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THE CORRELATION OF PHYSICAL ACTIVITY AND MINDFULNESS WITH DEPRESSION IN INTERNATIONAL SCHOOLS IN THE UAE

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This thesis is submitted in partial fulfillment of the requirements for the degree of Master of Science in Clinical Psychology

Under the Supervision of Professor Khalaf Nasser Al-Heeti

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Declaration of Original Work

I, Fiona Barron, the undersigned, a graduate student at the United Arab Emirates University (UAEU), and the author of this thesis entitled "*Physical Activity, Mindfulness and Depression in International Schools in the UAE Adolescents*", hereby, solemnly declare that this thesis is an original research work that has been done and prepared by myself under the supervision of Professor Khalaf Nasser Al-Heeti in the College of Humanities and Social Sciences at UAEU. This work has not been previously formed as the basis for the award of any academic degree, diploma or a similar title at this or any other university. The materials borrowed from other sources and included in my thesis have been properly cited and acknowledged.

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Abstract

This thesis was concerned with understanding potential preventative influencers in reducing depression. Focusing on mindfulness and Physical Activity (PA). Relatively few studies have explored the relationship between specific factors of PA and adolescent depressive symptoms and none have looked at the UAE population. Therefore the aim of this study was to determine whether a significant association exists between Mindfulness and PA on adolescent depressive symptoms, in order to understand if either variable can reduce the onset of depression, by exploring the relationships between frequency, duration, intensity and number of other individuals. A self-administered instrument was administered to international schools in the UAE. The instrument was made up of a seven questionnaires; Section 1, Demographics (4 items). Section 2, CAMS-R (10 items). Section 3, The Becks Depression Inventory-II (20 items). Section 4, Frequency of exercise (1 item, 40 options). Section 5, Duration of exercise (1 item, 40 options). Section 6, Level of intensity, (1 item, 40 options). Section 7, Number of other participants (1 item, 40 options). The findings showed a significant negative correlation between depression and mindfulness with a moderate effect size, and a significant negative relationship with frequency of PA, duration of PA, intensity of PA and number of individuals in which they engage in PA with, all with a small effect size. However mindfulness was the only predictor of depression in females and mindfulness and intensity were the only predictors of depression in males. It was also established that females presented significantly higher depression scores to males and participated in significantly less PA across all four measures. The findings can be used by clinical practitioners to guide them in their intervention recommendations, as well as by schools/counselors to integrate PA as a preventive strategy for depression.

Keywords: Depression, mindfulness, frequency of physical activity, duration of physical activity, intensity of physical activity and group exercise

Title and Abstract (in Arabic)

العلاقة الارتباطية بين الاكتئاب وكل من النشاط البدني والتدبر وسط طلاب المدارس العالمية بدولة الامارات العربية المتحدة

الملخص

اهتمت هذه الدراسة بمحاولة فهم العوامل التي يمكن أن تحد من الاكتئاب، وذلك بالتركيز على التدبر والنشاط البدني. هناك دراسات قليلة نسبيا تناولت العلاقة بين مختلف أنواع النشاط البدني وأعراض الاكتئاب وسط فئة المراهقين عموما، ولا توجد أي دراسة تناولت ذلك في دولة الإمارات.ولذلك تهدف هذه الدراسة إلى تحديد مدى الارتباط بين أعراض الاكتئاب وكل من التدبر والنشاط البدني لمعرفة قدرة كل من هذه العوامل على الاسهام في التنبؤ بالاكتئاب. تم إجراء تطبيق ذاتي لأداة الدراسة في بعض المدارس الاجنبية في دولة الإمارات العربية المتحدة. تكونت الأداة من سبعة أجزاء: الجزء 1،المتغيرات الديموغرافية (4 عبارات)؛ الجزء 2، مقياس التدبر الإدراكي والعاطفي (10 عبارات)؛ الجزء 3،مقياس بيك للاكتئاب (20 عبارة)؛ الجزء 4، تكرار ممارسة النشاط البدني (عبارة واحدة مع 40 خيار للإجابة)؛ الجزء 5، مدة ممارسة النشاط البدني (عبارة واحدة مع 40 خيار)؛ الجزء 6، حدة النشاط البدني (عبارة واحدة مع 40 خيار)؛ الجزء 7، عدد المشتركين في النشاط البدني (عبارة واحدة مع 40 خيار). أظهرت النتائج ارتباطا سلبيا دالا احصائيا بين الاكتئاب والتدبر ، وعلاقة سلبية دالة احصائيا بين الاكتئاب وكل من تكرار، وحدة النشاط البدني وعدد المشاركين فيه. التدبر هو العامل الوحيد الذي استطاع التنبؤ بالاكتئاب وسط الإناث، بينما استطاع التدبر وحدة ممارسة النشاط البدني التنبؤ بالاكتئاب وسط الذكور.وقد حققت الإناث معدلات أعلى من الإكتئاب مقارنة بالذكور وشاركن بقدر أقل في النشاط البدني في جميع مستويات النشاط الأربعة. يمكن استخدام هذه النتائج بواسطة المعالجين النفسيين للإسترشاد بها في خططهم العلاجية وتوصياتهم،.كما يمكن استخدامها بواسطة المدارس/ المرشدين النفسيين لدمج النشاط البدني كإستراتيجية وقائية من الإكتئاب.

الكلمات المفتاحية: الإكتئاب، التدبر، تكرار النشاط البدني، مدة النشاط البدني، حدة النشاط البدن،

التمارين الجماعية.

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I would also like to thank the schools and universities that granted me permission to distribute my instrument notably the Dubai English Speaking College and the Canadian University Dubai.

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Dedication

To my beloved parents, family and friends

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Chapter 1: Introduction

1.1 Overview

According to the latest report from the World Health Authority, depression remains one of the top five biggest contributors to disease globally. It was ranked as the third leading cause of disease in 2004 and will move to first by 2030 (WFMH, 2012). The prevalence continues to increase and this growth is becoming particularly concerning amongst young people (Mathers & Loncar, 2005). The early onset of depression is associated with increased likelihood of repeat episodes later in life, as well as poorer educational performance and success (Owens, Stevenson & Hadwin, 2013). Furthermore depressive disorders are costly not only to individuals in regards to time, treatment and lifestyle but also to society (Merry, 2013).

An additional concern in regards to depression in adolescents is in relation to the rise in antidepressant consumption. In 2007, a study revealed that antidepressants were the most frequently prescribed drug globally (McGrath, 2008). The most alarming outcome from this research was in regards to over prescription of antidepressants amongst young people, particularly in light of recent findings suggesting that some antidepressant medications can increase suicide risks among teens. An FDA review found that over 4% of teenagers taking selective serotonin reuptake inhibitor's (SSRI) experienced suicidal ideation and/or suicidal attempts (Faris, 2012).

A UK based report assessed the rise in antidepressants prescriptions to children under the age of 18 between 1992 and 2001 and found that the rate of antidepressant prescriptions for children rose by 70% in a decade. Almost half the adolescents experiencing depression had been described tricyclics, even though

research has consistently demonstrated that these drugs are only moderately effective with this group (Murray, Vries & Wong, 2004). Nevertheless children and adolescents globally are increasingly being prescribed antidepressants, with inadequate knowledge and research into the safety and effectiveness of the impact of psychotropic drugs both short and long term. Furthermore, it is thought that prescribing patterns are most likely based on research drawn from adults (Dickinson, 2004).

According to Reivich, Gillham, Chaplin & Seligman (2013), at any point in time approximately 6-9% of adolescents will experience a major depressive disorder, and one in five will have had a major depressive episode by the end of high school. Widespread research has shown that depression increases as children enter adolescence and furthermore depression has increased dramatically over the last 50 years, meaning adolescents and young adults are a particularly at risk group.

Reflecting global trends, the UAE has also shown an increase in depression and administration of antidepressants amongst adolescents and young adults. In a recent study conducted by the Dubai Health Authority (DHA), it was found that one in five children showed symptoms of depression and almost 18% of students between 14-18 were diagnosed with advanced symptoms (Ponce de Leon, 2014), however it should be noted that this information is second hand and not published directly by the DHA. Psychologists in the UAE have called for urgent action for the prevention and recognition of depression in teenagers, as it is believed that the rates are on the rise (Bell, 2014).

Unfortunately, there is a significant lack of psychological research in the UAE across the breadth of the field. It was found that in the Gulf Cooperation Council (GCC) countries, there were a total of 192 mental health studies published

over the past 20 years. Most of these studies were from the UAE University and were either epidemiologic (48.98%) or psychometric (24.49%). Health promotion was listed as one of the most under-represented areas (Osman & Afifi, 2010). Therefore, it is essential to identify and understand any modifiable risks and potential preventions (Lewinsohn et al, 1999).

As prevalence rates continue to rise and the long-term impacts such as poor academic performance, social dysfunction, substance abuse and suicide become more evident (Merry et al, 2012), there is an urgent need for dedicated research into identifying factors that may prevent depression. Therefore, modifiable risk factors such as PA and mindfulness are of great interest to both health authorities and psychological researchers (Wiles, Haase, Lawlor, Ness & Lewis, 2012).

Depression and Physical Activity (PA). Over the last few decades there has been an increase in the amount of supporting evidence into the relationship between PA for not only reducing depressive symptoms, but also for preventing the onset of depression (Biddle, Fox, & Boutcher, 2000). In a systematic review of over 26 years of research findings, it was concluded that exercise is not only an effective treatment for depression but can also be an effective prevention of depression in all age groups. It was found that even low levels of PA (walking and gardening) could serve to ward off depression (Mammen & Faulkenr, 2013). Therefore, suggesting that, from a population health perspective, the promotion of PA can serve as an extremely valuable mental health strategy in aiding the reduction of depressive symptoms.

While this is useful, the above research was predominantly focused on adults, and the current study was interested in whether the same could be found with adolescents and young people. Rothon et al. (2010) conducted a prospective study

focusing specifically on adolescents, whereby participants were recruited from three local education authorities in London and individuals were followed up with three years later. It was found that there was evidence for a cross-sectional association between PA and depressive symptoms at baseline, with a reduction in the chances of depressive symptoms by about 8% for each additional hour of exercise undertaken per week.

In earlier research, which explored the impact of sports participation as a protective factor against depression and suicidal ideation, it was demonstrated that as sports participation increased, the odds of experiencing or suffering from depression and suicidal ideation decreased by 25% and 12% respectively. The authors also provided further support for a psychosocial relationship as opposed to a biophysical explanation, concluding that adolescents should be offered and exposed to regular exercise and sporting activities which boost self-esteem and social support (Babiss & Gangwisch, 2009).

Added evidence for a direct association between exercise/PA and depression was provided in a study conducted on urban adolescents in China (Hong et al, 2009). A statistically significant negative relationship was apparent between PA and depressive symptoms. The majority of studies reviewed found that girls were more likely to suffer from depression and were less likely to undertake regular PA. This therefore may have lead to underestimation of the strength of association between PA and depression (Rothon et al., 2010).

There are numerous other studies that looked at overall benefits of PA for adolescents, and many that found a number of other positive psychological effects such as improved self-image (Kirkcaldy, Shepherd & Siefen, 2002) and overall psychological health and well-being (Parfitt, Pavey & Rowlands 2009). However,

few other studies have focused specifically on exploring the direct relationship between depression and PA. Furthermore, research on the relationship of PA and depression reduction for adolescents has been far more limited, particularly in this region.

Mindfulness and depression. The term mindfulness has undergone many revisions and clarifications over the last 40 years. The current definition - and most commonly accepted understanding - relates to remembering to pay attention to one's immediate experience with care and discernment (Black 2011). Over the past decade mindfulness techniques have experienced a surge in popularity due to the success of Mindfulness-Based Stress Reduction (MBSR) programs (Davis & Hayes, 2011).

Mindfulness has become increasingly established in the field of clinical psychology as an effective intervention for many disorders, with a wealth of literature supporting evidence for mindfulness as an effective intervention for treating depression and depressive symptoms (Keng, Smoski & Robins, 2011). Hoffman, Sawyer, Witt & Oh (2010), conducted a meta-analysis of 39 studies, which demonstrated the efficacy of mindfulness-based treatments in reducing symptoms of depression. This was explored in a study of trait mindfulness, where the relationship between mindfulness, depressive symptoms, and neural activity in a nonclinical sample of adults was explored. It was found that trait mindfulness had the capacity to alter baseline amygdala activity, therefore, providing support that mindfulness can serve as a preventive buffering in depressive mood and depressive symptoms (Way, Creswell, Eisenberger & Lieberman, 2010).

While there is growing support and evidence for the effectiveness of mindfulness-based approaches with adults for enhancing mental health, very little

evidence and research exists in relation to young adults and adolescents, more specifically there is no research into this population in the UAE.

1.2 Statement of the Problem

Depression continues to be a growing global concern, and attempts to understand potential risk factors are rising in importance. Owing to the long-term detrimental consequences of depression, it is a critical time to understand and research potential risks, preventions and causes. Despite numerous attempts to research the association between PA and mindfulness on the impact of depressive symptoms, no existing research or literature exists that focuses specifically on the UAE. The purpose of this study is to identify if there is a significant link between PA and mindfulness on the prevention of depression amongst adolescent and young adults in international schools/universities in the UAE, in an attempt to reduce the prevalence of depression among young people.

Definition of Terms

1. *Physical Activity (PA)*–is "Any bodily movement produced by skeletal muscles that requires energy expenditure - including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits" (WHO, 2014).
2. *Depression* – "People with depression may experience a lack of interest and pleasure in daily activities, significant weight loss or gain, insomnia or excessive sleeping, lack of energy, inability to concentrate, feelings of

worthlessness or excessive guilt and recurrent thoughts of death or suicide" (Kazdin, 2010)

3. *Mindfulness* - The term "mindfulness" has been used to refer to a psychological state of awareness, the practices that promote this awareness, a mode of processing information and a character trait… Mindfulness is a moment-to-moment awareness of one's experience without judgment. In this sense, mindfulness is a state and not a trait" Davis & Hayes, (2012).

1.3 Relevant Literature

PA is receiving increasing attention and research globally in regards to the physical and health benefits. Lately, this has become a key focus in the UAE given increasing concerns about obesity in young people in the region. Studies by the World Health Organization (WHO) show that the Middle East was second only to the Americas in terms of low activity rates (Carroll, 2014). A recent report focusing specifically on the UAE found that one in three children are overweight or obese. In a study of over 1,400 children and teenagers aged 6 to 19 it was found that 14.2% were overweight and a further 19.8% were obese (Bell, 2013). Leading on from this, UAE schools have put physical activity and health at the top of their agenda, whereby inspections will be taking place to ensure physical training classes are being attended (Sambridge, 2014). However, the rationale for this is purely from a physical perspective, given the focus that PA is receiving it is important to not only look at the physical health benefits but the mental health advantages as well.

1.3.1 Association Between PA and Depression

There are a number of factors to consider when understanding the relationship between depression and physical activity, with frequency being one that has received a lot of attention. Early studies demonstrated that adolescents who reported greater frequency of exercise also report lower levels of perceived stress, which is often considered to be a key contributor to depression (Norris, Carroll and Cochrane, 1992). In a cross-sectional study by Hassmen, Koivula, and Uutela (2000), it was found that individuals, who exercised at least two to three times a week, experienced significantly less depression than those exercising less frequently or not at all. Furthermore, those who exercised at least twice a week reported stronger feeling of social integration than individuals exercising less.

A more recent study by Legrand and Heuze (2007), assessed the effect of an eight-week aerobic exercise program where participants were randomized to low frequency exercise (one aerobic session per week) and individual high frequency exercise (3–5 aerobic exercise sessions per week). They established that those in the high frequency exercise interventions reported lower depression scores than those in the low frequency exercise intervention. Further research was conducted by Rethorst, Wipfli, and Landers (2009) in this area, they analysed the moderating variables of a number of exercise programs in the overall population. The study determined that exercise with a frequency of three or four times per week, resulted in a significantly larger effect than programs with two or five exercise sessions per week, concluding that the relationship between frequency of PA and depression has a plateau/cut-off point where frequency stops being effective.

Growing evidence demonstrates a relationship between PA and the reduction of depression. However, there are still a number of gaps in regards to the optimum recommendations concerning frequency, duration and intensity. While frequency is commonly studied, duration and intensity remain relatively inconclusive in terms of ideals. A recent meta-analyses by Rethorst, Wipfli, and Landers (2009), explored moderating variables of a number of exercise programs and found that within the overall population, exercise bouts of 20 – 29 minutes resulted in larger effects than bouts of ≥ 45 minutes, while within the clinically depressed population, exercise bouts of 45 – 59 minutes resulted in larger effects than bouts of 30 – 44 minutes and of ≥ 60 minutes.

However contradictory findings were shown in an extensive review conducted by Teycheme, Ball & Salmon (2008), and they explored the relationship of duration of physical activity on depression and found that, all five of the observational studies, and five of the seven intervention studies, showed both shorter and longer durations of PA were associated with reduced likelihood of depression, therefore no significant difference was evident between the levels of reduction.

A number of studies within this field have found that moderate exercise proves more effective than strenuous exercise in relation to reducing depressive symptoms owing to the assumption that high intensity physical activity can add more stress than relief. This observation has been demonstrated in a series of studies over the years. An earlier study, Moses, Steptoe, and Matthews (1989), conducted an experimental study involving 109 sedentary individuals who were randomly assigned to one out of four groups which varied in intensity including; high intensity exercise, moderate intensity exercise, attention-placebo or a waiting list. They found that

individuals in the moderate intensity group were the only ones to show improvement in their levels of depression.

Further support for this was evident in findings produced by Sund, Larsson and Wichstrom (2010). They conducted a 1-year study focused on adolescents and the impact of levels of physical activity on depressive symptoms and concluded that low levels of vigorous exercise constituted independent risk factors for the development of a high level of depressive symptoms. Mata et al (2012), provided additional evidence for a link between intensity levels and the reduction of depression, their study showed that depressed participants presented a dose-response effect of physical activity on affect. Those who participated in longer duration and/or higher intensity of physical activity increased their level of positive affect significantly more than shorter and/or lower intensity physical activity.

Developmental psychologists have stressed the importance of friends and peers in the overall psychological development, happiness and well being of children and adolescents (Weinberg, Robert, Daniel, 2014)**.** There is a wealth of research supporting the social benefits of sport and physical activity in regards to building self-esteem, and providing a social support network and a platform to make new friends. Through teachings around group cohesion and respect, children are taught how to function respectfully within a team (Cote and Deakin, 2008), which in effect can facilitate the development friendships. It has been previously found that children and adolescents who participate in sports are more likely to make more friends and friends of different cultures.

It has also been established that team sport participation can lead to positive psychological benefits including the ability to acquire better emotional control, the ability to work successfully in a team and the ability to exhibit initiative (Eccles and

Barber, 2002). The aforementioned factors are all thought to contribute in overall positive mental well-being. Research by Taliaferro et al. (2008), revealed that playing team sport can serve to protect against suicide risk. Furthermore, it was demonstrated that both men and women who participated in team sports, exhibited lower levels of hopelessness and suicidal ideation, and those who participated in multiple sports developed even more protection in regards to improved moods and alleviation of many forms of depression.

Legrand and Heuze (2007), however, found no differences in depression scores between participants in the individual and group based high frequency exercise groups, perhaps suggesting that the additional effects of exercising in a group are not important in the relationship between exercise and depression.

1.3.2 Relationship Between Mindfulness and Depression in Adolescents

Burke (2009) conducted an extensive review of current research into mindfulness-based approaches with children and adolescents. He concluded that based on the research available at that time, there is strong support for the feasibility of mindfulness-based interventions with children and adolescents. However the major limitation was that no generalized empirical evidence of the efficacy of these interventions existed.

One of the first studies exploring mindfulness and depressions in adolescents was by Kuyken et al (2013). They conducted a non-randomised controlled feasibility study with 522 young people aged 12–16 in 12 secondary schools. The research was a non-randomised controlled parallel group (MiSP programme v. matched control group) study, with assessment of outcomes at baseline (pre-intervention), post-intervention and follow-up (three months after baseline). They found that those who

received the Mindfulness in Schools Programme (MiSP) had significantly lower depression scores than the control group, and after a three-month follow up analysis, those in the MiSP showed increased well-being, lower stress and lower depression scores.

Further support for the efficacy of mindfulness in reducing depression, came from a study by Raes, Griffith, Van der Gucht, & Williams, (2014), in a cluster-randomized controlled trial of a mindfulness group program with adolescents. It was shown that the mindfulness intervention demonstrated significantly greater reductions in depression compared with the control group at the six-month follow-up. The findings posit that school-based mindfulness programs cannot only help to reduce but can also prevent depression in adolescents.

1.3.3 **Research Hypothesis**

For the purpose of this study, the following hypothesis was tested:

There will be a negative correlation between Physical Activity (Frequency, duration, intensity and other participants) and mindfulness with depression.

Chapter 2: Methods

2.1 Participants

The instrument was sent to international schools and universities in Dubai. The total number that received it was approximately 250, and the total number of responses was 172, which equated to 69% response rate, which is deemed acceptable according to Nulty, (2008). Of which, 86 males (*M* = 17.38 years, *SD* =1.48) and 83 females (*M* = 17.65 years, *SD* =1.81), ranging in age from 16 to 22 years (*M* = 17.51 years, *SD* =1.66), from 41 different countries.

The majority of the respondents were British (*n*=36*),* followed by Indian (*n*=25*)*, Egyptian (*n*=15*),* Emirati (*n*=9), Canadian (*n*=8), Lebanese (*n*=8), South African (*n*=5), Pakistani (*n*=5), Australian (*n*=4), Syrian (*n*=3), German (*n*=3). The remaining respondents (*n=51)* either did not disclose their nationality, or only one individual responded from that country. (See appendix B for a pie chart representation of nationality).

2.2 Instruments

An instrument comprised of seven sections was developed. Section 1, Demographics (4 items). Section 2, Cognitive and Affective Mindfulness Scale-Revised (10 items), Section 3, The Becks Depression Inventory-II (20 items) Section 4, Frequency of exercise (40 items), Section 5, Duration of exercise (40 items), Section 6, Level of intensity, (40 items), Section 7, Number of other participants (40 items).

2.2.1 The Cognitive and Affective Mindfulness Scale-Revised (CAMS-R)

The CAMS-R 10 item is a brief self-report measure of mindfulness with items that cover mindfulness, distress, well-being, emotion-regulation, and problem-solving approaches. There is proven evidence of acceptable internal consistency, convergent and discriminant validity with concurrent measures and correlates strongly with the 12-item measure. Adapted from the original 12-item measure, two items were removed to address potential construct contamination in two items (Feldmen et al 2006). The 10-item version of the CAMS-R that omits items 2 and 7 was tested and was found to be highly correlated with the 12-item version (r = .97), whereby internal consistency was found to be acceptable (*a*=.76). The authors noted that there were no significant differences in the correlations between the 10-item CAMS-R and 12-item CAMS-R and the criterion variables.

2.2.2 The Becks Depression Inventory-II

In a recent review of over 118 articles dedicated to investigate psychometric performance of the BDI-II, exploring both clinical and non-clinical populations of all age ranges, eighteen of those studies focused specifically on adolescents (13-17 years) and yielded an alpha reliability of between 0.89-0.94. In addition, 33 of those articles were conducted on a student population (18-23 years) and produced an alpha reliability of 0.83-0.93 (Wang & Gorenstein, (2013).

It was concluded that the BDI-II is a relevant psychometric instrument that consistently demonstrates high reliability and validity, with broad applicability for research and clinical practice worldwide.

The only adaption made to the original BDI-II is the removal of the final question related to sexual interest levels as it was deemed culturally inappropriate.

2.2.3 The Development of a New Measure for PA

It was deemed that no adequate tests existed that specifically measure the frequency, duration, intensity and number of other individuals who engage in physical activity for this culture, therefore one was developed specifically for the purpose of this study. This was done using a combined approach of curriculum review, a panel of local professors and psychologists to assess the battery of questions and test items and a pilot study of individuals from the target sample.

Once feedback was received, the items were adapted accordingly and were reworded and adjusted. The instrument used a number of Likert scales, containing ratings such as 1 = Never and 7 = Everyday (7 times a week) and 1= resting to 10 = maximal intensity.

The development process

1. A panel of local professors reviewed several international schools and universities sports curriculum to begin creating a list of potential PA and exercises to be included
2. Panel of local professors and psychologists reviewed draft list of PA and added/changed appropriate items
3. Panel of experts including local professors, student and school counselors developed an instrument to include the following;
    I. A list of culturally relevant physical activities

II. Suitable time frame of PA (within the last week/average week) to measure frequency

III. An item to measure duration of PA

IV. A self-rating scale of intensity - The Borg revised category-ratio scale (0 to 10 scale) was selected as the most suitable scale to include to measure intensity. This scale is widely used and provides a valid and reliable assessment of perceived level of intensity amongst individuals. (American College of Sports Medicine, 2010).

V. An item to measure number of other participants involved in PA.

4. It was piloted on a sample of 11 students ranging between 16-19 years, including the following nationalities; British, Australian, South African, Russian, Italian, Bulgarian, Sudanese and German. Adaptions included;

    a. The removal of ambiguous items (aerobics & athletics)
    b. Six new items of physical activity were added (boxing, skateboarding, table tennis, BMXing, two types of gym workouts – cardio and exercise
    c. The recording of time was changed from discrete to continuous
    d. Written descriptions for the intensity/exertion question were added
    e. The item measuring number of other participants was changed from 'number of friends/team mates' to 'others'

4. Finally in order to calculate a total number for each variable of PA the sum of each score was obtained and used.

2.3 Data Collection, Analysis Procedures and Reliability

The research design for this study was a correlational study consisting of 7 questionnaires, self-report instrument which took approximately 10-15 minutes to complete. Schools/universities were given two options for participation; via email with an online link to the questions and a physical version, which was handed out directly to participants at the relevant schools or distributed through teachers/school counselors.

In order to test the reliability of the existing measures CAMS-R-10 and BDI-II Chronbach's Alpha analysis was conducted, the findings are presented below in Table 1.

Table 1: A Chronbach's Alpha Analysis to Demonstrate Reliability Across Each Variable

Section	Measure	Reliability
2	CAMS-R	0.71
3	BDI-II	0.92

The Cronbach's Alpha's for the CAMs-R-10 (a=0.71) to BDI-II (a=0.92), therefore both are deemed to have acceptable alpha reliability (Cortina, 1993).

In order to analyze the results, all data was entered into SPSS and a number of analysis were conducted including; Descriptive, Chronbach's Alpha, Pearson's Correlation, Independent Sample T-Test and a Multiple Regression analysis.

2.4 Protection of Human Rights

Ethical approval was gained from the UAE ethical committee in advance of distribution. Once this was received, consent from the responsible educational staff was obtained in advance of distribution and for each school/university parental pre-consent was insured for all individuals under the age of 21 (See appendix C).

In the online link the first page included the consent form, only once they have read through this page and clicked on the tab 'I have read and give consent to participate' can they proceed to the actual instrument. The same consent form was attached to the printed version, stating that they had read the consent form and agreed to participate (See appendix A).

All participants were informed that their involvement was completely voluntary and it was made clear that participants may withdraw from the study at any time. Furthermore, it was stated that information would remain completely confidential.

Chapter 3: Results

The current study sought to analyze the relationship between PAs, mindfulness and depression in international schools in the UAE. The following chapter reports results of analyses designed to test the research hypotheses presented in Chapter 1. Before discussing the results of data analysis used to test the research hypothesis descriptive data for both the predictors and the criterion variables were presented on Tables 2 to 6

Predictor variables: Two main predictors variables were used in this research: (i) Mindfulness (ii) Physical Activity. Physical activity was subdivided into 40 activities. Tables 1-4 represent the descriptive statistics for each measure of PA; frequency, duration, level of exertion and number of other participants.

Table 2: Descriptive Statistics for Frequency of PA

Frequency of PA					
	n	*Min*	*Max*	*Mean*	*Std. D*
Archery	4	1	3	1.5	1
Badminton	26	1	7	2.15	1.76
Basketball	39	1	7	2.13	1.51
BMXing	8	1	7	2.63	1.92
Boxing	11	1	7	3.09	1.92
Cricket	12	1	7	3.25	2.14
Cycling	44	1	6	2.16	1.31
Dance	52	1	7	2.96	1.89
Diving	15	1	7	1.67	1.63
Fencing	2	1	2	1.5	0.71
Football	59	1	7	3.07	2.1
Frisbee	7	1	7	4.14	2.12
Golf	4	1	3	1.50	1
Gym workout 1	116	1	7	3.28	2.02
Gym workout 2	98	1	7	2.92	1.84

Gymnastics	13	1	6	2.15	1.41
Hockey	4	1	1	1	0
Horse/camel riding	15	1	7	2.4	1.68
Ice skating	18	1	6	1.72	1.36
Kayaking/rowing	3	1	1	1	0
Martial arts	6	1	5	2.67	1.63
Netball	11	1	4	1.73	0.94
Paddle boarding	2	1	1	1	0
Rugby	10	1	5	3.1	1.91
Running	57	1	7	3.04	2.03
Scuba diving	6	1	3	1.83	0.98
Skateboarding	7	1	4	2.29	1.11
Skiing/snowboarding	5	1	3	1.8	0.83
Snorkeling	1	1	1	1	0
Squash	4	1	7	2.5	3
Surfing	1	1	3	3	0
Swimming	56	1	7	2.25	1.67
Table tennis	25	1	4	1.84	0.89
Tennis	20	1	6	2.35	1.42
Trampolining	6	1	7	2.33	2.34
Volleyball	18	1	6	2.11	1.45
Wakeboarding	5	2	4	2.8	0.84
Weight training	49	1	7	3.61	2.04
Yoga & Pilates	15	1	7	2.47	1.85

Note: BMXing =organized bicycle racing on a dirt track, especially for youngsters. Gym Workout 1 = (push ups, squats, lunges, sit ups etc.). Gym Workout 2 = (cardio machines - treadmill, row machine, cross trainer etc.)
Means represent the total number of times a week individuals participate in each PA

Table 2 shows the PAs that the highest number of individuals engaged in were: gym workout 1 & 2, followed by football, running and swimming.

Reviewing the means and standard deviations of the highest number of individuals engaged in PA indicate that Gym workout 1 had the highest mean (3.28, SD=2.02), while swimming had the lowest mean (2.25, SD=1.67).

Table 3: Descriptive Statistics for Duration of PA

Type of PA	Duration of PA				
	n	*Min*	*Max*	*Mean*	*Std. D*
Archery	1	30	30	30	
Badminton	21	10	120	44.29	30.22
Basketball	31	15	240	58.87	57.14
BMXing	4	20	90	40	33.67
Boxing	8	20	90	37.5	21.88
Cricket	11	30	300	106.36	85.24
Cycling	31	10	180	40.16	32.65
Dance	34	10	120	42.35	29.13
Diving	4	10	120	45	50.66
Fencing	1	30	30	30	
Football	50	20	300	85.8	62.03
Frisbee	1	5	5	5	
Golf	4	40	60	51.25	10.31
Gym workout 1	100	5	180	52.35	36.27
Gym workout 2	84	10	180	51.37	33.21
Gymnastics	8	15	90	51.88	30.47
Hockey	12	5	120	67.92	28.64
Horse/camel riding	12	30	120	58.33	31.86
Ice Skating	3	30	220	103.33	102.14
Kayaking/rowing	3	20	60	46.67	23.09
Martial arts	8	30	90	60	16.04
Netball	1	20	20	20	
Paddle boarding	8	20	120	55	31.17
Rugby	35	5	240	48.57	48.89
Running	3	45	80	61.67	17.56
Scuba diving	3	10	30	23.33	11.55
Skateboarding	4	60	180	105	57.45
Skiing/snowboarding	2	20	45	32.5	17.68
Snorkeling	1	1	1	1	0
Squash	3	30	90	60	30
Surfing	1	20	20	20	
Swimming	38	10	240	60.26	45.43
Table tennis	15	20	120	44.67	30.67
Tennis	14	5	180	81.07	56.23
Trampolining	4	10	90	32.5	38.62
Volleyball	14	10	90	40.36	19.95
Wakeboarding	3	20	600	246.76	310.01
Weight training	33	10	180	65.3	46.75

Yoga & Pilates	13	10	90	48.46	22.02

Note: BMXing =organized bicycle racing on a dirt track, especially for youngsters. Gym Workout 1 = (push ups, squats, lunges, sit ups etc.). Gym Workout 2 = (cardio machines - treadmill, row machine, cross trainer etc.)
Means represent the total number of time spent engaged in PA for a typical session a week

The table above demonstrates that the PAs with the highest number of respondents for duration were: gym workout 1 & 2, followed by football, swimming and rugby. From the means and standard deviations of the highest number of individuals that engaged in PA for duration, it is indicated that football had the highest mean (85.8, SD=62.03) and rugby had the lowest mean (48.57, SD=48.89).

Table 4: Descriptive Statistics for Level of Intensity of PA

Type of PA	Level of intensity of exercise				
	n	*Min*	*Max*	*Mean*	*Std. D*
Archery	1	2	2	2	
Badminton	21	2	8	4.14	1.59
Basketball	26	1	10	5.46	2.1
BMXing	4	4	6	5	1.15
Boxing	7	6	9	7.71	0.95
Cricket	11	3	8	5.81	1.47
Cycling	29	2	8	5.48	1.81
Dance	35	1	8	5	1.9
Diving	5	1	6	3.4	2.07
Fencing	2	3	5	4	1.41
Football	43	2	10	6.26	1.97
Frisbee	2	7	8	7.5	0.71
Golf	4	2	5	3	1.41
Gym workout 1	104		10	6.04	1.83
Gym workout 2	87		10	6.4	1.76
Gymnastics	7	2	8	5.4	2.23
Hockey					
Horse/camel riding	11	2	8	4.73	2.15
Ice skating	12	2	7	3.83	1.8
Kayaking/rowing	3	3	8	5.33	2.52
Martial arts	2	2	5	3.5	2.12
Netball	7	4	9	6.71	1.7
Paddle boarding	1	3	3	3	

Rugby	9	4	10	7.11	1.76
Running	30	1	9	5.9	1.82
Scuba diving	5	2	7	3.8	2.17
Skateboarding	4	4	5	4.75	0.5
Skiing/snowboarding	6	4	7	5.17	1.17
Snorkeling	0				
Squash	3	3	10	6	3.61
Surfing	0				
Swimming	37	1	9	4.73	2.03
Table tennis	14	2	6	3.71	1.44
Tennis	13	3	10	6.38	1.94
Trampolining	3	2	5	3	1.73
Volleyball	12	1	9	5.33	2.27
Wakeboarding	2	5	5	5	0
Weight training	41	1	10	6.39	2.36
Yoga & Pilates	12	1	7	4.33	1.56

Note: BMXing =organized bicycle racing on a dirt track, especially for youngsters. Gym Workout 1 = (push ups, squats, lunges, sit ups etc.). Gym Workout 2 = (cardio machines - treadmill, row machine, cross trainer etc.)
Means represent the total level of intensity for each PA

From Table 4, it can be seen the PAs with the highest number of respondents for duration level of intensity were; gym workout 1 & 2, followed by football, weight training and swimming. The means and standard deviations of the highest number of individuals that engaged in PA show that weight training had the highest mean (6.39, SD=2.36) and swimming had the lowest mean (4.73, SD=2.03).

Table 5: Descriptive for Number of Other Participants

Type of PA	Number of others participants				
	n	*Min*	*Max*	*Mean*	*Std. D*
Archery	1	0		0	
Badminton	20	2	5	2.9	0.79
Basketball	27	1	7	5.11	1.91
BMXing	3	1	3	2.33	1.15
Boxing	9	1	6	2.33	1.58
Cricket	11	1	7	6.18	1.94
Cycling	23	1	7	2.04	1.52

Dance	39	1	7	2.94	2.24
Diving	3	1	3	2	1
Fencing	1	4	4	4	
Football	48	1	7	6.13	1.57
Frisbee	1	5	5	5	
Golf	4	2	3	2.75	0.5
Gym workout 1	103	0	7	1.76	1.29
Gym workout 2	90	0	7	1.84	1.36
Gymnastics	7	1	7	3.57	2.76
Hockey	0	0			
Horse/camel riding	11	1	4	2.45	0.93
Ice skating	8	1	7	3.38	1.68
Kayaking/rowing	2	2	5	3.5	2.12
Martial arts	3	1	4	3	1.73
Netball	9	5	7	6.67	0.7
Paddle boarding	1	1	1	1	0
Rugby	5	7	7	7	0
Running	37	1	7	2	1.73
Scuba diving	4	2	5	3.25	1.5
Skateboarding	4	1	4	2.5	1.29
Skiing/snowboarding	5	2	5	3.2	1.3
Snorkeling	0				
Squash	2	2	3	2.5	0.7
Surfing	1	3	3	3	
Swimming	38	1	7	2.79	1.77
Table tennis	18	1	7	2.83	1.38
Tennis	16	1	6	2.56	1.26
Trampolining	3	2	5	4	1.73
Volleyball	13	1	7	5.62	1.8
Wakeboarding	2	5	5	5	0
Weight training	37	1	7	1.81	1.43
Yoga & Pilates	11	1	4	1.63	1.12

Note: BMXing =organized bicycle racing on a dirt track, especially for youngsters. Gym Workout 1 = (push ups, squats, lunges, sit ups etc.). Gym Workout 2 = (cardio machines - treadmill, row machine, cross trainer etc.)
Means represent the total level of intensity for each PA

Table 5 shows that the PAs with the highest number of respondents for number of other participants were: gym workout 1 & 2, followed by football, dance and swimming. The means and standard deviations of the highest number of individuals that responded to number of other participants show that football has the

highest mean (6.13, SD=1.57) and gym workout 1 has the lowest mean (1.76, SD=1.29).

In order to understand the prevalence of depression, the BDI-II was used to categorize levels of depression, using the following cut-off points; 0-13 = Minimal, 14-19 = Mild, 20-28 = Moderate, 29-63 = Severe. The below table is a representation of the total scores for each classification on the BDI-II for the total population, as well as for both males and females.

Table 6: Frequencies and Percentages of Scores from the Becks Depression Inventory

Becks Depression Inventory Rating	Group Male		Female		Total	
	Freq.	Percentage	Freq.	Percentage	Freq.	Percentage
Minimal	53	61.7	39	46.8	92	54.7
Mild	18	21.1	17	20.4	35	20.9
Moderate	9	10.6	15	18	24	14.1
Severe	6	7.2	12	14.4	18	10.6

n=Male (86), Female (83).

From this table it is demonstrated that the majority of respondents reported minimal symptoms of depression. Approximately, a quarter of respondents ranked between moderate and severe. Females reported almost double the amount of depressive symptoms for moderate and severe categories than males.

To test the hypothesis of this research:

There was a negative correlation between Physical Activities (frequency, duration and other participants) and mindfulness with depression. Both simple

correlation and multiple regressions were used. The results are presented in Table 7 to 9.

Table 7: Pearson's Correlation Coefficients (using bootstrap) between Physical Activities and Mindfulness with Depression

Physical Activities	Depression	
	r	95% CI
Mindfulness	-.55**	-.65, -.43
Frequency	-.18*	-.29, -.07
Duration	-.28**	-.39, -.17
Level of Intensity	-.27**	-.38, -.16
Other participants	-.20*	-.32, -.07

Notes: n=154 **p < 0.01 *p < 0.05

Correlation was calculated on the sum of the 40 items for each measure of PA

The results in Table 7 indicated that there were significant negative correlations between mindfulness and all PA variables with depression. The effect size according to Cohen's criteria (1992) were moderate for mindfulness and depression correlation coefficient while all correlation coefficients for PA variables, although they were also negatively significant, the effect size according to Cohen's criteria were small.

Table 8: Pearson's Correlation Coefficients Between PA and Mindfulness with Depression for Female and Male

Physical Activities	Depression Female		Male	
	r	95% CI	r	95% CI
Mindfulness	-.51**	-.66, -.34	-.57**	-.70, -.40
Frequency	-.04	-.20, .19	-.23*	-.41, -.03
Duration	-.20	-.34, -.42	-.29**	-.46, -.09
Level of Intensity	-.13	-.31, -.08	-.33**	-.48, -.14
Other participants	-.25*	-.38, -.09	-.10	-.34, .12

*Notes: n=75 Female, 77 Male***p < 0.01 *p<0.05*

Correlation was calculated on the sum of the 40 items for each measure of PA

Table 8 shows negative and significant correlation coefficients for male between mindfulness and all PA except number of other participants. The effect size was moderate for mindfulness correlation coefficient with depression and small for level of intensity, while for frequency and duration, according to Cohen's criteria. Meaning that males are more likely than females to benefit from mindfulness and all PA (except from practicing PA with others) to decrease depression.

For females the results indicated that a significant negative correlation coefficient was evident between both mindfulness and other participants in relation to depression with moderate and small effect size respectively. This may lead us to conclude that females may benefit from mindfulness and practicing PA with others to decrease their depression.

To better understand which variables can be used to predict depression a Multiple Regression analysis with stepwise was conducted. The most important assumption for conducting multiple regressions is to ensure that no multi-collinearity

exists. The findings demonstrate that there is no multi-collinearity for the five variables mindfulness, frequency of PA, duration of PA, intensity of PA and number of others as predictors for BDI-II total score, as all Variance Inflation Factor (VIF) were within the acceptable criteria (less than 5) indicating that it is acceptable to use multiple regressions to analyze the data. Table 9 below shows the results of multiple regressions.

Table 9: A Stepwise Multiple Regression Analysis to Represent the Relationship between Depression and the Predictor Variables

Model			Change Statistics							
	R	R2	Adj. R2	R2 C	F	Sig. F	P	b	SE b	β
1	.55a	0.3	0.29	0.3	64.76	0	C	42.36	3.56	
							M	-1.6	0.13	-.55**
2	.58b	0.34	0.33	0.04	9.3	0.03	C	43.9	3.5	
							M	-1.01	0.13	-.52**
							I	-0.13	0.04	-.21*

Notes: P=Predictor, C=Constant, M=Mindfulness, I=Level of Intensity

From the analysis it was shown that the only two variables that can be used to predict the decrease or reduction of depression is mindfulness and level of intensity of PA. When the weight of the two variables were compared it was found that mindfulness (β = -.55) had a higher beta level than intensity (β = -.21). From the magnitude of the t-statistics we can see that mindfulness had more impact on depression than intensity.

To understand if the above would be found in both males and females, a stepwise multiple regression analysis was conducted for each gender.

Table 10: A Stepwise Multiple Regression Analysis to Represent the Relationship between Depression and the Predictor Variables for Males and Females

Model			Change Statistics							
	R	R2	Adj. R2	R2 C	F	Sig. F	P	b	SE b	β
Male 1	.57a	0.33	0.32	0.33	36.83	0.00	*C*	42.12	4.97	
							M	-1.09	0.18	-0.57
Male 2	.63b	0.4	0.38	0.07	8.23	0.01	*C*	44.04	4.79	
							M	-1.03	0.17	-0.54
							I	-0.14	0.05	-0.26
Female 1	0.51	0.26	0.25				*C*	41.92	5.12	
							M	-0.99	0.12	-0.51

Notes: P=Predictor, C=Constant, M=Mindfulness, I=Level of Intensity

This analysis also indicated that there is no multi-collinearity for the five variables for both males and females as all Variance Inflation Factor (VIF) were again within the acceptable criteria (less than 5). Table 10 indicated that there were two possible models that could be used with males to predict depression. The first and most powerful model was mindfulness, which can predict 33% of the total variance of depression. While the second model can accept intensity PA in addition to mindfulness, meaning that intensity can add 7% of the total variance, consequently demonstrating a significant change on R2. Therefore adding this variable will increase the power of prediction to 40%.

As compared to females, the results showed that only one model could be used to predict depression using the same predictors. This one variable model included only mindfulness. Comparing between male and female on the weight of the mindfulness variable showed that it was higher for males (-.57) than females (-.51).

Using an alpha level of .05, an independent-samples t-test was conducted to evaluate whether males and females differed significantly in levels of mindfulness, depression, frequency of PA, duration of PA, intensity of PA and number of other participants.

Table 11: Independent Sample T-Test and Descriptive Statistics for Mindfulness, Depression, and PA

Outcome	Group							
	Male			Female				
	n	SD	M	n	SD	M	t	Sig
Mindfulness	86	4.89	27.26	83	5.39	25.80	1.84	0.36
Depression	86	9.20	12.36	83	10.68	16.58	-2.75	0.19
Freq of PA	82	15.02	17.70	79	11.29	10.59	3.39	0.05
Duration of PA	79	203.10	279.94	78	162.21	172.01	3.68	0.11
Intensity of PA	79	17.02	26.53	76	11.38	17.71	3.81	0.00
No of others	79	12.35	14.57	78	7.57	8.37	3.80	0.01

**p < 0.01 *p < 0.05

There are statistically significant differences, at the .05 level, between male and female participants for the following; Males scored higher for frequency of PA; levels of intensity of PA; and number of other participants. No statistically significant difference exists between males and females in terms of levels of depression, mindfulness or duration of PA.

Chapter 4: Discussion

4.1 Findings

Findings for PA - From the results it was found that the most commonly participated physical activities across all four measures of PA (meaning activities most individuals engaged in, this is not referring to the frequency of PA), were; Gym workout 1 and 2, swimming, football, running, dance & weight training. These seven activities consistently had over 30 respondents across each of the four measures of PA.

It was also found that the highest frequency of PAs of those that met the minimum criteria of respondents was gym workout 1. For duration and number of other participants it was football. Finally for levels of intensity it was weight training. Although these findings provide some insight into the most popular PA across students in international schools/universities in the UAE, it was not possible to compare differences between specific PA as a large number of individual activities were found to have a low number of responses. For example across all four measures of PA (frequency, duration, levels of intensity and number of others), the majority of individual PA items had less than 30 responses.

Findings for depression - Demonstrated in previous findings, females reported higher levels of depression for both moderate and severe range. This finding is not unique to this study as there is ample evidence that demonstrates a female preponderance of depression in adolescents (Essau, Lewisohn, Seeley & Sasagawa, 2010). However, when overall scores were compared, no significant

difference was found. According to the findings, approximately 54.7% (*n*=92) of participants scored in the minimal range of the BDI-II rating: males (*n*=53) and females (*n*=39*)*. 20.9% scored in the mild range, males (*n*=18) and females (*n*=17*)*. Approximately 14.1% in the moderate range, males (*n*=9) and females (*n*=15*)* and 10.6% scored in the severe range, males (*n*=6) and females (*n*=12*)*. This is inline with previously mentioned findings by Ponce de Leon, (2014), that almost 18% of students between 14-18 were diagnosed with advanced symptoms of depression, although it is unclear exactly what is meant by the term 'advanced'. This study found that almost 25% of the population, reported moderate to severe symptoms. However it is important to note, that these figures should be accepted with caution, as although the BDI-II is one of the most universally tested and accepted measures for different cultures, it was not adapted and normalized specifically for this population, which may have led to a misrepresentation of scores.

In accordance with previous findings, the results showed that females were less likely to engage in PA than males. It was found that girls scored lower in all four measures of PA, and significant differences were found for frequency, level of intensity and number of other participants.

Research hypothesis - The overall aim of this study was to understand if a negative relationship was evident between physical activities and mindfulness in regard to depressive symptom levels in a correlational study of an international sample of adolescents and young adults in the UAE. The results showed that mindfulness, frequency of PA, duration of PA, level of intensity of PA and number of other participants engaged in PA all had a significant negative correlation with depression. The effect size of mindfulness was moderate, whereas for each of the four measures of PA the effect size was small.

When this was analyzed further, it was found that only mindfulness was a predictor of reduced depression for both males and females. However, intensity of PA and mindfulness were predictors for reduced depression in males. Below is a discussion of each variable in relation to depression.

Mindfulness and PA - There is a growing body of research that shows the impact of mindfulness on depression. However, studies on adolescents are still relatively infantile. This study does support previous findings into this area, in that mindfulness cannot only reduce depression, but can be used as an effective preventative tool in both males and females (Griffith, Van der Gucht & Williams, 2014). Furthermore, mindfulness was the most powerful predictor of depression across all five variables. Demonstrating predictable power of 33% in males and 26% in females. As no significant difference was found in regards to the strength of relationship between mindfulness and depression in either males or females, it can be suggested that mindfulness-based interventions would be an effective strategy for reducing depression in both males and females.

*Frequency of exerci*se - Overall, a significant relationship was found between frequency of exercise and depression, however the effect size was small. When this was explored further, it was found that this relationship was only evident in males, meaning no significant relationship was found for females in regards to frequency of PA and depression. One explanation for the small effect size in males and the absence of a relationship in females, could possibly be explained by findings presented by Rethorst, Wipfli and Landers (2009), who found that frequency of PA and depression has a cut-off point of three to four times per week, where frequency stops being effective, after this point the impact plateaus. This means that there are

an optimum number of times to engage in PA and the relationship between frequency of PA and depression may not be continuous.

An understanding of why frequency of PA was not significantly correlated with depression in females can be offered from previous literature, whereby a number of studies established that girls were more likely to have depression and less likely to undertake regular PA, which consequently had been thought to lead to an underestimation of the strength of association between PA and depression in females (Rothon et al., 2010). Furthermore, females have been found to report higher levels of exercise dissatisfaction and be more critical of themselves and their bodies in relation to exercise performance (Edman, Wesley, Lynch & Yates, 2014). Therefore, Edman at al suggested that females have a higher level of perfectionism toward both the body and exercise performance than males, which can be associated with certain psychological problems such as depression.

Duration of PA – A significant negative relationship was found between duration of PA and depression meaning that the longer individuals participated in PA, the lower the reported levels of depression, which supports previous findings by Teycheme, Ball & Salmon, (2008). Although this study found a negative relationship existed, when further analysis was conducted, duration of PA was not found to be a predictor of depression in either males or females and the negative relationship effect size was small. This may be explained from a recent study conducted by, Wipfli, and Landers (2009), who found that depression levels did not continue to decrease as duration increased. They established that there was an optimum duration of 20-29 minutes of exercise in the overall population, and 45-59 minutes in clinically depressed population.

This particular area has received very little research, especially in relation to the impact of duration of exercise on mental health benefits. Furthermore, from the studies that have been conducted the findings have been contradictory. Therefore further research is required to draw appropriate conclusions.

Intensity of PA –The findings showed a significant negative relationship between intensity and depression, which suggests that the more intense/higher the levels of intensity, the lower the levels of depression. This finding is contradicted by many previous studies though, where it was established that moderate PA was more beneficial than both low intensity and high intensity. However, the majority of these studies were controlled experimental rather than correlational (Moses, Steptoe, and Matthews, 1989; Sund, Larsson and Wichstrom, 2010).

When further analysis was conducted, it was found that this relationship was only significant with males and produced a small effect size. Furthermore, intensity was demonstrated to be the only measure of PA that was found to be a predictor of depression in males (no predictor of PA existed with females). The positive association between exertion/intensity of physical activity level and depression among males and the absence/weakness of a relationship between this variable among females is similar to previous findings exploring such factors on adolescents (Goldfield et al., 2011). Although numerous studies indicate that exercise may be a protective factor in depression, some studies have found a positive association between excessive exercise and psychological distress among females. Stiles-Shields, Goldschmidt, Boepple, Glunz, and Le Grange (2011) found that driven exercise, which can be defined as an intense or excessive form of exercise, was associated with symptoms of depression and disordered eating among female youth seeking treatment for eating disorders.

Number of other participants – The results showed an overall negative significant relationship between the number of other participants who engage in physical activity and levels of depression. When this was explored by sex, it was found that this was only significant for females, providing support that females who engage in physical activity with a number of other individuals will have lower levels of depression. This is concordant with previous findings centered on developmental and social theories in regards to team sports and activities providing a foundation for emotional growth, protection against suicide and overall mental well-being (Taliaferro et al. (2008). One possible explanation for its significance with females rather than males could be in relation to improvement of the development of more interpersonal relationships. In a study conducted by Spotts et al (2004), quality of interpersonal relationships was found to be a strong predictor of depression in women. Furthermore, in a review focused specifically on adolescent depression, it was found that females demonstrated greater interpersonal depressive vulnerability and greater reactivity to stressful events involving others. These two findings were supported by a clinical study conducted by Zarshenas, Houshvar, & Tahmasebi (2013), who concluded that women who participated in group exercise for a period of four weeks showed a significant improvement and reduction in depressive symptoms in comparison to the control group. This was attributed to individuals developing more interpersonal relationships, as well as reinforcing and motivating each other to continue exercising, gain self-efficacy, and improve their mood.

While the above is important to explore and understand, it is essential to note that although a significant negative relationship was found with number of other participants and depression in females, the effect size was small, and when further

analysis was conducted, number of other participants was not found to be a predictor of depression.

4.2 Conclusion

This study provides some support for an association between levels of PA, mindfulness and decreased depressive symptoms in UAE adolescents. Most notably mindfulness can be recommended as a preventive strategy in the reduction of depression.

However, it further emphasizes the existence of several major gaps in this research area and the fact that few clear conclusions can be made. Further longitudinal research is required before PA can be recommended as a prevention strategy or treatment of depression in adolescents.

The aim of this research is to provide initial insight for psychologists and health authorities in regards to a potential prevention strategy for both depression and obesity, in order to deliver a foundation for future research into this area for adolescents in the UAE. Promoting PA is a valuable mental health strategy and could reduce the risk of adolescents developing depression. Furthermore, it may reduce the knock on effect depression has on personal, education, social, and economic factors.

4.3 Limitations

There are a number of limitations and caveats to note about this study. One of the major drawbacks of this research is that it is a correlational exploration. The main issues regarding this approach are three fold (Rodriguez & Llorca, 2004). 1) It is difficult to make a conclusive causal inference. As the study is exploring the relationship between factors, there may be a number of other variables impacting

/causing the correlation. Therefore, we cannot conclusively state that any of the four measures of PA causes a reduction in depression or symptoms of depression. An alternative explanation may be that individuals who are less depressed or less predisposed to depression, are more inclined to engage in PA. 2) A correlational study can only provide a snapshot of a situation, and results may differ if another time frame had been chosen. As no follow-up was conducted, we cannot generalize these findings across a period of time. 3) Prevalence-incidence bias - in this study it was found that 25% of the sample population were rated between moderate and severe on the BDI-II. However, the timing of the study should be mentioned. This study was conducted in May during a period of time where many of the sample population were taking exams, therefore, the percentage of individuals reporting symptoms of depression might be higher at this time than if, for example, they completed it in the summer break. In a recent survey, it was found that 54% of respondents, cited pressure and stress at school as being the main cause of depression (Maddern, 2014). Furthermore, during this period of time, individuals may not be as physically active due to time restrictions. If so, the reported frequency of PA would be under-represented.

An additional limitation of this approach is that it relies on a self-report approach to recording the frequency, duration, intensity and other participants involved in PA. In a recent comparative study, it was found that participants tended to report more vigorous PA and less sedentary time compared with actual results tracked using an accelerometer. This indicates that the self-report approach tended to over-estimate the amount and intensity of exercise (Dyrstad et al 2014).

Furthermore, although the BDI-II has been tested on a wide range of different cultures, it had not been specifically normalized or adapted for this sample. Therefore it may have produced inaccurate representation of depression.

The sample of respondents could also be stated as a limitation. Although there were over 40 different nationalities representatives, the majority of those were British (21%) and Indian (14%), the other nationalities made up the remaining total, with many nationalities only having 1-2 individuals, this therefore makes it difficult to generalize the findings to the overall adolescent population in the UAE.

Language of the instrument is arguably an additional weakness of the study, as it was only printed and distributed in English. Whilst the target population was international adolescents in the UAE, it may have been beneficial to have it developed in other languages, most notably Arabic.

4.4 Further Research

Understanding the impact of PA and mindfulness on depression is a significantly important area. This study provides an initial understanding of the impact of different types of PA, different measures of PA and mindfulness on depression. However, given the limitations mentioned above, there is a vast amount of scope for further study and research. Below are a number of recommendations on how this study could be further developed and improved.

The optimum study in this area would involve longitudinal experimental studies that use accelerometers to precisely measure the frequency, duration and intensity of PA, across a period of time, thus removing the reliance on self-report measures and the limitations imposed by that of a correlational study. Alternatively, it would further progress this area of research by understanding the impact of PA on

a group of clinically depressed adolescents compared to a non-depressed sample, by exposing both groups to the varying frequencies, duration and intensities of exercise.

In addition, to draw evidence based conclusions regarding the impact of mindfulness on depression, it would be beneficial to conduct a controlled comparative study, where half the participants were exposed to a mindfulness intervention compared with a controlled group, with assessment of outcomes at baseline (pre-intervention), post- intervention and follow-up.

One area that could be further explored is the power of the relationship of PA and depression against psychosocial factors to understand if certain conditions need to be met in order for PA to reduce depression. For example, Rothon et al. (2010), offered four main explanations for why PA reduces depression, which include, 1) Distraction – in that individuals focus is shifted away from their negative thoughts. 2) Mastery – the completion of tasks and sense of achievement leads to improved mood. 3) Social interaction – the majority of PA, especially in young people, involves social interaction amongst peers and, 4) Self-esteem – the potential to modify their body can lead to improved image and self-confidence. Therefore, it could offer greater insight to measure each of these areas to understand if they impacted the strength of relationship.

In order to provide generalizable findings about the PA, mindfulness and depression in UAE adolescents, it would be recommended that a more representative sample be involved in the study.

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Appendix

Appendix 1 – Seven item instrument measuring mindfulness, depression and PA

UAE UNIVERSITY
Physical activity and mindfulness in preventing depression in UAE adolescents
Psychology Department
Participant Consent Form

Purpose and benefit:
The purpose of this research is to examine the impact of physical activity on individuals overall mood and outlook to explore potential differences between types of physical activity. Furthermore it will also explore the impact of individual's awareness on their mood. The benefit of this study is to identify if there are optimum levels and types of physical activity that can prevent depressive symptoms.

This questionnaire will be incorporated into a report contributing towards a thesis for a Masters in Clinical Psychology programme.

Procedure:
This study is made up of a total of 37 questions that will explore physical activity habits, awareness and mood.

The total time required to complete the survey should be approximately 15 minutes.

Voluntary Nature of the Study/Confidentiality:
Your participation in this study is entirely voluntary and you may refuse to complete the survey at any point during the experiment, or refuse to answer any questions with which you are uncomfortable. You may also stop at any time and ask the researcher any questions you may have. Your name will never be connected to your results or to your responses on the questionnaires. Information that would make it possible to identify you or any other participant will never be included in any sort of report. The data will be accessible only to those working on the project.

Instructions
Please read each section carefully and answer as accurately as possible.

Once you have completed the survey please hand it to a member of the staff.

Remember there are no right or wrong answers.

Contacts and Questions:
If you have questions later, you may contact Fiona Barron at 201270167@uaeu.ac.ae

Statement of Consent:
I have read the above information.. I consent to participate in this study.

Name of Participant (optional)_____Date: _____
(please print)

Signature of Participant _____

If you are interested in receiving the results please provide your email address below
_____

Thank you for your participation!

Gender
Age
School
Nationality

Below are 10 statements, please rate from 1-5 which you agree with the most for each one.

		Rarely/Not at all	Sometimes	Often	Almost always
		1	2	3	4
1	It is easy for me to concentrate on what I am doing				
2	I can tolerate emotional pain				
3	I can accept things I cannot change				
4	I can usually describe how I feel at the moment in considerable detail.				
5	I am easily distracted. (R)				
6	It's easy for me to keep track of my thoughts and feelings				
7	I try to notice my thoughts without judging them				
8	I am able to accept the thoughts and feelings I have				
9	I am able to focus on the present moment				
10	I am able to pay close attention to one thing for a long period of time				

Question 6. Choose the one statement, from among the group of four statements in each question that best describes how you have been feeling during the past few days/weeks. Please put a 'x' in the number beside your choice

Statements	**Score**
1. Sadness	
0 I do not feel sad.	
1 I feel sad much of the time.	
2 I am sad all of the time.	
3 I am so sad or unhappy that I can't stand it.	
2. Pessimism	
0 I am not discouraged about my future.	
1 I feel more discouraged about my future than I used to be.	
2 I do not expect things to work out for me.	
3 I feel my fortune is hopeless and will get only worse.	
3. Past Failure	
0 I do not feel like a failure.	
1 I have failed more than I should have.	
2 As I look back I see a lot of failures.	
3 I feel I am a total failure as a person.	

4. Loss of Pleasure	
0 I get as much pleasure as I ever did from the things I enjoy.	
1 I don't enjoy things as much as I used to.	
2 I get very little pleasure from the things I used to enjoy.	
3 I can't get any pleasure from the things I used to enjoy.	
5. Guilty Feelings	
0 I don't feel particularly guilty.	
1 I feel guilty over many things I have done or should have done.	
2 I feel quite guilty most of the time.	
3 I feel guilty most of the time.	
6. Punishment Feelings	
0 I don't feel I am being punished.	
1 I feel I may be punished.	
2 I expect to be punished.	
3 I feel I am being punished.	
7. Self-Dislike	
0 I feel the same about myself as ever.	
1 I have lost confidence in myself.	
2 I am disappointed in myself.	
3 I dislike myself.	
8. Self-Criticisms	
0 I don't criticize or blame myself more than usual.	
1 I am more critical of myself than I used to be.	
2 I criticize myself for all of my faults.	
3 I blame myself for everything bad that happens.	
9. Suicidal Thoughts or Wishes	
0 I don't have any thoughts of killing myself.	
1 I have thoughts of killing myself, but I would not carry them out.	
2 I would like to kill myself.	
3 I would kill myself if I had the chance.	
10. Crying	
0 I don't cry anymore than I used to.	
1 I cry more than I used to.	
2 I cry over every little thing.	
3 I feel like crying, but I can't.	
11. Agitation	
0 I am no more restless or would up than usual.	
1 I feel more restless or would up than usual.	
2 I am so restless or agitated that it's hard to stay still.	
3 I am so restless that I have to keep moving or doing something.	
12. Loss of Interest	
0 I have not lost interest in other people or activities.	
1 I am less interested in other people or things than before.	
2 I have lost most of my interest in other people or things.	

3 It's hard to get interested in anything.	
13. Indecisiveness	
0 I make decisions about as well as ever.	
1 I find it more difficult to make decisions than usual.	
2 I have much greater difficulty in making decisions than usual.	
3 I have trouble making any decision.	
14. Worthlessness	
0 I do not feel I am worthless.	
1 I don't consider myself as worthwhile and useful as I used to.	
2 I feel more worthless as compared to other people.	
3 I feel utterly worthless.	
15. Loss of Energy	
0 I have as much energy as ever.	
1 I have less energy than I used to have.	
2 I don't have enough energy to do very much.	
3 I don't have enough energy to do anything.	
16. Changes in Sleeping Patterns	
0 I have not experienced any change in my sleeping pattern.	
1 I sleep somewhat more/less than usual.	
2 I sleep a lot more/less than usual.	
3 I sleep most of the day.	
I wake up 1-2 hours early and can't get back to sleep.	
17. Irritability	
0 I am no more irritable than usual.	
1 I am more irritable than usual.	
2 I am much more irritable than usual.	
3 I am irritable all the time.	
18. Changes in Appetite	
0 I have not experienced any change in my appetite.	
1 My appetite is somewhat greater/lesser than usual.	
2 My appetite is much greater/lesser than usual.	
3 I crave food all the time or I have no appetite at all.	
19. Concentration Difficulty	
0 I can concentrate as well as ever.	
1 I can't concentrate as well as usual.	
2 It's hard to keep my mind on anything for very long.	
3 I find I can't concentrate on anything.	
20. Tiredness or Fatigue	
0 I am no more tired or fatigued than usual.	
1 I get more tired or fatigued more easily than usual.	
2 I am too tired or fatigued to do a lot of the things I used to do.	
3 I am too tired or fatigued to do most of the things I used to do.	

Question 1. Please rate below how often you engage in the following physical activity and sports in a typical week or in the last week.
Example: 2 = Twice a week
3 = Three times a week

	Type of exercise	Frequency of exercise (number of times a week)							
		0	1	2	3	4	5	6	7
		Never							Everyday
	Archery								
	Badminton								
	Basketball								
	BMXing								
	Boxing								
	Cricket								
	Cycling								
	Dance								
	Diving								
	Fencing								
	Frisbee								
	Football								
	Golf								
	Gym Workout (push ups, squats, lunges, sit ups etc.)								
	Gym Workout (cardio machines - treadmill, row machine, cross trainer etc.)								
	Gymnastics								
	Hockey								
	Horse/camel riding								
	Ice Skating								
	Kayaking/Rowing								
	Martial Arts (judo, jujutsu, karate etc)								
	Netball								
	Paddle boarding								
	Rugby								
	Running								
	Scuba Diving								
	Skateboarding								
	Skiing/snowboarding								
	Snorkeling								
	Squash								
	Surfing								
	Swimming								
	Table tennis								
	Tennis								
	Trampolining								
	Volleyball								
	Wake-boarding								
	Walking								
	Weight training (Dumbbells, kettle bells etc)								
	Yoga & Pilates								

Question 2. Please rate below in minutes how long you engage in the following physical activity and sports in a typical week or in the last week.
Example: 30 = Thirty minutes each time
90 = 90 minutes each time (1 hour 30 minutes)

	Type of exercise	Duration of exercise (in minutes)
	Archery	
	Badminton	
	Basketball	
	BMXing	
	Boxing	
	Cricket	
	Cycling	
	Dance	
	Diving	
	Fencing	
	Frisbee	
	Football	
	Golf	
	Gym Workout (push ups, squats, lunges, sit ups etc)	
	Gym Workout (cardio machines - treadmill, row machine, cross trainer etc)	
	Gymnastics	
	Hockey	
	Horse/camel riding	
	Ice Skating	
	Kayaking/Rowing	
	Martial Arts (judo, jujutsu, karate etc)	
	Netball	
	Paddle boarding	
	Rugby	
	Running	
	Scuba Diving	
	Skateboarding	
	Skiing/snowboarding	
	Snorkeling	
	Squash	
	Surfing	
	Swimming	
	Table tennis	
	Tennis	
	Trampolining	
	Volleyball	
	Wakeboarding	
	Walking	
	Weight training (Dumbbells, kettle bells etc)	
	Yoga & Pilates	

Question 3. While doing physical activity, we want you to rate your perception of exertion. This feeling should reflect how heavy and strenuous the exercise feels to you, combining all sensations and feelings of physical stress, effort, and fatigue. Do not concern yourself with any one factor such as leg pain or shortness of breath, but try to focus on your total feeling of exertion.

Look at the rating scale below while you are engaging in an activity; it ranges from 0-10, where 0 means "no exertion at all" and 10 means "maximal exertion." Choose the number from below that best describes your level of exertion.

Try to appraise your feeling of exertion as honestly as possible, without thinking about what the actual physical load is. Your own feeling of effort and exertion is important, not how it compares to other people's. Look at the scales and the expressions and then give a number, based on a typical/average session

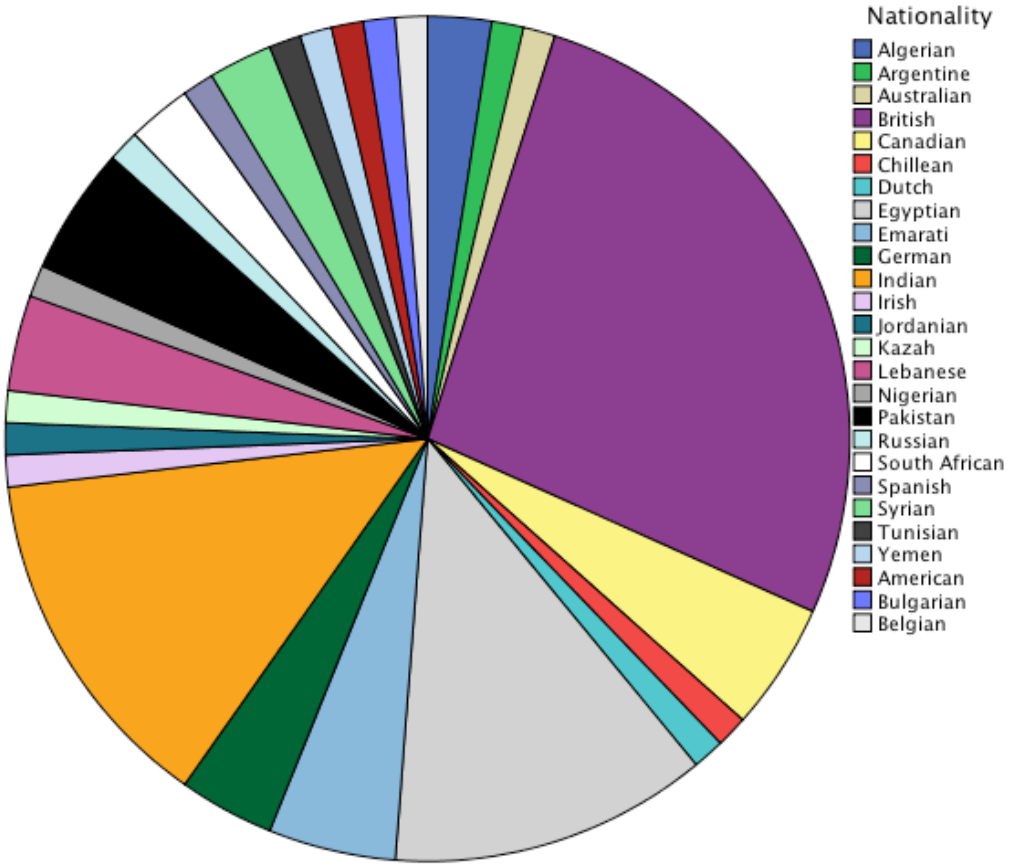
Type of exercise	Intensity of exercise									
	1	2	3	4	5	6	7	8	9	10
	RESTING	MIN	LIGHT	LIGHT	MODERATE	MODERATE	HARD	HARD	VERY HARD	MAXIMAL EXERTION
	No exertion	Barest exertion	Comfortable, slight difficulty breathing	Breaking a sweat, comfortable speaking	Speaking is easy, light sweating	Moderate sweating, able to speak	Heavy sweating, difficulty speaking	Difficulty breathing, unable to speak	Almost at maximum, heavy sweating, breathless	Cannot push any harder
Archery										
Badminton										
Basketball										
BMXing										
Boxing										
Cricket										
Cycling										
Dance										
Diving										
Fencing										
Frisbee										
Football										
Golf										
Gym Workout (push ups, squats, lunges, sit ups etc)										
Gym Workout (cardio machines - treadmill, row machine, cross trainer etc)										

	Gymnastics										
	Hockey										
	Horse/camel riding										
	Ice Skating										
	Kayaking/Rowing										
	Martial Arts (judo, jujutsu, karate etc)										
	Netball										
	Paddle boarding										
	Rugby										
	Running										
	Scuba Diving										
	Skateboarding										
	Skiing/snow boarding										
	Snorkelling										
	Squash										
	Surfing										
	Swimming										
	Table tennis										
	Tennis										
	Trampolining										
	Volleyball										
	Wakeboarding										
	Walking										
	Weight training (Dumbbells, kettle bells etc)										
	Yoga & Pilates										

Question 4. Please rate below how many others you normally engage in the following physical activity and sports with.

	Type of exercise	Who I engage in activities with						
		1	2	3	4	5	6	7
		Alone	With 1 other	With 2-3 others	With 4-5 others	With 5-6 others	With 6-7 others	With 8+ others
	Archery							
	Badminton							
	Basketball							
	BMXing							
	Boxing							
	Cricket							
	Cycling							
	Dance							
	Diving							
	Fencing							
	Frisbee							
	Football							
	Golf							
	Gym Workout (push ups, squats, lunges, sit ups etc)							
	Gym Workout (cardio machines - tredmill, row machine, cross trainer etc)							
	Gymnastics							
	Hockey							
	Horse/camel riding							
	Ice Skating							
	Kayaking/Rowing							
	Martial Arts (judo, jujutsu, karate etc)							
	Netball							
	Paddle boarding							
	Rugby							
	Running							
	Scuba Diving							
	Skateboarding							
	Skiing/snowboarding							
	Snorkelling							
	Squash							
	Surfing							
	Swimming							
	Table tennis							
	Tennis							
	Trampolining							
	Volleyball							
	Wakeboarding							
	Walking							
	Weight training (Dumbbells, kettle bells etc)							
	Yoga & Pilates							

Appendix B - A Pie Chart to Show the Distribution of Nationalities



Appendix C – Preparental consent forms

DUBAI ENGLISH SPEAKING COLLEGE
PO Box 125814, Dubai,
United Arab Emirates.
TEL: 04-3604866
FAX: 04-3604864
Email: headteacher@descdubai.com
WEBSITE: www.descdubai.com

PRINCIPAL
Andrew Gibbs
Headteacher
Chris Vizzard

كلية دبي للتخاطب بالإنجليزية
ص.ب: ١٢٥٨١٤، دبي
الإمارات العربية المتحدة.
تليفون: ٠٤-٣٦٠٤٨٦٦
فاكس: ٠٤-٣٦٠٤٨٦٤
Email: headteacher@descdubai.com
WEBSITE: www.descdubai.com

Dear Parents,

Over the course of your child's time with us at DESC we may ask them to participate in various surveys or questionnaires for research purposes.

This is an extremely beneficial way for us to understand trends, developments and changes across a broad range of factors that may affect your child's experience at DESC. Results of such surveys help us to incorporate necessary changes to enhance your child's experience.

We are writing to you to request your consent for your child to participate in such research.

The college will decide whether or not to approve each study based on our own ethical guidelines and standards. Any information collected will remain completely confidential and your child's name will remain anonymous.

We thank you in advance for your cooperation.

Kindest regards,

M Cotgrove

Mr M Cotgrove
Deputy Headteacher

……..

I, (full name of parent)……., give permission for my child (full name of child)…….to participate in future surveys/questionnaires carried out by DESC.

If you have any concerns regarding this permission, please do not hesitate to contact me at the college.

Relationship to child……

Signature…… Date……

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Fax. +971 4 321 1991

Dear parent,

Over the course of your child's academic time with us, we may wish for them to participate in various surveys/questionnaires.

This can be an extremely beneficial way of understanding trends, developments and changes across a range of fields and help us to incorporate necessary changes and services to your child's experience.

Therefore we request your pre-consent for participation in future research.

The school in compliance with our ethical guidelines and standards will approve anything that they will be involved in. Furthermore the information collected will remain completely confidential and your child's name/identity will remain anonymous.

We thank you in advance for your cooperation.

I (full name of parent) _____, Give permission for my child (full name of child) _____ to participate in future surveys/questionnaires distributed by (name of school).

Relationship to child _____

Signature_____

Date _____