5. Discussion

In summary, the results show that the majority of participants (86%) were more active than the current DH recommended guidelines and approximately half were an ideal weight for their height. In relation to happiness levels, 98% of participants were happy or very happy as only one participant had a low happiness score. 67% of participants were classed as very happy. The analyses conducted also showed that there was no statistical relationship between the happiness levels of the participants and physical activity levels in any activity domain. This applied when activity was measured as energy expenditure in kcals or as duration of activity in minutes. Therefore, the results of this study support the null hypothesis that physical activity levels are not significantly associated with levels of self reported happiness.

Female happiness scores were significantly higher than male scores (p = 0.001), but there was no significant relationship between happiness and age.

Although accumulated research has established the link between activity and positive mental health (Biddle, 2000; Fox, 2000; Peluso & Guerra de Andrade, 2005; Thøgersen-Ntoumani, Fox, & Ntoumanis, 2005) there has been limited research in relation to activity, mental health and happiness although happiness is acknowledged as having an important role in maintaining good health (Argyle, 1997; Bekhet et al. 2008).

Therefore, although comparative analyses with previous studies is difficult, accumulated research from research into physical activity and mental
wellbeing together with current government data can assist in comprehending the outcomes of this study.

The accuracy of data collected was supported by the comparison between daily expenditure figures taken from the diaries and the SWA’s. Results show a positive correlation between the two sets of figures ($p = 0.002$ and $r = 0.64$). Previous studies have found motion sensors such as the SWA to provide reliable data (Ainsworth, 200a; Mignault et al. 2005), and the correlation between the two figures would suggest that the physical activity diaries provided valid results in relation to the activity levels of participants. (A detailed analysis comparing the results from both diaries and armbands is given in Appendix 7.6)

The results of the energy expenditure analysis showed that 86% of the participants met the DH (2004) recommendation for moderate/vigorous activity and 74% of the participants completed 60min/day of moderate/vigorous activity. This profile is very different from current figures in England (NHS, 2008) where only 34% of the population meet physical activity guidelines. The DH also reports a higher percentage of males meeting the recommendations (40% of men compared of 28% of women) and suggests that activity levels continue to decline after the age of 25. Conversely, the results of this study showed more females (91%, $n = 21$) achieving the recommended activity levels compared to males (82%, $n = 23$). The number of minutes spent in moderate or vigorous activity was also higher in the older age group (2hrs 13mins) than the youngest age group (1hr 25mins). Only one
Discussion

person of the 25 participants above the age of 51, (4%) did not achieve the recommendation, compared to the national figure of 36% (NHS, 2008). These factors indicate that the study sample did not typify the population as a whole although the group did relate to certain socio-economic trends. The DH report “Choosing activity” (2005) identifies that men in professional and managerial positions spend more time doing sport and exercise (45 - 49%), than males in the lower three employment categories. Similar trends existed for walking, gardening and DIY. Over 80% of the participants in this study fell into the professional/managerial category, (Labour Force Survey - 2006), and the results show a similar profile to the Choosing Activity Report with the majority of males taking part in sport or exercise (57%), and similar high participation levels in gardening (45%) and walking (71%).

Although leisure time activity was the domain where exercise and sport were recorded, occupational expenditure was the largest contributor to daily energy expenditure in both males and females (accounting for 31% of the total). Analysis of the expenditure identifies that only a small proportion of activity was at a moderate or vigorous intensity level with sedentary activity such as desk work dominating the working day. Non–teaching participants were found to have higher levels of moderate activity due to duties involving walking, movement of equipment and cleaning. Climbing stairs within the faculty was the only activity recorded with a MET > 3 and common to all participants. In 2004, Hu et al. concluded that moderate or vigorous occupational activity was significantly associated with improvement in health and longevity, but the same health benefits were not acquired through light or sedentary
occupations. Although teaching has been classed by King et al (2001) as a low occupational activity, Vaz and Bharathi (2004) found teachers had moderate occupational activity levels. At the time the present study was conducted, lecturing staff had finished class teaching and were involved in marking, invigilation and administration duties. Term time activity is likely to produce higher occupational energy expenditure and may have been similar to the 41% found by Vaz and Bharathi. A study completed in term time may also have resulted in higher moderate activity levels due the increased time spent walking, (often brisk!) and climbing stairs.

The importance of leisure time physical activity in maintaining health was emphasised by Morris and colleagues in the 1950’s and the results of this study would reinforce these views. Although a smaller proportion of energy was expended in leisure time, (see Figure 4.3.) the majority of activities were in the form of planned exercise and consistently of a moderate or vigorous intensity as required in order to gain the health benefits. The importance of physically activity in leisure time as occupations become more sedentary has been identified by several researchers (Prentice & Jebb, 1995; King et al, 2001; Hu et al 2004, Sturm, 2004) and the results of this study would also suggest that most participants would not meet physical activity recommendations if they did not participate in planned exercise taken in leisure time.

However, the level of participation in exercise and sport would again suggest that the sample group was not representative of the population. Data from the NHS report on Obesity, Physical Activity and Diet (2008) found that only 42%
of the population in England participated in sport/exercise compared to 67% (n= 34) of the sample group. The most common types of exercise reported by the NHS survey, i.e. gym/exercise class, cycling, swimming and walking, which closely matched those undertaken by the sample group.

The popularity of sedentary leisure activities amongst the sample group (i.e. watching television was undertaken by 92% participants, reading by 62%), also adds to the importance of exercise in maintaining good health. Without exercise, physical activity recommendations would not have been met by the majority of participants in this group.

All participants reported some form of housework or gardening tasks as part of non-occupational activity. Housework was generally of a light intensity in terms of its energy expenditure with few tasks exceeding 3 METs.

Several studies have suggested significantly higher energy expenditure in females due to the volume of housework carried out (Stephens, 1988; O’Brien Cousins & Gillis, 2004; Vaz & Bharathi, 2004). This however, was not found to be the case in this study although certain tasks, e.g. washing/laundry appeared to be dominated by females but were balanced by cooking, some cleaning tasks and DIY which were often carried out by males. Child care also appeared to be divided between males and females.

Gardening was carried out by 45% of the sample group (n=23, 13 males and 10 females) and was more frequently of a moderate intensity. The amount of time spent gardening by participants resulted in it being a valuable form of exercise.
Discussion

Although the results of the sample group indicate higher than average activity levels and high happiness scores, the results of the statistical analysis show that the relationship between the two variables is not significant and the active participants do not have higher levels of happiness than less active participants. Unlike activity levels, the happiness scores cannot be widely compared with similar available data, but comparisons can be made with the results obtained in studies also using the Oxford Happiness Questionnaire.

A mixed gender study by Thalbourne and Houran (2005) obtained a mean score of 123 (SD ± 19) from 200 participants. In order to assess the level of happiness in the group studied, Thalbourne and Houran applied the theoretical midpoint on the scale (101) as the ‘benchmark’ and from this concluded that participants with scores exceeding 101 were “happy most of the time”. The study by Jayavasti & Kanchanatawan, (2005) investigating the relationship between happiness and pregnancy in females resulted in a mean happiness score of 128 (SD = ± 15). By subdividing the possible range of scores into three equal groups they concluded that over half the women (57%) had a high level of happiness group. A small intervention study investigating the cognitive behaviour therapy calculated happiness before and after therapy in two males and found that the mean score increased from 105 to 113 (Binnie, 2008).

These three studies all report a lower mean happiness score than obtained in the current study (mean = 132 ± 20). Applying the same midpoint indicator as Thalbourne and Houran (midpoint 101) results in 94% of the participants in
this study being happy most of the time. Similarly, when the group was subdivided into three happiness levels as in the Jayavasti & Kanchanatawan, study, two thirds of the participants (n=34) fell into the high happiness category. The results of these comparisons suggest that the participants in this study have higher happiness levels compared to other groups using the same measurement method.

The potential reasons for higher happiness levels should be considered before any conclusions are drawn. Satisfaction obtained through leisure has been found to be strongly correlated with overall happiness and the strongest source of positive moods (Argyle, 1997). People who are involved in sport or who exercise regularly (more than once a month) have also been found to be significantly happier than non-exercisers (p < 0.01) (Stubbe et al).

Participation in sport was also found by Hills and Argyle (1998) to be the only activity to show a positive association with happiness when compared to watching TV, church membership and involvement in a music group Giacobbi et al. (2005) found that participants had a more positive mood on days when they took part in greater amounts of leisure time exercise regardless of whether or not they had positive or negative experiences the same day. In the current study only four individuals did not record any exercise over the three day period, either in the form of planned exercise, sport, gardening, dog walking, or through walking as a mode of transport. The mean happiness score of the four participants was 120. Seven participants were categorised as ‘inactive’ (See table 4.4) and had a mean happiness score of 124. The mean score of the active and very active participants was 134. Although the difference between the scores is not statistically significant (p = 212) it is
interesting to note that, based on mean scores, active / very active participants were happier than the inactive participants, who in turn were happier than non active participants. The increase in mean scores support the findings of Hills and Argyle, (1998); Reed and Ones (2006); Giacobbi et al (2005) and Stubbe et al (2008) who found that positive mood or happiness increased in relation to levels of activity. If the sample group in this study had been significantly larger, the correlations between activity and happiness may have shown stronger relationships.

The effect of gender on happiness levels has varied amongst studies (see Table 3.2). In the current study, females were significantly happier than their male colleagues (p= 0.001) with 19 of the 23 females (78%) falling into the high happiness category. This same outcome was reported by Argyle and Lu (1990) in sample of 31 females and 32 males with females scoring significantly higher. In contrast, a study by Lewis, Maltby and Day (2005) found there was no significant difference in happiness levels between males and females and a second study by Maltby, Day and Barber (2005), found males to score significantly higher than females (p < 0.01). Stubbe et al. (2007) measured happiness across 8000 participants and found that men were significantly more satisfied with their lives and also happier than women (p's < 0.01). The reason for gender differences is unclear, although Furnham and Cheng (2000) suggested that the factors which cause happiness are significantly different in males and females. The authors concluded that males need material possessions and physical attributes in order to define social status and females enjoy close friends and social relationships.
Research such as that by Furnham and Cheng (2000) indicates there are several factors beyond the scope of this study which may significantly affect happiness. As the association between activity and happiness was not significant, the high mean happiness scores of the sample population suggests other environmental and lifestyle factors are involved.

The results of research by Argyle (1997) and others (Francis et al, 1998; Hills & Argyle, 1998; Stubbe et al, 2007) suggest that personality traits are consistently associated with self reported happiness. Jayasvasti and Kanchanatawan (2005) found that both stable and extrovert personality characteristics were related to higher happiness levels in pregnant women. Similar results were reported by Furnham and Cheng (2001) who found that extraversion and an optimistic nature were strong predictors self reported happiness. However, Giacobbi et al (2005) found that personality had little effect on the association between exercise and mood.

Conversely, Argyle (1997) states that social relationships are “probably” the greatest single cause of happiness in individuals, likewise studies by Cornelisse –Vermatt et al (2006) and Jayavasti and Kanchanatawan, 2005, identified a positive correlation between happiness and good social structure. Other causes of happiness identified through research have included sedentary leisure activities (for example, television watching TV, music, reading watching sport), religious participation (Argyle, 1997), income (Jayavasti & Kanchanatawan, 2005) education (Corelisse – Vermaat et al. 2006) and job satisfaction (Giacobbi et al. 2005).
A repeated study by Thirlaway and Benton (1992 and 1996) into the relationship between physical activity and positive mental health produced different outcomes relating to the sample population involved. The initial study involved civil servants from the same workplace; the second, larger study involved participants randomly selected from the electoral role. Although positive correlations between activity and good mental health were established in both studies, results from the civil servant study were statistically less robust than those from the population study. The sample size was acknowledged as a factor, Thirlaway and Benton concluded that the homogenous nature of participants in the initial study explained the less significant findings. Based on this conclusion, the similarity of participants in the current study in relation to education, job type, social class and financial security may have had an impact on the results as well as uniformity in relation to activity and happiness levels.

The results of the study have highlighted that both happiness and physical activity are both multifarious concepts in which direct dose-response relationships are hard to establish. A review of research has also highlighted that the study limitations may have had some bearing on the statistical associations between happiness and activity.
Discussion

5.1. Study Limitations

In evaluating the findings of the study, it is important to consider its limitations. The study was conducted within one workplace and therefore taken from a narrowly defined social context. As a result, the findings may not be representative of other population groups. In addition, the sample size was relatively small, \( n=51 \) and a study involving a larger number of participants may have produced more statistically significant results.

A key limitation of the study was the time period available for data collection which coincided with student exams and therefore reduced teaching activity. This resulted in an increase in desk work and less active movement around the building. There is also a short term ‘sense of relief’ amongst staff once teaching is over and this may have improved the positive mood of the participants.

Measurements of both physical activity and happiness were self reported and although systems were put in place to preserve confidentiality, disclosure of personal information, particularly in relation to emotion and feelings, may have affected the results given. However, there was no evidence of this, either in relation to employee feedback or the results obtained. Similarly the use of physical activity diaries may lead to inaccurate estimations of time spent in various activities; however comparisons between the diaries and SWA’s suggest that the diaries gave an accurate representation of the energy expenditure levels of the group.
5.2. Areas for Future Research

The research reviewed has identified that the association between an active lifestyle and mental health requires further research. The possibility that exercise may be used to treat or prevent certain mental health conditions within the general population requires more development and exploration. Links between activity and more common negative mental health states such as stress, anxiety and fatigue needs more investment and investigation in order to provide a greater understanding of the increasing prevalence. Studies which have considered physical activity in relation to mental health have focused on exercise rather than daily activity levels. Further research is required which takes into account changing lifestyle patterns and the effect that this may have on mental health status.

Longitudinal studies involving population based sample groups are also required to examine the benefits both physical activity and exercise may have to positive mental wellbeing. Although happiness has been recognised as a key dimension of mental health, studies looking at happiness as a potential benefit of an active lifestyle appear to have been ignored and offer great scope for further research.

There are currently few established measures for happiness which have been successfully trialled in mixed populations and this also is an area requiring further study. Once established, the relationship between happiness and different forms of exercise and activity can be analysed more accurately.
across populations with a view to motivating individuals to move towards a healthier and more rewarding lifestyle.

Investment in research which will facilitate a greater understanding of the role physical activity may have on the positive mental health of populations is required.

5.3. Conclusion

The overall aim of the study was to investigate if there was an association between physical activity and happiness levels in working adults. The results found the null hypothesis to be correct, as there was no significant relationship between physical activity and happiness levels in the sample group. Further objectives of the study were to identify if levels of activity in different domains were associated with happiness levels, and to investigate if age or gender were also associated with happiness. The results of the study found that there were no significant relationships between happiness and occupation, leisure-time or household activity levels. Similarly, age of the participants had no association with happiness scores.

Analysis of activity levels found that the group with the highest level of inactivity also had the lowest mean happiness scores but the association was not significant. The study also found that the majority of participants had an active lifestyle compared to other population groups, and were also happier than sample populations measured in studies using the same scale. These
findings suggest that as a group, the participants had a relatively good level of physical and mental health and the homogenous nature of the sample may account for the lack of association between the key variables. The cause and effect nature of activity and happiness are beyond the scope of this investigation, but the results could be considered to suggest that active populations also benefit from good psychological well-being, although there is not statistical evidence to support this in the current study.

The study has highlighted the complex nature of happiness and confirms that happiness does not appear to be caused by a single factor, such as activity, but by several social, environmental and possibly genetic elements which are unique to each individual.

Finally comparisons between activities in each domain highlighted the importance of planned exercise which was taken during leisure-time. Very little moderate or vigorous intensity activity, as necessary to maximise health benefits, was carried out, except during exercise or through active hobbies such as walking and gardening. If the participants had not taken part in exercise or sport, the resulting low levels of lifestyle activity may have had a negative effect on both physical and mental health.