0
6	[Comp1]ge01pessimistic2	+	[Comp1]ge07immature2 = 0
7	[Comp1]ge01pessimistic2	+	[Comp1]ge08high_place2 = 0
8	[Comp1]ge01pessimistic2	+	[Comp1]ge09tired_morn2 = 0
9	[Comp1]ge01pessimistic2	+	[Comp1]ge10angry2 = 0
10	[Comp1]ge01pessimistic2	+	[Comp1]ge11helpless2 = 0
11	[Comp1]ge01pessimistic2	+	[Comp1]ge12confused2 = 0
12	[Comp1]ge01pessimistic2	+	[Comp1]ge13sensitive2 = 0
13	[Comp1]ge01pessimistic2	+	[Comp1]ge14anxiety2 = 0
14	[Comp1]ge01pessimistic2	+	[Comp1]ge15irrelevent2 = 0
15	[Comp1]ge01pessimistic2	+	[Comp1]ge16dark2 = 0

Note: Chi^2 (15) = 170.48, p= 0.000

Source: Author's calculation, Field Survey.

Table C8: Summarised statistics of the variables (questions) on self-confidence

Variable	Obs	Mean	Std. Dev.	Min	Max
sc01_expect	873	6.805	2.758	0	10
sc02_situation	873	6.342	2.652	0	10
sc03_feel	873	7.929	2.528	0	10
sc04_difficult	873	7.117	2.637	0	10
sc05_try	873	7.554	2.510	0	10
sc06_hard	873	8.225	2.278	0	10
sc07_goal	873	7.216	2.305	0	10
sc08_negative	873	6.557	2.841	0	10
sc09_accomplish	873	6.137	3.266	0	10
sc10work	873	6.987	2.654	0	10
sc011success	873	7.399	2.610	0	10
sc012 obstacle	873	7.939	2.386	0	10
sc013goals	873	8.896	2.049	0	10
sc014experience	873	7.734	2.699	0	10

Source: Author's calculation, Field Survey.

The summarised statistics of Table C8 show that there are 873 observations for all questions and they vary from 0 to 10 as per sample students' responses. Mean values for all responses are between 6 and 9 and these seem towards the higher end. Variation around these means (measured by Std Dev) has been detected to vary from 2 to 4.

Table C9: Correlation matrix of the variables on self-confidence

	sc01_ expect	*sc02 _situation*	*sc03 _feel*	*sc04 _difficult*	*sc05 _try*	*sc06 _hard*	*sc07 _goal*	*sc08 _negative*	*sc09 _accomplish*	*sc10 work*	*sc011 success*	*sc012 obstacle*	*sc013 goals*
sc01_expect	1												
sc02_situation	0.189*	1											
sc03_feel	0.128*	0.299*	1										
sc04_difficult	0.205*	0.249*	0.289*	1									
sc05_try	0.113*	0.261*	0.308*	0.451*	1								
sc06_hard	0.153*	0.260*	0.297*	0.263*	0.326*	1							
sc07_goal	0.094*	0.228*	0.261*	0.229*	0.327*	0.328*	1						
sc08_negative	0.188*	0.298*	0.297*	0.315*	0.314*	0.272*	0.292*	1					
sc09_accomplish	0.263*	0.094*	0.100*	0.152*	0.068*	0.091*	0.026	0.148*	1				
sc10work	0.110*	0.215*	0.224*	0.172*	0.165*	0.190*	0.197*	0.177*	0.125*	1			
sc011success	0.148*	0.223*	0.267*	0.268*	0.252*	0.290*	0.203*	0.329*	0.102*	0.300*	1		
sc012 obstacle	0.164*	0.243*	0.298*	0.278*	0.288*	0.378*	0.278*	0.245*	0.110*	0.258*	0.394*	1	
sc013goals	0.097*	0.166*	0.331*	0.260*	0.320*	0.362*	0.306*	0.254*	.056	0.217*	0.272*	0.448*	1
sc014experience	0.137*	0.192*	0.251*	0.184*	0.231*	0.180*	0.206*	0.135*	0.160*	0.260*	0.151*	0.251*	0.289*

Note: * represents significant at the 5% level.
Source: Author's calculation, Field Survey.

Correlation coefficients across all questions have been presented in Table C9. Most of the coefficients have been found as statistically significant and so they are highly correlated.

Table C 10: Test results for using component 1 in self-confidence

1	[Comp1]sc01expect	+	[Comp1]sc02_situation = 0
2	[Comp1]sc01expect	+	[Comp1]sc03_feel = 0
3	[Comp1]sc01expect	+	[Comp1]sc04_difficult = 0
4	[Comp1]sc01expect	+	[Comp1]sc05_try = 0
5	[Comp1]sc01expect	+	[Comp1]sc06_hard = 0
6	[Comp1]sc01expect	+	[Comp1]sc07_goal = 0
7	[Comp1]sc01expect	+	[Comp1]sc08_negative = 0
8	[Comp1]sc01expect	+	[Comp1]sc09_accomplish = 0
9	[Comp1]sc01expect	+	[Comp1]sc10work = 0
10	[Comp1]sc01expect	+	[Comp1]sc011success = 0
11	[Comp1]sc01expect	+	[Comp1]sc012 obstacle = 0
12	[Comp1]sc01expect	+	[Comp1]sc013goals = 0
13	[Comp1]sc01expect4	+	[Comp1]sc014experience = 0

Note: Chi^2 (13) = 58.49, p= 0.000

Source: Author's calculation, Field Survey.

Table C11: Summarised statistics of the variables (questions) under school adjustment

Variable	Obs	Mean	Std. Dev.	Min	Max
sa05group_disc1	873	4.239	3.187	0	10
sa06class_work1	873	3.754	2.825	0	10
sa07participate1	873	4.078	3.124	0	10
sa08confused1	873	4.431	3.584	0	10
sa09solve1	873	3.955	3.159	0	10

Source: Author's calculation, Field Survey.

Look at the summarised statistics for each question (i.e., variable) in Table C11. All questions have 873 observations, varying from 0 to 10. Mean value assigned by all students has been running from 3 to 5. Variation around these means (measured by Std Dev) is seen to vary from 2 to 4.

Table C12: Correlation matrix of variables on school adjustment

	sa05group_disc 1	*sa06class_wo rk1*	*sa07participate 1*	*sa08confused 1*	*sa09solve 1*
sa05group_disc 1	1				
sa06class_work 1	0.4107*	1			
sa07participate1	0.2960*	0.3347*	1		
sa08confused1	0.2592*	0.4105*	0.3083*	1	
sa09solve1	0.3561*	0.3921*	0.3045*	0.4707*	1

Note: * represents significant at the 5% level.
Source: Author's calculation, Field Survey.

All coefficients have been found statistically significant, which suggests that they are highly correlated (see Table C12).

Table C13: Test results for using component 1 in school adjustment

1	[Comp1]sa05group_disc1	+	[Comp1]sa06class_work1 = 0
2	[Comp1]sa05group_disc1	+	[Comp1]sa07participate1= 0
3	[Comp1]sa05group_disc1	+	[Comp1]sa08confused1 = 0
4	[Comp1]sa05group_disc1	+	[Comp1]sa09solve1= 0

Note**:** $Chi^2(4)=30.69$, p = 0.00
Source: Author's calculation, Field Survey.

Table C14: Results of multivariate regression on the levels of general emotion, self confidence and school adjustment by physical activity self-efficacy

	Coef.	Std. Err.	p
General emotion			
physical activity self-efficacy	0.078**	0.038	0.039
Fiji	_0.429***	0.116	0
Boy	0.735***	0.122	0
Constant	4.984***	0.191	0
Self confidence			
physical activity self-efficacy	0.274***	0.029	0
Fiji	-0.475***	0.088	0
Boy	0.123	0.092	0.182
Constant	6.212***	0.144	0
School adjustment			
physical activity self-efficacy	-0.134***	0.043	0.002
Fiji	2.180***	0.133	0
Boy	0.007	0.139	0.962
Constant	3.656***	0.219	0

Note: R^2 (general emotion) = 0.069, R^2 (self confidence) = 0.133, R^2 (school adjustment) = 0.24, F(3, 869)= 32.91, (p=0.00)

* p<0.10, **p<0.05 and *** p<0.01

Source: Author's calculation, Field Survey.

General emotion, self-confidence and school adjustment have been regressed on physical activity self-efficacy using multivariate regression method (see Table C14). The marginal effect of physical activity self-efficacy is positive on general emotion and self-confidence while it is negative on school adjustment. Moreover, the F-statistic of test result shows whether the marginal effects of physical activity self-efficacy on general emotion, self-confidence and school adjustment are significantly different from each other. The statistical results appear to be significant even at 1% level. Therefore, one can infer that the effects of physical activity self-efficacy have been found to be positive on general emotion and self-confidence but negative on school adjustment and they are significantly different from each other. The physical activity self-efficacy has stronger influence on self-confidence than that on general emotion.

Table C15: Correlation matrix of variables on mastery experience

	me1 even	*me2 assignments*	*me3 grade*	*me5 successful*	*me6 academictest*
me1even	1				
me2assignments	0.492*	1			
me3grade	0.268*	0.426*	1		
me5successful	0.237*	0.278*	0.298*	1	
me6academictest	0.275*	0.374*	0.407*	0.468*	1

Source: Author's calculation, Field Survey.
Note: * = significant at the 5% level.

The results of the summarised statistics for each question have not been reproduced here, to cut down the number of tables in the analysis; however, the results were seen and taken into account before further statistical analysis was undertaken. Correlation coefficients across all questions are shown in Table C15, and all the coefficients in the table are found statistically significant. This suggests that they are highly correlated.

Table C16: Test results for using component 1 in mastery experience

1	[Comp1]me1even	+	[Comp1]me2assignments = 0
2	[Comp1]me1even	+	[Comp1]me3grade = 0
3	[Comp1]me1even	+	[Comp1]me5successful = 0
4	[Comp1]me1even	+	[Comp1]me6academictest = 0

Note**:** $Chi^2(4)=15.97$, p = 0.00
Source: Author's calculation, Field Survey.

Table C17: Correlation matrix of variables on vicarious experience

	ve1 adult	*ve2 other*	*ve3solve another*	*ve4solve teacher*	*ve5 challenging*	*ve6 compete*
ve1adult	1					
ve2other	0.549*	1				
ve3solveanother	0.408*	0.502*	1			
ve4solveteacher	0.336*	0.471*	0.572*	1		
ve5challenging	0.280*	0.304*	0.339*	0.463*	1	
ve6compete	0.317*	0.344*	0.282*	0.343*	0.454*	1

Source: Author's calculation, Field Survey.
Note: * = significant at the 5% level.

Correlation coefficients across all questions (shown in Table C17) show that they are statistically significant, suggesting that all the questions are highly correlated.

Table C18: Test results for using component 1 in vicarious experience

1	[Comp1]ve1adult	+	[Comp1]ve2other = 0
2	[Comp1]ve1adult	+	[Comp1]ve3solveanother = 0
3	[Comp1]ve1adult	+	[Comp1]ve4solveteacher = 0
4	[Comp1]ve1adult	+	[Comp1]ve5challenging = 0
5	[Comp1]ve1adult	+	[Comp1]ve6compete = 0

***Note*:** $Chi^2(5)= 11.15$, $p = 0.04$
Source: Author's calculation, Field Survey.

Table C19: Correlation matrix of variables on social persuasions

	sp1good at learning	*sp2good student*	*sp3other student*	sp4_talent	*sp05 complimented*	*sp06 classmates*
sp1good at learning	1					
sp2good student	0.516*	1				
sp3other student	0.539*	0.579*	1			
sp4_talent	0.440*	0.463*	0.548*	1		
sp05complimented	0.415*	0.467*	0.518*	0.586*	1	
sp06classmates	0.409*	0.433*	0.487*	0.485*	0.559*	1

Source: Author's calculation, Field Survey.
Note: * = significant at the 5% level.
The correlation coefficients across all questions are shown in Table C19. All the coefficients are statistically significant, indicating that the questions are highly correlated.

Table C20: Test results for using component 1 in social persuasions

1	[Comp1]sp1learning	+	[Comp1]sp2goodstudent = 0
2	[Comp1]sp1learning	+	[Comp1]sp3otherstudent = 0
3	[Comp1]sp1learning	+	[Comp1]sp4talent = 0
4	[Comp1]sp1learning	+	[Comp1]sp05complimented = 0
5	[Comp1]sp1learning	+	[Comp1]sp06classmates = 0

Note: $Chi^2(5)= 4.81$, $p = 0.44$
Source: Author's calculation, Field Survey.

Table C21: Summarised statistics of variables in academic emotional state

Variable	Obs	Mean	Std. Dev.	Min	Max
ae1stressed1	873	5.737	3.192	0	10
ae2energy1	873	6.196	3.075	0	10
ae3beginlearning1	873	6.682	2.988	0	10
ae4mindblank1	873	6.426	3.109	0	10
ae5sad1	873	7.636	2.872	0	10
ae6tense1	872	7.213	3.210	0	10

Source: Author's calculation, Field Survey.

Summary statistics for each of the six questions (i.e., variables) are displayed in Table C21. All questions except the last have 873 observations and range from 0 to 10. Mean values of all questions vary between 5 and 8. Variation around these means (measured by Std Dev) fluctuates between 2 and 4.

Table C22: Correlation matrix of variables on academic emotional state

	ae1 stressed1	*ae2 energy1*	*ae3begin learning1*	*ae4mind blank1*	*ae5sad1*	*ae6tense1*
ae1stressed1	1					
ae2energy1	0.494*	1				
ae3beginlearning1	0.459*	0.560*	1			
ae4mindblank1	0.398*	0.464*	0.570*	1		
ae5sad1	0.305*	0.355*	0.531*	0.488*	1	
ae6tense1	0.342*	0.419*	0.499*	0.442*	0.578*	1

Note: * = significant at the 5% level.

Source: Author's calculation, Field Survey.

All the coefficients are found to be statistically significant, suggesting that they are highly correlated (see Table C22).

Table C23: Test results for using component 1 in academic emotional state

1	[Comp1]ae1stressed1	+	[Comp1]ae2energy1 = 0
2	[Comp1]ae1stressed1	+	[Comp1]ae3beginlearning1 = 0
3	[Comp1]ae1stressed1	+	[Comp1]ae4mindblank1 = 0
4	[Comp1]ae1stressed1	+	[Comp1]ae5sad1 = 0
5	[Comp1]ae1stressed1	+	[Comp1]ae6tense1 = 0

***Note*:** $Chi^2(5)= 20.67$, $p = 0.00$
Source: Author's calculation, Field Survey.

Table C24: Summarised statistics of the variables on learning self-efficacy

Variable	Obs	Mean	Std. Dev.	Min	Max
glse1ability	873	8.073	1.815	0	10
glse2well	873	8.222	1.792	0	10
glse3subjects	873	7.703	1.950	0	10
glse4getA	873	7.795	2.139	0	10
lsse_science	873	7.580	1.447	2.3	10
lsse_arts	873	7.540	1.485	2.3	10
sesr01deadlines	873	7.428	2.161	0	10
sesr02perform	873	6.647	2.410	0	10
sesr03concentrate	873	7.929	1.873	0	10
sesr04goodnotes	873	7.567	2.182	0	10
sesr05libr/internet	873	6.589	3.214	0	10
sesr06plan	873	7.096	2.314	0	10
sesr07organize	873	7.332	2.178	0	10
sesr08remember	873	7.260	2.050	0	10
sesr09arrange	873	7.360	2.370	0	10
sesr010getyourself	873	7.747	2.247	0	10

Source: Author's calculation, Field Survey.

The summary statistics of Table C24 show that there are 873 observations for all questions and they vary more or less from 0 to 10 as per sample students' responses. Mean values for all responses are within the 6 to 9 range and these seem towards the higher end. Variation around these means (measured by Std Dev) has been detected to vary from 1 to 4.

Table C25: Correlation matrix of the variables on learning self-efficacy

	glse1 ability	*glse2 well*	*glse3 subjects*	*glse4 getA*	*Lsse _science*	*Lsse _arts*	*sesr01 dead lines*	*sesr02 perform*	*sesr03 concen trate*	*sesr04 good notes*	*sesr05 libr/ internet*	*sesr06 plan*	*sesr07 organize*	*sesr08 remember*	*sesr09 arrange*	*ses get you*
glse1ability	1															
glse2well	0.494*	1														
glse3subjects	0.402*	0.4586*	1													
glse4getA	0.448*	0.482*	0.462*	1												
lsse_science	0.446*	0.419*	0.344*	0.507*	1											
lsse_arts	0.389*	0.357*	0.340*	0.366*	0.456*	1										
sesr01deadlines	0.305*	0.336*	0.305*	0.301*	0.375*	0.408*	1									
sesr02perform	0.224*	0.240*	0.215*	0.252*	0.289*	0.231*	0.403*	1								
sesr03concentrate	0.265*	0.291*	0.282*	0.276*	0.330*	0.364*	0.328*	0.323*	1							
sesr04goodnotes	0.181*	0.216*	0.275*	0.223*	0.285*	0.292*	0.288*	0.245*	0.430*	1						
sesr05libr/internet	0.205*	0.199*	0.211*	0.179*	0.276*	0.350*	0.216*	0.134*	0.197*	0.223*	1					
sesr06plan	0.190*	0.256*	0.298*	0.204*	0.267*	0.268*	0.268*	0.269*	0.287*	0.360*	0.233*	1				
sesr07organize	0.271*	0.326*	0.276*	0.315*	0.358*	0.386*	0.344*	0.347*	0.375*	0.344*	0.245*	0.460*	1			
sesr08remember	0.330*	0.340*	0.312*	0.379*	0.406*	0.326*	0.370*	0.280*	0.352*	0.306*	0.261*	0.397*	0.457*	1		
sesr09arrange	0.283*	0.282*	0.202*	0.292*	0.313*	0.298*	0.325*	0.300*	0.346*	0.274*	0.189*	0.376*	0.406*	0.474*	1	
sesr010getyourself	0.273*	0.281*	0.262*	0.254*	0.269*	0.380*	0.327*	0.251*	0.384*	0.313*	0.269*	0.312*	0.451*	0.316*	0.425*	

Note: * = significant at the 5% level.

Source: Author's calculation, Field Survey.

All the coefficients have been found statistically significant and so they are highly correlated (see Table C25).

Table C26: Test results for using component 1in learning self-efficacy

1	[Comp1]glse1ability	+	[Comp1]glse2well = 0
2	[Comp1]glse1ability	+	[Comp1]glse3subjects = 0
3	[Comp1]glse1ability	+	[Comp1]glse4getA = 0
4	[Comp1]glse1ability	+	[Comp1]lsse_science = 0
5	[Comp1]glse1ability	+	[Comp1]lsse_arts = 0
6	[Comp1]glse1ability	+	[Comp1]sesr01deadlines = 0
7	[Comp1]glse1ability	+	[Comp1]sesr02perform = 0
8	[Comp1]glse1ability	+	[Comp1]sesr03concentrate = 0
9	[Comp1]glse1ability	+	[Comp1]sesr04goodnotes = 0
10	[Comp1]glse1ability	+	[Comp1]sesr05libr/internet = 0
11	[Comp1]glse1ability	+	[Comp1]sesr06plane = 0
12	[Comp1]glse1ability	+	[Comp1]sesr07organize = 0
13	[Comp1]glse1ability	+	[Comp1]sesr08remember = 0
14	[Comp1]glse1ability	+	[Comp1]sesr09arrange = 0
15	[Comp1]glse1ability	+	[Comp1]sesr010getyourself = 0

***Note*:** $Chi^2(15)= 208.11$, $p = 0.00$
Source: Author's calculation, Field Survey.

Table C27: Summarised statistics of the variables on mathematics learning self-efficacy

Variable	Obs	Mean	Std. Dev.	Min	Max
gmlse01ability	873	7.118	2.242	0	10
gmlse02well	873	7.487	2.037	0	10
gmlse03learn	873	7.621	2.043	0	10
gmlse04getA	873	7.589	2.339	0	10
sesrlm01finish	873	7.423	2.258	0	10
sesrlm02mathwork	873	6.450	2.524	0	10
sesrlm03concentrate	873	7.337	2.327	0	10
sesrlm04remember	873	7.133	2.285	0	10
sesrlm05getyourself	872	7.401	2.338	0	10
sesrlm06participate	873	7.241	2.556	0	10
sesrlm07arrange	873	7.230	2.376	0	10
sesrlm08gethelp	873	7.561	2.367	0	10
sesrlm09check	873	7.200	2.396	0	10
sesrlm10getback	873	6.832	2.321	0	10
sesrlm11organize	873	7.549	2.289	0	10

Source: Author's calculation, Field Survey.

The summarised statistics of all questions have been shown in Table C27; there are 873 observations for all questions except the ninth one, and they vary from 0 to 10 as per sample students' responses. Mean values of all responses are within the 6 to 8 range, which seems towards the higher end. Variation around these means (measured by Std Dev) varies from 2 to 3.

Table C28: Correlation matrix of the variables on mathematics learning self-efficacy

	gmlse01 ability	*gmlse02 well*	*gmlse03 learn*	*gmlse04 getA*	*sesrlm01 finish*	*sesrlm02 mathwork*	*sesrlm03 concentrate*	*sesrlm04 remember*	*sesrlm05 getyourself*	*sesrlm06 participate*	*sesrlm07 arrange*	*sesrlm08 gethelp*	*sesrlm09 check*	*sesrlm10 getback*	*sesrlm11 organize*
gmlse01ability	1														
gmlse02well	0.682*	1													
gmlse03learn	0.582*	0.647*	1												
gmlse04getA	0.585*	0.632*	0.548*	1											
sesrlm01finish	0.485*	0.445*	0.471*	0.384*	1										
sesrlm02mathwork	0.488*	0.432*	0.429*	0.383*	0.606*	1									
sesrlm03concentrate	0.577*	0.552*	0.543*	0.500*	0.563*	0.548*	1								
sesrlm04remember	0.513*	0.520*	0.502*	0.425*	0.459*	0.455*	0.585*	1							
sesrlm05getyourself	0.566*	0.520*	0.565*	0.505*	0.503*	0.453*	0.651*	0.566*	1						
sesrlm06participate	0.508*	0.491*	0.518*	0.487*	0.476*	0.464*	0.582*	0.521*	0.692*	1					
sesrlm07arrange	0.358*	0.374*	0.421*	0.405*	0.423*	0.448*	0.483*	0.476*	0.491*	0.497*	1				
sesrlm08gethelp	0.278*	0.248*	0.309*	0.302*	0.290*	0.259*	0.381*	0.316*	0.369*	0.310*	0.427*	1			
sesrlm09check	0.395*	0.318*	0.426*	0.361*	0.427*	0.405*	0.458*	0.452*	0.458*	0.435*	0.410*	0.439*	1		
sesrlm10getback	0.422*	0.386*	0.432*	0.361*	0.402*	0.430*	0.502*	0.473*	0.410*	0.432*	0.383*	0.398*	0.502*	1	
sesrlm11organize	0.461*	0.414*	0.477*	0.423*	0.477*	0.392*	0.512*	0.476*	0.494*	0.431*	0.440*	0.367*	0.377*	0.459*	1

Note: * represents significant at the 5% level.

Source: Author's calculation, Field Survey.

All the coefficients are statistically significant, suggesting they are highly correlated (see Table C28).

Table C29: Test results for using component 1 in mathematics learning self-efficacy

1	[Comp1]gmlse01ability	+	[Comp1]gmlse02well = 0
2	[Comp1]gmlse01ability	+	[Comp1]gmlse03learn = 0
3	[Comp1]gmlse01ability	+	[Comp1]gmlse04getA = 0
4	[Comp1]gmlse01ability	+	[Comp1]sesrlm01finish = 0
5	[Comp1]gmlse01ability	+	[Comp1]sesrlm02mathwork = 0
6	[Comp1]gmlse01ability	+	[Comp1]sesrlm03concentrate = 0
7	[Comp1]gmlse01ability	+	[Comp1]sesrlm04remember = 0
8	[Comp1]gmlse01ability	+	[Comp1]sesrlm05getyourself = 0
9	[Comp1]gmlse01ability	+	[Comp1]sesrlm06participate = 0
10	[Comp1]gmlse01ability	+	[Comp1]sesrlm07arrange = 0
11	[Comp1]gmlse01ability	+	[Comp1]sesrlm08gethelp = 0
12	[Comp1]gmlse01ability	+	[Comp1]sesrlm09check = 0
13	[Comp1]gmlse01ability	+	[Comp1]sesrlm10get_back = 0
14	[Comp1]gmlse01ability	+	[Comp1]sesrlm11organize = 0

***Note*:** $Chi^2(14)= 98.18$, $p = 0.00$

Source: Author's calculation, Field Survey.