

A Review of Literature:
The impact of competitive school sport on students' academic performance within school as well as other factors such as improved diet, health and wellbeing.

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This review contains the identification and synthesis of existing published evidence (both in the UK and international) examining the impact of competitive school sport on students' academic performance within school as well as other factors such as improved diet health and wellbeing.

1.0 Introduction

Children's engagement in sports competition is known to contribute to the developmental outcomes for a healthy lifestyle, where children learn about physical, social and cognitive skills (Choi et al, 2014). More broadly, engagement in physical activity is also recognised to contribute a range of positive outcomes, specifically; physical and mental health, social wellbeing, cognitive and academic performance (Bailey et al, 2013).

For young people to achieve such outcomes it is recognised that physical education (PE) in schools is an ideal vehicle to promote physical activity due to its availability to all young people. Whilst teachers also have the opportunity to integrate this into the overall education process (Telford et al 2012).

The associations found for participation in competitive sport and physical activity often yield multiple benefits. Bailey et al (2013) recognise that such benefits are not autonomous, independent or disconnected, but instead reinforce each other.

Despite these recognised benefits, it remains a concern that within schools "the increasing pressures to improve academic scores often lead to additional instructional time for subjects such as mathematics and language at the cost of time for being physically active" (Singh et al, 2012). In agreement, Trudeau and Shepard (2008) stated that if we want to improve the academic achievement, physical fitness and health of our young people, we should not be limiting the time allocated to PE and school sport.

Where possible, this review draws upon evidence that explores the impact of competitive school sport on young people. However, due to the limited research available on these competition specific outcomes, the findings presented focus on the role physical activity, PE and school sport play on the holistic development of the child. Particular attention has been paid to the academic, diet and health and wellbeing outcomes for young people.

2.0 Method

The literature was explored for 2 themes; 1) academic performance 2) improved diet and health and wellbeing. For each theme a comprehensive list of relevant journal articles were collated using a range of sources, including peer reviewed journal articles and reports. The peer reviewed journal articles were located and accessed using Primo Central (resource index). Key search terms included “competitive school sport and academic performance”, “impact of school sport on academic achievement”, “health benefits of school sport”, “competitive school sport and health and wellbeing” and “school sport and improved diet”. Approximately 353,615 journal articles were located. The first 200 articles of each search were observed. From these, 248 were deemed relevant to review for this research, and 73 were used in the review. These 73 have been recorded in a summary table (Appendix 1).

Further searches through other sources were also carried out to locate primary research articles within the literature. These have been recorded within the reference list.

Literature searches were primarily focused on the impacts of competitive school sport, school sport and physical education where possible, but also included physical activity. These terms were commonly used synonymously.

References are made to additional authors and their studies throughout the review. Where detail of their studies is not provided, this can viewed by accessing the original research using the full reference provided in the reference list.

2.1 Academic performance

Of the 28 research studies sourced systematically using the primary method outlined above, 18 conducted their own research to explore the association between the two variables. All of these studies concluded that involvement in school sport positively impacts academic performance.

2.2 Health and wellbeing and diet

45 relevant articles were sourced and used within the literature review regarding this topic. These revealed numerous physical and psychological health benefits of sport. Of the 45 articles retrieved, 22 completed their own research to examine the relationship between sports participation and health. They found that sport either positively impacts upon or has no relationship with health. The results of these research articles will now be discussed.

3.0 Academic performance

There is a growing body of research, both in the UK and internationally, which has found a positive association between participation in physical activity, and higher academic performance in young people (Chaddock et al, 2012; Singh et al, 2012; Lleras, 2008; Trudeau and Shepard, 2008; Strong et al, 2005; Taras, 2005).

Amongst this research there are some key reviews which have studied the influence of physical activity on academic performance (Trudeau and Shepard, 2008; Singh et al, 2012 and Taras, 2005). In detail:

Trudeau and Shepard (2008) reviewed the literature on the relationship between PE, school physical activity and school sports on academic performance. They concluded that physical activity can be added to the school curriculum by taking time from other subjects without the risk of hindering student's academic achievement. Further conclusions were made stating the literature strongly suggests that academic achievement, physical fitness and health of children will not be improved by limiting the time allocated to PE instruction, school physical activity and sports programmes. It was also reported that cross-sectional studies generally indicate a positive association between physical activity and academic achievement.

A review by Singh et al (2012) aimed to describe the prospective relationship between physical activity and academic performance, focusing only on longitudinal studies. It was concluded that participation in physical activity is positively related to academic performance in children, however only 2 high quality studies were found and the need for future high-quality studies was highlighted. These future studies should also examine the dose-response relationship between the two variables as well as explanatory mechanisms for this relationship.

Taras (2005) reviewed literature investigating the association between physical activity and academic outcomes among school-aged children. It was recognised that physical activity is well associated with improved overall health and that among school-aged children it can help develop social skills, improve mental health, and reduce risk-taking behaviours. It was concluded that there may be some short-term benefits of physical activity, such as concentration. The long-term improvement on academic performance is a result of more vigorous physical activity but further research is needed in this area.

3.1 Test results and grades

A key indicator of this educational success is improved test results and overall grades.

Recent research in the UK, undertaken by Booth et al (2013), investigated associations between physical activity and academic attainment in UK adolescents. Accelerometry data on 4,755 11 year olds was used from the Avon Longitudinal Study of Parents and Children and linked with nationally administered school assessments in English, Mathematics and Science at ages 11, 13 and 16. It was concluded that regular moderate to vigorous physical activity improves adolescents' academic performance, and particularly seems to help girls do better in science. A dose-response relationship

was identified, whereby the more intensive exercise undertaken, the greater the impact on test results. This further emphasises the need for young people to undertake regular physical activity of moderate to vigorous levels. This research is of key significance, due to positive associations and its research design (longitudinal and an objective measurement of physical activity).

An American study by Nelson and Gordon-Larsen (2006) found that from a cohort of 11,957 American seventh to twelfth graders, those who were active were more likely to achieve higher grades in Mathematics and English. In agreement with these findings, Lipscomb (2007) found that participation in sport amongst 16,449 American eighth graders was associated with a 2% increase in Mathematics and Science tests scores and a 5% increase in Bachelor degree attainment expectations. Both of these studies used self-reported levels of physical activity.

In a similar manner, Sigfúsdóttir, Kristjánsson & Allegrante (2007) explored the relationship between self-reported physical activity and academic achievement in 5,810 Icelandic 14 and 15 year olds. They concluded that the correlation between the two variables was positive, although only of modest strength.

Despite the similar age ranges of these studies, the strength of the impact of physical activity appears to vary in accordance with the country in which the study took place. These varying degrees of impact may be the result of the intensity, quality or type of activity participated in and possibly linked to cultural differences.

The above studies using self-reported physical activity data rely upon subjective data which is liable to inaccuracies, whereas studies that use objective measures such as accelerometer data are of higher quality as in the study undertaken by Booth et al (2013).

3.2 School attendance

Another of the reported outcomes related to academic performance was school attendance rates and school engagement of young people.

Large cross-sectional studies have shown a positive relationship between participation in sports programmes and school attendance and between physical fitness and school attendance (Stead and Neville, 2010). Welk et al (2010) also suggested that health-related fitness is positively associated with school attendance. However, this increased attendance is insignificant if the students do not focus, think and behave appropriately, and work productively whilst they are at school. The other performance indicators relate to these broad topics, which it could be argued, are more difficult to measure.

3.3 Attitudes and aspirations of young people

The attitude of students has the potential to greatly affect their grades as this directly influences their behaviour and the effort they put into their work. Darling, Caldwell and Smith (2005) measured the attitudes which 3,761 American high school students held towards school. Through the use of a questionnaire, the participants reported their value and commitment to school on a 4-point scale

from 1 (strongly agree) to 4 (strongly disagree). The results of this suggested that participants in extra-curricular sport had more positive attitudes to school than those pupils who did not participate in this activity. Moreover, Stead and Neville (2010) recognised that PE, physical activity and sport have been shown to positively impact the extent to which young people feel connected to their school, the aspirations of young people and the positive social behaviours which exist within their school.

Similarly, Darling, Caldwell and Smith (2005) also discovered that young adolescent athletes also hold higher academic aspirations than non-athletes, when asked what was the highest level they expect to reach in school is. This was ranked using a 1-6 rating scale of likeliness of staying at school by each research participant. Additionally, this study revealed that the more time spent participating in sport, the higher the individual's aspirations were. Thus, it is unsurprising that academics have claimed that sport increases the effort which young people exert academically.

3.4 Behaviour at school

Jonker et al (2010) found that elite Dutch football players aged 12-16 self-reported higher levels of effort; willingness to achieve a task goal, in school than the control group who did not participate in sport. In a similar way, it is unsurprising that Mahar (2011), reported increased and improved on-task behaviour amongst American elementary school students following short bouts of physical activity in a classroom setting.

Stead and Neville (2010) also contribute to this topic of researching by noting that as little as 10 minutes of additional organised physical activity in or outside the classroom implemented into the school day improves classroom behaviour, and consequently may enhance academic performance.

3.5 Learning abilities

These outcomes of sporting participation on academic performance can be seen as the result of non-sporting skills and habits which sport can teach individuals.

The enhanced learning abilities of students are often noted as an example of this. Schilling et al (2006) report that being active and moving during play facilitates verbal, visual, and kinaesthetic learning, whilst Jonker et al (2010) mention an increased use of self-regulatory skills amongst athletes, particularly effort, monitoring and evaluation. These findings are also reflected in the work of Pfeifer and Cornelißen (2010) who concluded that sport encourages the development of behavioural habits such as discipline; increases young people's motivation and confidence, and assists in the teaching of skills such as following instructions. Thus, this not only leads to an increased willingness to reach their potential, but also provides them with the basic skills needed to do this.

Another positive outcome of sporting participation is increased productivity as a result of enhanced attention. Castelli et al (2007) and Kamijo et al (2011) both reported that young people who are more physically active appear to have greater allocations of attention resources for the working memory, which will undoubtedly help them when learning in school. These improved attention

abilities can be attributed to a variety of cognitive changes which alter the structure and function of the brain (Hillman et al 2012). There is evidence that physical activity improves circulation, increases blood flow to the brain and raises levels of norepinephrine and endorphins – all of which may reduce stress, improve an individual's mood and have a calming effect on the individual, which as a result may improve academic performance (Taras, 2005; Fleshner, 2000; and Morgan, 1994). Many studies have also implied that participation in sport improves and quickens cognitive processing (Buck, Hillman, and Castelli 2008; Castelli et al, 2007; Hillman et al, 2009; Tomporowski et al, 2007; Van Dusen et al, 2011), thus enhancing mental alertness, concentration and focus (Bailey, 2006; Basch, 2010; Beets et al, 2009; Brisswalter et al, 2002; Cotman and Berchtold, 2002, Trudeau and Shepard, 2008).

These cognitive changes coupled with improvements in attitude, aspirations, attendance, effort and on-task behaviour facilitate increased productivity in lessons, therefore improving the likelihood of achieving better academic grades (Pfeifer & Cornelißen, 2010). In this way, the evidence from the journal articles reviewed suggests that the impact of sporting participation upon academic performance is significantly positive due to the extensive range of outcomes.

4.0 Conclusion

Based upon the literature reviewed here, there are clear, academically backed findings that indicate the positive role of sport-related forms of physical activity.

It is a challenge to relate the direct role of competitive school sport to these known associations. It can be presumed that as these exist from participation in physical activity, that participation in competitive sport will reflect these. The question that remains is whether it further strengthens this association.

A review by Choi et al (2014) addresses this gap in the literature, recognising the wide range of positive outcomes that exposure to sports competition can have on children early in life (behavioural, physical and psychosocial). Most notably, through competition children are provided with excellent opportunities to build their skills, develop their social adjustment; integration and emotional growth. Competition is also thought to contribute to children's ability to work with others in the achievement of shared goals.

When it comes to long-term success, competition helps children be better prepared for the challenges they will face in the future, whilst helping them to learn effective emotional and psychological skills and strategies to deal with winning and losing, as well as success and failure (Choi et al, 2014).

4.1 Study strengths and weaknesses

This collection of research papers boasts a number of strengths as well as limitations when assessing the impact of sport on academic performance. The studies were conducted across a range of school years, used a wide variety of indicators of academic behaviour, performance and achievement, and generally had relatively large sample sizes. However, there were also significant methodological

limitations within these studies, which may weaken the overall significance and reliability of the results and conclusions made.

Although the review revealed a variety of research designs, measures and populations, it was often difficult to make comparisons and summaries regarding the extent of association between sport and academic performance because not enough papers focused and analysed the same variables. The lack of longitudinal studies or follow-up studies proved to be an issue as this did not allow for an exploration of causality.

A further problem with the methodological make-up of the studies was the selection biases and limited examination of data concerning subgroups of gender, race, ethnicity and different socioeconomic status, amongst others. This limits the data which was collected and analysed, and this disables the possibility of providing an accurate picture.

Despite the usefulness of identifying a wide range of academic indicators, the measures of the majority of variables measured were not standardised, which may limit the reliability of the results. The lack of sufficient definitions provided regarding what is meant by “sport”, “physical activity” and “physical fitness” proves to be problematic. It appears that these terms are often used synonymously.

4.2 Future research

Trudeau and Shepard, 2008; Singh et al, 2012 and Taras, 2005, identified that further research is needed to better understand the relationship between physical activity and academic performance. Examining the dose-response explanatory mechanisms for this relationship are areas for further research, with a focus on longitudinal studies which use objective measures of physical activity. Current research in this area is beginning to emerge, for example, the study undertaken by Booth et al (2013).

There was a distinct lack of research papers exploring the direct relationship between competitive school sport and academic achievement. Therefore, to reinforce the known associations for physical activity, more specific research around competitive school sport is required to draw out the competitive nature.

5.0 Improved diet and health and wellbeing

In 1948, the World Health Organisation (WHO) defined health as a “state of complete physical, mental and social wellbeing, and not merely the absence of disease and infirmity” (WHO, 2006). This definition has not been amended by this organisation since, but academics, amongst others, have produced their own definitions. One such categorisation was provided by Ewles and Sirmett (1999). They categorised the notion of health into five separate aspects: (1) physical health which relates to the mechanistic role of the body; (2) mental health which is deemed to be the ability to think clearly and logically; (3) emotional health which involves being able to recognise different emotions and to convey these emotions appropriately; (4) social health which is the ability to create and maintain relationships with other people; and (5) spiritual health which is associated with religious values and customs (Ewles & Simnett, 1999). There is a substantial body of research which examines the link between sport and health. A significant amount focuses on the general population; however there is an emerging research direction which seeks to investigate the effects of sports participation specifically on the health of school aged children.

A review of the literature revealed that the key health benefits of sport on young people could be grouped into the physical and mental categories of health as described by Ewles and Sirmett (1999). Although the enhanced emotional wellbeing of young athletes was mentioned, there were no specific benefits noted in relation to this. Moreover, there does not appear to be literature concerning the link between sport and spiritual health. Further research regarding the social benefits of sports participation however did indicate that there is existing literature available which examines the relationship between the two variables. This centres around the facilitation of social inclusion (Collins, 2003). That is, sport is seen to provide an opportunity for individuals from different backgrounds to meet, communicate and thus develop social networks and unite communities (Bailey, 2004).

5.1 The physical health benefits of sport participation

The physical health benefits of sport have been widely documented. In a review of youth sport, Blom et al (2013) identified a range of benefits which include improved bone mineral density, increased strength, stamina, flexibility and endurance, as well as enhanced functioning of cardio-respiratory and muscular systems, reduced risk of chronic illnesses and favourable changes to body composition.

5.1.1 Chronic diseases

It is proposed that a significant benefit of sports participation is the decreased risk of developing chronic diseases. While young people do not usually suffer from chronic illnesses such as heart disease, diabetes or osteoporosis, risk factors can begin to develop early in life (US Department of Health and Human Services, 2008). A report entitled “Physical Activity Guidelines for Americans” which was published by the US Department of Health and Human Services in 2008 suggests that regular physical activity reduces the likelihood of the risk factors developing and therefore increases the chances of children remaining healthy as adults (US Department of Health and Human Services, 2008). McMurray and Andersen (2010) corroborate these claims by also implying that sport decreases the risk of developing cardiovascular disease and other chronic illnesses. However, there does not appear to be any tangible evidence surrounding this topic. Future research needs to focus on providing sufficient figures on this relationship. Moreover, longitudinal studies would be highly beneficial in explaining the link and causality further.

5.1.2 Obesity

Sports participation has also been associated with a reduced risk of obesity (Ness et al, 2007). The discussion concerning the relationship between sport and obesity has become more prominent over the last two decades as the worldwide crisis of obesity has emerged and escalated. The 2011 Health Survey for England report indicated that approximately 3 in 10 boys and girls aged 2 to 15 were classified as overweight (31%) or obese (28%) (The Health and Social Care Information Centre, 2012). The Foresight Report, produced by Butland et al (2007) estimated the projected 2050 English obesity rates to be 26% for males and females under the age of 20, 14% by 2025, and 10% by 2015. Thus, it is unsurprising that a variety of methods are being introduced to reduce the likelihood of this obesity epidemic.

Many individuals, organisations and governmental departments suggest that physical activity and sport has the potential to reduce body fat, and therefore decrease the risk of obesity (Burke et al, 2006; US Department of Health and Human Services, 2008). Burke et al (2006) found that greater fitness amongst 602 Australian 11-14 year olds was associated with a reduced risk of obesity. Moreover, a study by Dencker et al (2006) on the effects of physical activity on the percentage of body fat of 248 Swedish 8-11 year olds revealed that there is a strong cross-sectional association between physical activity and obesity. Additionally, this appears to be stronger for the higher intensity activity (Dencker et al, 2006). Ness et al (2007) found similar findings in a cross sectional analysis on 5,500 12 year old children who were enrolled into the English Avon Longitudinal Study of Parents and Children. The results of this study illustrated that moderate to vigorous physical activity

reduced fat mass, and thus, reduced the risk of obesity. A further study by Pallan et al (2013) identified a small but significant association between the inter-school variation in body mass index in English primary school children and school-based physical activity. The results suggest that the time devoted to PE and school in sport may influence weight status (Pallan et al, 2013). Although this study investigates primary school children in year six, the findings have partial significance to the review as it demonstrates that there are already issues with obesity prior to children attending secondary school.

A criticism of these results however, is the presence of weak or modest associations between physical activity participation and reductions in obesity, which may be the result of the multi-causality of obesity; numerous factors contribute to obesity, including diet and family life. Therefore, changes in these areas are also needed to accompany alterations in the time spent exercising to ensure that significant reductions in obesity and the risk of obesity are made (Stouffer & Dorman, 1999; Verduin et al, 2005) Following on from this, the impact of sports participation on the diet of young people will now be discussed.

5.1.3 Diet

Meyer et al (2000) suggested that a healthy diet is essential for the overall health of children during their vital years of growth and development. Following the onset of the obesity epidemic, the significance of a healthy diet has also been connected to a reduced risk of obesity.

Several researchers have begun observing the connection between sports participation and diet in young people. Cavadini et al (2000), Croll et al (2006), Ottevaere et al (2011) and Tomlin et al (2013) have all conducted studies surrounding this association and have concluded that adolescents who participate in sport have a healthier diet than their non-sporting peers. Tomlin et al (2013) observed the dietary patterns of 1421 Canadian 10-11 year olds. Through the use of two questionnaires and a 24-hour dietary recall, the sports participation levels and food intake of the participants were measured. The results indicated that those involved in organised sporting activity consume more calories, fat, fibre, fruit, non-flavoured milk and vegetables than those who do not participate in sport or physical activity. It was concluded that although the sporting group of participants consumed more calories, they have healthier diets and lower BMI's in comparison to their non-athletic counterparts.

Jago et al (2004) conducted a study on the relationship between physical activity and diet and found some association between the variables, but the results varied in accordance with gender. The study utilised activity monitors and dietary recalls to record the food intake and mean time of moderate to vigorous activity completed by 210 8-10 year old African-American girls. Whilst they found that increased physical activity was related to lower fat intake and lower BMI, it was also associated with higher carbohydrate intake.

While the above studies have found associations between the variables, there are research papers available which indicate that there is no relationship between sport and diet. Vissers et al (2013) observed 4 days of food diaries and 7 days of accelerometry for 1317 British children aged 9 and 10. No obvious association was present between diet and physical activity; there were no significant

associations for females, and although there were some associations found for males, these were relatively weak. Thus, it was concluded that there was no relationship between the variables. Similarly, McNaughton et al (2008) could not find a consistent relationship between physical activity and the dietary patterns of 764 Australian 12-18 year olds when analysing the results of the Australian National Nutrition Survey, with only their high sugar and fat consumption patterns related with high levels of physical activity. Although these two studies explored the association for different demographics and used different methods of data collection, the results appear to be the same.

Nonetheless, the results of the research papers on this topic appear to be mixed and articulate different information. Williams (2008) observed that whilst the results of the studies surrounding this topic are mixed, the dietary consumption of young athletes are deemed to be lacking in carbohydrates, energy and numerous micronutrients, particularly calcium, iron, folate and zinc, yet intake of fat is in excess (Beals, 2002; Christensen et al, 2005; Iglesias-Gutierrez et al, 2005; Lopez-Valera et al, 2000; Papadopoulou et al, 2002; Ziegler et al, 2002). Similarly, Tomlin et al (2013) noted that less than 50% of the children in the sporting and non-sporting groups of this study met the recommended guidelines in regards to fruit and vegetables, and the sport group ingested more fat than that which is recommended. Thus, Williams (2008) claims that most studies indicate that many young athletes do not have adequate or healthy diets.

A considerable limitation of the research on this topic involved the issue of self-reporting dietary intake, whether this be through food frequency questionnaires or food diaries (Vissers et al, 2013). Due to the nature of the topic, participants may under-report or over-report consumption of certain foods, thus potentially affecting the accuracy, reliability and validity of the findings and conclusions (Vissers et al, 2013).

5.1.4 Diabetes

The rates of diabetes among young people are increasingly becoming a cause for concern in England (Townsend et al, 2013). A survey conducted by the Royal College of Paediatrics and Child Health determined that in 2009 there were 22,783 young people aged 0-17 living in England with diabetes (approximately 97% of these had type 1 diabetes, and 3% had type 2 diabetes). These are the most recent statistics currently available. Diabetes has been associated with low physical activity levels as well as increased obesity rates (American Diabetes Association, 2007; NICE, 2011; Rocchini, 1999). Whilst the data concerning the impact sport or physical activity has on the prevention of diabetes is prevalent with regards to adults, this information for young people is scarce. However, one study conducted by Thomas et al (2009) explored the relationship between physical activity and intravenous glucose tolerance (Kg) and resting energy expenditure (REE) in 32 American adolescents aged 12-18. The results illustrated that physical activity is significantly and positively associated with both Kg and REE; as the levels of physical activity increased, the Kg and REE simultaneously rose. Thus, it was concluded physical activity can be used to assist with the prevention of diabetes in young people.

5.1.5 Bone health

Another physical health benefit of youth sport appears to be enhanced skeletal and bone health (Eime et al, 2013). McKay et al (2005) examined the effects of a daily, three minute, physical activity intervention on the changes in bone mass and structure in American school children. The results suggested that this exercise did improve bone mass at the weight bearing proximal femur in early pubertal young people (McKay et al, 2005). As this study investigated the effects of an extremely short amount of time exercising, it would be interesting to observe the results of a longer exercise time.

5.1.6 Summary of the physical benefits

It is clear that there is a range of physical health benefits of sports participation for children, which not only enhance the physical wellbeing of the individuals involved through improving the health of their bones, but also potentially contribute to extending or saving their lives, through the decreased risk of chronic diseases and obesity. It is proposed that children also benefit from participation in sport in a psychological sense. Thus, the psychological benefits of involvement in sport will now be discussed.

6.0 The psychological health benefits of sports participation

There is an increasing amount of published research which focuses on the psychological health benefits of sports participation. Numerous authors (Connoll et al, 2011; Biddle & Mutrie, 2007; Eime et al, 2013; Sagatun et al, 2007) claim that involvement in sport significantly improves mental wellbeing. This is particularly prevalent when discussing sport in relation to depression, anxiety and issues of self-esteem, which all contribute to life satisfaction.

6.1 Depression

Several research reports have focused on the effect sport has on symptoms of depression. Parfitt et al (2009) investigated the relationship between physical activity of varying intensities and the psychological health of 57 English 9-10 year olds. The results of this study indicated that those participating in very light physical activity are less likely to suffer from depression (Parfitt et al, 2009). Further research from England by Wiles et al (2011) concerning 2,951 14 year olds revealed that there is a modest relationship between physical activity and symptoms of depression. The results of this study suggest that those students who are more physically active self-report less depression symptoms, which therefore suggests that participation in physical activity decreases the likelihood of experiencing depression (Wiles et al, 2011). Whilst the results of these research papers are significant as they both originate in England, there are various issues concerning this evidence. The use of questionnaires which enable the individuals to self-report symptoms of depression can be seen as problematic due to the possible low accuracy and reliability attached to these. Therefore, the quality of methodology and thus, the results, are questionable.

6.2 Anxiety

The association between sport and anxiety has also been discussed in the available literature. In the same study as discussed above, Parfitt et al (2009) concluded that very light physical activity had positive correlations with anxiety amongst young people, whilst vigorous physical activity was negatively correlated with anxiety. Research has also been conducted on the impact of physical activity on specific subtypes of anxiety. Dimech and Seiler (2011) examined the relationship between sport and social anxiety amongst 208 Swiss 7-8 year olds over a 2 year period. Their results illustrated that participation in sport can act as a buffer against social anxiety symptoms in children. Several differences within the variables were discovered; girls report greater levels of symptoms at both data collection points which corroborate the findings of Essau et al (2004) who also found that boys report less social anxiety symptoms. Furthermore, those participating in team sports were found to report less symptoms than those involved in individual sports. It should be noted that this study focused on primary school children and therefore, the results may not be applicable for other populations and age groups. Nonetheless, it provides a knowledge base to enable future research to create a broader and more holistic representation of the relationship between anxiety and sport. It appears that there are few studies dedicated to the association between anxiety and sport from the last 10 years. Therefore, new research is needed to provide information on the current situation regarding this topic.

The levels of self-esteem within children have also been related to sports participation. Slutzky and Simpkins (2009) compiled data concerning three groups of elementary aged children, their parents and their teachers, and found that students who spent more time in team sports rather than individual sports, reported higher levels of self-concept and therefore higher self-esteem, than their non-sporting peers. The authors concluded that the type of sport affects the amount of self-esteem the students held (Slutzky & Simpkins, 2009). This difference could be associated with the different dynamics and structure of the two types of sport. Dunton et al (2006) produced cross-sectional research which examined whether physical activity was more closely associated with self-concept within 103 14-17 years old females. The results indicated that participation in physical activity at a level which will increase fitness could assist in enhancing self-esteem or protect against reductions in self-esteem (Dunton et al, 2006). Levels of self-esteem can be seen to be associated with emotional wellbeing. Donaldson and Ronan (2006) investigated the relationship between the sports participation of 203 adolescents and their emotional wellbeing, including self-reported behavioural and emotional problems. The results suggested that increased involvement in sport had a positive association with elements of behavioural wellbeing, especially self-concept (Donaldson & Ronan, 2006).

6.3 Summary of the psychological benefits

In summary, many researchers have examined the connection between sports participation and the possible psychological benefits this has on school aged children. Whilst there are numerous types of benefits reported, the quality and significance of the results of the studies are problematic and can also be disputed. Although it is interesting to observe the different populations, interventions and methodologies of each research paper, the heterogeneity makes it difficult to draw conclusions concerning the association between sport and health. Moreover, the lack of follow up data has resulted in a gap in the literature concerning the degree to which the effects of sport and the programmes are maintained overtime, in addition to unknown causality.

6.4 The negative aspects of sport participation

In their review, Choi et al (2014) recognise that sports competition can be either positive or negative in terms of child development, depending on how experiences are perceived by children and how competitions are designed.

Amongst these negative aspects, Choi et al (2014), amongst other researches, acknowledge that competition can reinforce unacceptable and impractical behaviors such as poor social skills, unrealistic expectations, and poorly developed self-concepts. Linked to this, competition can diminish the enjoyment of the sports activities that have become competitive and can bring down self-esteem and self-confidence, as someone always has to be the loser.

They recognised that in youth sports many children are playing to win and with this, the pressure to compete can cause children to experience psychological stress disorders with distinct symptomatic behaviors and feelings of mental exhaustion.

It was also recognised that competition can produce anxiety, pressure, and stress, but they go on to say that competitive sports are no more anxiety-evoking than other experiences such as test taking in the classroom.

Another consideration is injury. Abernethy and MacAuley (2003) recognise that school sport is not risk free and that most injuries (predominantly minor injuries) in school occur during sport.

6.5 Conclusion

To conclude, the literature suggests that by participating in physical activity, PE and sport, children could potentially profit from a variety of physical and psychological health benefits. These include improved skeletal health and functioning of cardio-respiratory and muscular systems, a decreased risk of chronic illnesses and obesity, as well as enhanced self-esteem and reduced symptoms of symptoms. However, it has been acknowledged that although there are many benefits to participation, there are also negatives such as unacceptable behaviour, low self-esteem and injury.

Whilst the significance of the positive associations often differs, and at times, the quality of the methodology and research papers is questionable, the overall consensus is that, for the most part, sport can enhance the health and wellbeing of young people. Future research which examines the long term effects of sport and the causality of sport and health would however, be useful and beneficial, not only for academic purposes, but also at a tool to improve the wealth of knowledge available to governing bodies and thus, also the public.

7.0 Overall conclusion

In conclusion, the research says there is a positive association between participation in sport-related forms of physical activity and students' academic performance and wellbeing.

There is a place for sport in schools but further research is needed to explore the benefits of competitive school sport on the progress we expect young people to make. This is especially needed in the areas of young people with physical and mental disabilities.

Teachers in schools need to be mindful when providing competitive school sport, that they provide a positive experience for all their young people and not just the best.

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8.0 References

8.1 Academic Performance References

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Appendix 1: Background information and summary table

The following tables summarise the most relevant academic journal articles linked to competitive school sport, academic performance and health outcomes.

Academic performance

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|----|-----------------------------------|-------------|--|---|---|----------------|---------------|
| 1. | Bailey | 2006 | Benefits of sport. | The research evidence suggests that increased levels of physical activity in school do not interfere with pupils' achievement in other subjects and in many instances improves academic performance, as it can aid academic and cognitive development. | Relevant 4 | Multiple | Positive |
| 2. | Bailey, Hillman, Arent & Petitpas | 2013 | Physical activity and human development | Outcomes of physical activity can represent investments in emotional, financial, individual, intellectual, physical and social assets. Suggesting that physical activity can yield significant rewards if investment is made at an early age. | Relevant 4 | Multiple | Positive |
| 3. | Basch | 2011 | Physical activity and the achievement gap. | Three literature reviews revealed that school-based physical activity programs may result in short-term cognitive benefits, improve cognitive functioning among children and do not hinder academic achievement. | Relevant 4 | America | Positive |
| 4. | Beets, Beighle, Erwin & White | 2009 | After-school programmes, physical activity and fitness | This meta-analysis concludes that after-school programmes can enhance physical activity and health levels, although further studies are required which offer more attention to theoretical rationale, levels of implementation, and measures of physical activity within and outside of the intervention. | Relevant 4 | Multiple | Positive |
| 5. | Booth, Leary, | 2013 | Physical activity | Physical activity is not only beneficial to health and well- | Relevant | UK | Positive |

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|----|---|------|--|--|--|----------|----------|
| | Joinson, Ness & Tomporowski | | and academic attainment | being but has positive effects on academic attainment. Moderate-vigorous physical activity (MVPA) was positively associated with in English, Maths and Science scores for males and female from 11 year old to 16 years. Suggesting a long term benefit of MVPA on academic achievement. | 4 | | |
| 6. | Brisswalter, Collardeau & Rene | 2002 | Cognitive performance and exercise | The hypothesis behind the positive relationship between physical activity and cognitive performance is still not clear. | Relevant 3 | Multiple | Positive |
| 7. | Buck, Hillman & Castelli | 2008 | Aerobic fitness to Stroop task | Greater aerobic fitness correlated with better performance on Stroop test. Older children and those with a higher IQ also performed better. Increased levels of fitness may be beneficial to cognition in adolescent development. | Relevant 2 | America | Positive |
| 8. | Castelli, Hillman Buck & Erwin | 2007 | Physical fitness and academic achievement. | This study examined 259 public school students in third and fifth grades and found that field tests of physical fitness were positively related to academic achievement. Associations were demonstrated in total academic achievement, mathematics achievement, and reading achievement, thus suggesting that aspects of physical fitness may be globally related to academic performance in preadolescents. | Relevant 4 | America | Positive |
| 9. | Chaddock, Hillman, Pontifex, Johnson, Raine | 2012 | Aerobic fitness and cognitive performance. | The study illustrated that aerobically fit children outperform less fit peers on cognitive control challenges that involve inhibition, cognitive flexibility, and working memory. The results revealed that more fit | Relevant 3 | America | Positive |

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|-----|---|------|--|---|--|----------|----------|
| | & Kramer | | | children demonstrated increased flanker accuracy at both test sessions, coupled with a superior ability to flexibly allocate strategies during task conditions that required different amounts of cognitive control, relative to less fit children. More fit children also gained a speed benefit at follow-up testing. | | | |
| 10. | Cotman & Berchtold | 2002 | Exercise, brain function and health | Exercise has beneficial effects on health and cognitive function. Exercise mobilises gene expressions that benefits the brain plasticity process. Therefore, exercise can maintains brain function and brain plasticity, and lead to benefits to cognitive function. | Relevant 3 | Multiple | Positive |
| 11. | Darling, Caldwell & Smith | 2005 | Extracurricular activities | Adolescents who participated in ECAs reported higher grades, more positive attitudes towards schools, and higher academic aspirations once demographic characteristics and prior adjustment were controlled. | Relevant 4 | America | Positive |
| 12. | Hillman, Buck, Themanson, Pontifex & Castelli | 2009 | Fitness and cognitive development | The results of this study suggested that there is a positive association between fitness and cognitive performance in children. A general relationships is found where fitter children performed more accurately across conditions in comparison to children you weren't as fit. | Relevant 3 | America | Positive |
| 13. | Hillman, Pontifex, Motl, O'Leary, Johnson, | 2012 | Academic achievement and the p3 component. | The findings of this study support the association between working memory and inhibitory elements of executive control with academic performance. Additionally, it was suggested that improved attention | Relevant 4 | America | N/A |

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|-----|--|------|---|---|--|-----------------|----------|
| | Scudder, Raine & Castelli | | | abilities can be attributed to a variety of cognitive changes whilst alter the structure and function of the brain. | | | |
| 14. | Jonker, Elferink-Gemser, Toering, Lyons & Visscher | 2010 | Academic performance and self-regulatory skills | The results show that elite youth football players are more often enrolled into the pre-university academic system, are higher academic achievers, report an increased use of self-regulatory skills such as self-monitoring, evaluation, reflection and effort, and also have a higher graduation rate than those students who are not involved in sports. | Relevant 4 | The Netherlands | Positive |
| 15. | Kamijo, Pontifex, O'Leary, Scudder, Wu, Castelli & Hillman | 2011 | PA and memory | The results of this study illustrated that increases in cardiorespiratory fitness are connected to improvements in the cognitive control of working memory amongst preadolescent children. | Relevant 3 | America | Positive |
| 16. | Lipscomb | 2007 | Secondary school sports involvement and academic achievement. | The results indicated that participating in school sport is associated with a 1.5 to 2% improvement in test scores and a 5% improvement in Bachelor's degree attainment expectations. | Relevant 4 | America | Positive |
| 17. | Lleras | 2008 | Behaviours in school | The longitudinal study on tenth grade high school students show that students with better social skills, work habits and physical activities has higher educational achievements and earnings than fellow | Relevant 3 | USA | Positive |

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|-----|--|------|--|--|--|---------|----------|
| | | | | class mates | | | |
| 18. | Mahar | 2011 | Physical activity and attention-to-tasks | A positive effect of physical activity on attention-to-tasks in elementary school children carried out during the school day. Teachers should implement PA sessions throughout the day to improve this behaviour. | Relevant 3 | America | Positive |
| 19. | Nelson & Gordon-Larsen | 2006 | Physical activity, sedentary behaviour and health. | Participation in physical activity was associated with favourable adolescent behaviours such as higher grades and higher self esteem. Enhancing opportunities for physical activity and sport can produce beneficial effect on behaviour in adolescent children. | Relevant 4 | America | Positive |
| 20. | Pfeifer & Cornelißen | 2010 | Participation in sports on educational attainment | The results show that there is strong evidence that the effect of sport on educational attainment is statistically significant. Sport trains functional skills, teaches soft skills and assists in forming the character of young people. These behavioural aspects lead to reduced truancy, increased willingness to succeed in school, and encourage social interaction with other students which is associated with higher efficiency of learning because their time is used more productively. | Relevant 3 | Germany | Positive |
| 21. | Schilling, McOmber, Mabe, Beasley, Funkhouser & Martinez | 2006 | Language development through movement | Students with limited English proficiency (LEP) can benefit from physical activity and play by promoting community and development. With a link between cultures to the enjoyment of physical activities. | Relevant 3 | USA | Positive |
| 22. | Sigfúsdóttir, Kristjánsson & | 2007 | Health behaviour, | The results illustrate that body mass index, diet and physical activity explained up to 24% ($P < 0.01$) of the | Relevant | Iceland | Positive |

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|-----|--|------|---|---|--|-----------|---|
| | Allegrante | | academic achievement | variance in academic achievement when controlling for gender, parental education, family structure and absenteeism. | 4 | | |
| 23. | Singh, Uijtdewilligen, Twisk, Van Mechelen & Chinapaw | 2012 | Physical activity and school performance | A review of current literature which suggest a positive relationship between physical activity and academic performance. | Relevant 3 | Multiple | Positive |
| 24. | Stead & Neville | 2010 | Physical education, sport, education | Physical education impacts positively on educational attainment and cognitive function. Equally, physical education is shown to impact positively on young people on their behaviours, development and aspirations. | Relevant 3 | UK | Positive |
| 25. | Strong, Lalina, Blimkie, Daniels, Dishman, Gutin & Heren | 2005 | Physical activity on health and behaviour | Greater amount of physical activity is needed to achieve beneficial effects on health and behaviour. School age children should take part in 60 minutes of moderate to vigorous activity involving a variety of tasks. | Relevant 3 | Multiple | Positive |
| 26. | Taras | 2005 | Physical activity and students' academic performance. | Fourteen articles which were published since 1984 and explored the association between physical activity in school aged children and academic performance were examined. The results of this study illustrates that, for the most part, the studies showed either significant but weak associations between activity level and academic performance or no correlation at all. | Relevant 3 | Multiple | Positive or no significant relationship |
| 27. | Telford, Cunningham, | 2012 | Physical Education, | PE taught by specialists resulted in smaller increased in the age-related increase in percentage body fat. A | Relevant | Australia | Positive |

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|-----|---|------|---|---|--|----------|----------|
| | Fitzgerald, Olive, Prosser, Jiang & Telford | | Obesity, and Academic Achievement | positive association between PE specialist lessons and improvements in numeracy and literacy. However, no reading effect. | 3 | | |
| 28. | Tomporowski, Davis, Miller & Naglieri | 2008 | Exercise and academics | The study demonstrated that fitness is strongly and significantly related to academic performance. | Relevant 4 | America | Positive |
| 29. | Trudeau & Shephard | 2008 | School sport school sports and academic performance | The results illustrate that allocating up to an additional hour per day of curricular time to PA programmes does not affect the academic performance of primary school students negatively. Further, an additional curricular emphasis on physical education may result in small absolute gains in grade point average (GPA), and such findings strongly suggest a relative increase in performance per unit of academic teaching time. | Relevant 4 | Multiple | Positive |
| 30. | Van Dusen, Kelder, Ranjit & Perry | 2011 | Fitness and academics | This study found that participation in physical activity was associated with favourable risk behaviour outcomes. It also concluded that from a data set of 11,957 American seventh to twelfth graders, those who were active were more likely to achieve higher grades in mathematics and English with 1.20 and 1.21 adjusted risk ratios respectively. | Relevant 4 | America | Positive |
| 31. | Welk, Jackson, Morrow, Haskell, Meredith, & | 2010 | Health-related fitness, academic performance | The results of this study revealed modest but consistently favourable effects of physical fitness on several aspects of positive school performance. This supports the contention that fitness can be another | Relevant 4 | America | Positive |

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|--|------------------|-------------|--------------|---|---|----------------|---------------|
| | Cooper | | | important indicator of effective schools. This effect of fitness on academic performance can be explained by improved cognitions (Hillman, Castelli, & Buck, 2005; Schott, 2007), reduced psychological stress (Zametkin, Zoon, Klein, & Munson, 2004) and increased time on task/attendance. | | | |

Health and diet

| | Author(s) | Year | Theme | Summary | Quality of the research and relevance to the UK school sport setting | Country | Impact |
|----|--------------------------------------|-------------|--|--|---|----------------|---------------|
| 1. | American Diabetes Association | 2007 | Diabetes care. | This report suggested that diabetes is associated with low physical activity levels as well as increased obesity rates. | Relevant 3 | America | Positive |
| 2. | Bailey | 2004 | Sport and social inclusion. | This paper indicates that sport is seen to provide an opportunity for individuals from different backgrounds to meet, communicate and thus develop social networks and unite communities, however, it also suggests that more research is needed surrounding the topic. | Relevant 3 | N/A | Positive |
| 3. | Beals | 2002 | Eating habits among elite female volleyball players. | The results of this study indicate that their nutrient intakes put them at risk of deficiencies and thus compromised performance. | Relevant 3 | America | N/A |
| 4. | Biddle & Mutrie | 2007 | Effects of physical activity on wellbeing. | This book suggests that involvement in sport significantly improves mental wellbeing. | Relevant 3 | N/A | Positive |
| 5. | Blom, Bronk, Coakley, Lauer & Sawyer | 2013 | The benefits of youth sport. | The literature suggests that sport maximizes physiological development among young people. This involves enhanced functioning and health of cardio-respiratory and muscular systems, increased likelihood of maintaining weight (Beets & Pitetti, 2005), lowered risk of diabetes, heart disease, obesity, and other related diseases, and improved dietary choices (Beets & | Relevant 3 | N/A | Positive |

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|----|---|------|--------------------------------|--|--|-----------|----------|
| | | | | <p>Pitetti, 2005; Brady, 2004). Furthermore, young athletes have shown lower total cholesterol (Beets & Pitetti, 2005; Brady, 2004), favourable changes in body composition, and enhanced bone mineral density (Faigenbaum et al., 2009; Ginty et al., 2005; Laing et al., 2002; Laing et al., 2005).</p> <p>Participating in youth sport also offers a unique variety of psychological and affective benefits, including regular access to peers, thus providing opportunities to cultivate friendships and learn about peers from different backgrounds (Jones, Dunn, Holt, Sullivan, & Bloom, 2011), the opportunity to gain insight into how to manage emotions (Light, 2010), and a positive context for the development of identity (Light, 2010).</p> | | | |
| 6. | Burke, Beilin, Durkin, Stritzke, Houghton & Cameron | 2006 | Physical activity and obesity. | The findings of the study indicate that adolescents who are physically fit are less likely to be obese or overweight. | Relevant 3 | Australia | Positive |
| 7. | Butland, Jebb, Kopelman, McPherson, Thomas, Mardell & Parry | 2007 | English obesity rates. | This report estimated the projected 2050 English obesity rates to be 26% for males and females under the age of 20, 14% by 2025, and 10% by 2015. | Relevant 3 | N/A | N/A |

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|-----|--|------|--|---|--|----------------|----------|
| 8. | Cavadini, Decarli, Grin, Narring & Michaud. | 2000 | Food habits and sport activity. | The results of this study suggest that adolescents who participate in sport have healthier diets than their non-athletic peers. | Relevant 4 | Switzerland | Positive |
| 9. | Collins | 2003 | Sport and social inclusion. | This book chapter suggests that sport can play a role in facilitating social inclusion. | Relevant 3 | N/A | Positive |
| 10. | Connolly, Quin & Redding | 2011 | Health implications of a dance intervention. | The literature reviewed indicates that exercise can improve levels of self-esteem in children and young people (Ekeland, Heian and Hagan 2005), as well as enhance bone mass in early pubertal children (McKay et al. 2005), and levels of bone density in adolescence (Daly and Petit 2007) This study illustrated that dance can statistically improve components of physical fitness and psychological well-being. There was a statistical increase aerobic capacity, upper body strength and self esteem. No significant change occurred in flexibility or intrinsic motivation, however motivation scores were higher than average at pre-test stage. | Relevant 3 | United Kingdom | Positive |
| 11. | Croll, Neumark-Stainer, Story, Wall, Perry & Harnack | 2006 | Nutritional intake and sport. | The findings of this study suggest that adolescents involved in sport have better nutritional intake and eating habits than those not involved in sport. However, there are still improvements which need to be made in the dietary intake of athletes. | Relevant 4 | America | Positive |
| 12. | Dencker, | 2006 | Health benefits | This study demonstrated that there is a strong cross- | Relevant | Sweden | Positive |

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| | Thorsson, Karlsson, Lindén, Wollmer & Andersen. | | of physical activity. | sectional association between physical activity and obesity. | 3 | | |
| 13. | Dimech & Seiler | 2011 | Extra-curricular sport and social anxiety. | The results revealed that sport can act as a buffer against social anxiety symptoms in children, but only in the case of team sport. | Relevant 4 | Switzerland | Positive |
| 14. | Donaldson & Ronan | 2006 | Sports participation and emotional wellbeing. | The study concluded that sports participation is positively correlated with emotional and behavioural wellbeing. | Relevant 3 | New Zealand. | Positive |
| 15. | Dunton, Schneider, Graham & Cooper | 2006 | Physical activity and self-concept. | The findings of the study illustrate that participation in physical activity at a level which will increase fitness could assist in enhancing self-esteem or protect against reductions in self-esteem. | Relevant 3 | America | Positive |
| 16. | Eime, Young, Harvey, Charity & Payne | 2013 | Benefits of sport. | The review indicated that there is substantial evidence of many different psychological and social health benefits of participation in sport by children and adolescents. The most common of these were higher self-esteem, better social skills, fewer depressive symptoms, higher confidence and higher competence. In total 40 different psychological and social health factors were reportedly associated with participation in sport. | Relevant 4 | Multiple | Positive |

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| | | | | Also, previous literature suggests that increased physical fitness results in reduced body fat, favourable cardiovascular and metabolic disease risk profiles, enhanced bone health and reduced symptoms of depression and anxiety . | | | |
| 17. | Essau, Sakano, Ishikawa & Sasagawa | 2004 | Anxiety in children. | The results of this study illustrated that German children experience higher symptoms of most types of anxiety, whilst Japanese children report higher scores concerning symptoms associated with physical injury fear. The findings also suggest that anxiety and panic decrease with age, whilst social phobia increases with age. | Relevant 3 | Germany and Japan. | N/A |
| 18. | Ewles & Simnett | 1999 | Promotion of health. | Health was categorised into five separate aspects; physical, mental, social, emotional and spiritual health. | Relevant 3 | N/A | N/A |
| 19. | Iglesias-Gutierrez, Garcia-Roves, Rodriguez, Braga, Garcia-Zapico & Patterson | 2005 | Food habits among adolescent soccer players. | The nutritional intake of the players did meet the recommended nutritional status and food habits of players. | Relevant 3 | Spain | N/A |
| 20. | Jago, Baranowski, Yoo, Cullen, Zakeri, | 2004 | Diet and physical activity. | The findings of this study indicate that obesogenic diet and physical activity were weakly associated. | Relevant 3 | United Kingdom | Weakly associated |

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| | Watson, Himes, Pratt, Sun, Pruitt & Matheson | | | | | | |
| 21. | Lopez-Valera, Montero, Chandra & Marcos | 2000 | Nutrition in elite female gymnasts. | The findings illustrate that the total weekly calorie intake was lower in the gymnasts than the less active control group. The results also suggest that the gymnasts are at risk of malnutrition. | Relevant 3 | Canada | Negative |
| 22. | McKay, Maclean, Petit, MacKelvie-O'Brien, Janssen, Beck & Khan | 2005 | Exercise and bone mass. | The findings of this study suggest that short bouts of exercise can enhance bone mass in early pubertal children. | Relevant 3 | Canada | Positive |
| 23. | McMurray and Anderson | 2010 | Exercise and metabolic syndrome. | This study implies that sport decreases the risk of developing cardiovascular disease and other chronic illnesses. | Relevant 3 | N/A | Positive |
| 24. | McNaughton, Ball, Crawford & Mishra | 2008 | Diet and obesity. | This study could not find a consistent relationship between physical activity and the dietary patterns. | Relevant 3 | Australia | No relationship |
| 25. | Meyer, O'Connor & Shirreffs | 2007 | Nutrition of young athletes. | This study suggests that a healthy diet is essential for the overall health of children during their vital years of growth and development. | Relevant 3 | N/A | N/A |
| 26. | Ness, Leary, Mattocks, | 2007 | Physical activity and fat mass. | This study illustrated that physical activity is associated with a reduced risk of obesity. | Relevant | England | Positive |

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| | Blair, Reilly, Wells, Ingle, Tilling, Smith & Riddoch | | | | 4 | | |
| 27. | NICE | 2011 | Type 2 diabetes. | This report indicates that diabetes is associated with low physical activity levels as well as increased obesity rates. | Relevant 4 | England | N/A |
| 28. | Ottevaere, Huybrechts, Béghin, Cuenca-Garcia, De Bourdeaudhuij, Gottrand, Hagströmer, Kafatos, Le Donne, Moreno, Sjöström, Widhalm, De Henauw & Healthy Lifestyle in Europe by Nutrition in Adolescence | 2011 | Dietary intake and physical activity levels. | The results of this study illustrated that whilst the most active adolescents of both genders consumed more fruit and milk products compare to the least active adolescents, the active individuals did not always eat healthier than the less active students. | Relevant 4 | Multiple | Varied relationship. |

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| | Study Group | | | | | | |
| 29. | Pallan, Adab, Sitch & Aveyard | 2013 | Physical activity and weight status. | The results suggest that the time devoted to physical education and school in sport may influence weight status. | Relevant 4 | England | Positive |
| 30. | Papadopoulou, Papadopoulou & Gallos | 2002 | Nutrition intake in female volleyball players. | This study illustrated that the volleyball players did not meet the recommended daily allowance values for calcium, iron, folic acid, magnesium, zinc and vitamins A, B, and B2. | Relevant 3 | Greece | Negative |
| 31. | Parfitt, Pavey & Rowlands | 2009 | Physical activity and psychological health. | This study indicated that elements of psychological health were negatively correlated with very light intensity activity and positively correlated with vigorous intensity activity. | Relevant 3 | England | Mixed association |
| 32. | Rocchini | 1999 | Obesity and physical fitness. | This article suggests that diabetes is associated with low physical activity levels as well as increased obesity rates. | Relevant 3 | N/A | N/A |
| 33. | Sagatun, Sjøgaard, Bjertness, Selmer & Heyerdahl | 2007 | Physical activity and mental health. | The results illustrate that physical activity at age 15–16 years may influence some aspects of mental health three years later in boys, but not in girls. In boys, the number of hours spent on physical activity per week at age 15–16 was negatively associated with emotional symptoms and peer problems at age 18–19 after adjustments. In girls, there were no significant differences at age 18–19 according to weekly hours of physical activity at age 15–16 after adjustments. Boys and girls with five to seven hours of physical activity per week at age 15–16 had the lowest mean scores for total | Relevant 4 | Norway | Positive for boys. |

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| | | | | difficulties and the lowest percentage with high impact score at age 18–19, but the differences were not statistically significant after adjustments. | | | |
| 34. | Slutzky & Simpkins | 2009 | Sports participation and self esteem. | The results of this study indicate that young people who spend more time in team sports report higher self concept, which is connected to self esteem than their non-sporting peers. However, this association is not observed in individual sports. | Relevant 4 | America | Mixed |
| 35. | Stouffer & Dorman | 1999 | Childhood obesity. | The study discussed the multifaceted aspect of obesity. | Relevant 3 | N/A | N/A |
| 36. | The Health and Social Care Information Centre | 2012 | Health and lifestyles. | The report indicate that approximately 3 in 10 boys and girls aged 2 to 15 were classified as overweight (31%) or obese (28%). | Relevant 4 | N/A | N/A |
| 37. | Tomlin, Clarke, Day, McKay & Naylow | 2013 | Diet and organised sport. | The findings of the study revealed that the children who participate in organised sport had a healthier diet and a lower BMI than those children who were not involved in sport. | Relevant 4 | Canada. | Positive. |
| 38. | Townsend, Bhatnagar, Wickramasingh, Williams, Vujcich & Rayner | 2013 | Health statistics for young people. | This report illustrates that the rates of diabetes and heart disease among young people are increasingly becoming a cause for concern in England. | Relevant 4 | Britain. | N/A |
| 39. | US | 2008 | Physical Activity | This report suggests that regular physical activity | Relevant | America. | Positive |

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| | Department of Health and Human Services | | Guidelines. | reduces the likelihood of the risk factors developing and therefore increases the chances of children remaining healthy as adults. | 3 | | |
| 40. | Verduin, Argarwal & Waltman | 2005 | Solutions to obesity. | Obesity is multidimensional, thus the solution to it must encompass food as well as lifestyle choices. | Relevant 3 | America | N/A |
| 41. | Vissers, Jones, van Sluijs, Jennings, Welch, Cassidy & Griffin | 2013 | Diet and physical activity | The findings of the study illustrated that there were few relationships between diet and physical activity in children aged 9-10. | Relevant 4 | United Kingdom | No relationship |
| 42. | WHO | 2006 | Health. | This report defined health as a “state of complete physical, mental and social wellbeing, and not merely the absence of disease and infirmity | Relevant 3 | N/A | N/A |
| 43. | Wiles, Haase, Lawlor, Ness & Lewis | 2011 | Physical activity and depression. | The study revealed that there is a modest relationship between physical activity and symptoms of depression. | Relevant 4 | England | Positive |
| 44. | Williams | 2008 | Nutrition of child athletes. | The study illustrated that whilst the results of the studies surrounding sport and diet are mixed, the dietary consumption of young athletes are deemed to be lacking in carbohydrates, energy and numerous micronutrients, particularly calcium, iron, folate and zinc, yet intake of fat is in excess. | Relevant 3 | N/A | Mixed |
| 45. | Ziegler, Jonnalagadda, | 2002 | Eating habits of figure skaters. | This study revealed that the athletes need educating in the benefits of breakfasts as well as the consumption of | Relevant | America | N/A |

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| | Nelson, Lawrence & Baciak | | | calories during the day in order to enhance their performance. | 3 | | |

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