The Influence of Social Cognitive Constructs and Personality Traits on Physical Activity in Healthy Adults

Abstract

The psychosocial factors involved in successful physical activity engagement are not fully understood. Research suggests that specific personality traits (e.g., extraversion, conscientiousness, and neuroticism) influence physical activity behaviour. There is also evidence that social cognitive constructs (e.g. self-efficacy, self-regulation, outcome expectations, social support, and perceived barriers) can significantly explain and predict physical activity behaviour. The current study aimed to investigate the influence of personality and social cognitive constructs on physical activity over a two-week period. The study employed a prospective design in which ninety-four participants provided two-weeks of pedometer data and completed daily diary measures of non-ambulatory physical activity. In addition, all participants completed self-report measures of the Big Five personality traits and social cognitive constructs. Multiple regression analyses revealed that social cognitive constructs significantly explained 35.6% of the variance in physical activity, with goal setting emerging as a key predictor. Although personality did not have an effect on physical activity overall, subsequent analyses found significant differences in neuroticism between activity groups, and personality significantly interacted with social cognitive constructs to influence behaviour. The findings suggest a key role for goal setting, barrier self-efficacy, conscientiousness, and neuroticism in explaining physical activity behaviour.

Keywords: physical activity, self-efficacy, goal setting, neuroticism, social cognitive theory, the Big Five

There is a growing body of evidence to suggest that the Social Cognitive Theory (SCT) (Bandura, 1997) provides a useful framework for explaining and predicting physical activity behaviour (Anderson, Wojcik, Winett & Williams, 2006; Ayotte, Margrett & Hicks-Patrick, 2011; Petosa, Suminski & Hortz, 2003). According to SCT, human behaviour is the product of the interactions between personal factors and environmental factors, and is altered/maintained through the interaction between the core constructs of self-efficacy, outcome expectations, perceived barriers, and self-regulatory behaviours (Bandura, 1997; 2004). Previous studies have demonstrated that self-efficacy (a person's beliefs in their capabilities to change or continuously engage in behaviour) and self-regulatory behaviours (the ability to plan, set goals, and evaluate progress) are key constructs, and are consistently associated with higher levels of physical activity.

Other important constructs within SCT include social support (support from significant others, such as family and friends), outcome expectations (positive or negative outcome beliefs), enjoyment of physical activity (the amount of enjoyment for being active), and perceived barriers (personal and environmental obstacles that a person perceives). Each of these constructs have been positively associated with physical activity engagement, with the latter (perceived barriers) being negatively associated (Anderson et al., 2006; Ayotte et al., 2011; Bandura, 1997; 2004; Petosa et al., 2003; Rovniak, Anderson, Winett & Stephens, 2002; Salmon, Owen, Crawford, Bauman & Sallis, 2003). Taken together, these constructs form a framework that takes into consideration the individual, social, and environmental factors that influence physical activity behaviour. Furthermore, given that these constructs are modifiable, investigating the influence of these constructs on physical activity behaviour warrants further analyses.

Although previous studies have demonstrated that SCT constructs explain a significant proportion of the variance in physical activity behaviour, there is still a considerable proportion of the variance that remains unexplained (Hagger, Anderson, Kyriakaki & Darkings, 2007). Researchers have suggested that it may be useful to augment and extend existing social cognition models with other factors, including personality, in order to improve the predictive power of the theory in accounting for variations of health behaviours, including physical activity intentions and beliefs (e.g. Rhodes et al., 2007). For example, Rhodes, Courneya and Jones (2004) added the activity trait to the Theory of Planned Behaviour (TPB) and found that the activity trait had a significant direct effect on both exercise intention and behavior while controlling for the TPB.

Personality is hypothesised to affect an individual's social cognitions (e.g., self-efficacy) towards the behaviour, which in turn influences the health behaviour itself. According to the "five-factor model" (FFM), human personality can be described by the traits of openness, conscientiousness, extraversion, agreeableness, and neuroticism (Costa & McCrae, 1992). Existing research has examined the roles of personality traits on physical activity behaviour (Bogg & Roberts, 2004; Rhodes & Smith, 2006). In a meta-analyses of 33 studies, Rhodes and Smith (2006) indicated that the personality traits of conscientiousness (the tendency to be organised, self-disciplined, and achievement seeking), extraversion (the tendency to be sociable, fun loving, and active), and neuroticism (the tendency to be anxious, worry and insecure) were significantly associated with physical activity behaviour (Rhodes & Smith, 2006). Conscientiousness and extraversion were positively related to physical activity, while neuroticism was negatively related.

Although direct links between personality and physical activity have been found, studies have also demonstrated that personality may influence physical activity through social cognitions (McEachan, Sutton & Myers, 2010; Rhodes & Smith, 2006). For example, Rhodes and colleagues (2002a) provided evidence that neuroticism and extraversion moderated the effect of subjective norm on physical activity intentions. Similarly, McEachan and colleagues

(2010) demonstrated that the effect of conscientiousness on physical activity was mediated by perceived behavioural control (linked to self-efficacy), affective attitude, and intentions. These findings suggest that personality factors may positively predict physical activity as they are related to dispositions or skills that may help people engage in physical activity related behaviours.

There are a number of limitations within this area of research. Firstly, there are relatively few studies that use objective measures to assess physical activity (Rhodes & Pfaeffli, 2010). This is important, as the accuracy of self-reported measures of physical activity have been brought into question (Prince et al., 2008). In addition, it is important to note that very few studies have used a broad range of social cognitive constructs in their investigations, and instead have opted to use a restricted approach which examines only one or two specific components at a time (e.g., self-efficacy alone) to explain physical activity behaviour (Rhodes & Nigg, 2011; White, Wojcicki & McAuley, 2012). Furthermore, the bulk of research in this area has focused on the role of self-efficacy with the other SCT constructs receiving far less attention. In order to better understand physical activity behavior and design more effective interventions, it is important to examine the other SCT constructs alongside self-efficacy. In addition, given that SCT suggests behaviour is the product of a variety of personal, behavioural, and environmental factors (Bandura, 1997), the inclusion of a broad range of variables may be necessary to explain physical activity. Third, many studies do not investigate the differences in psychosocial variables between physical activity groups (i.e. low active, moderately active, or highly active). Categorising individuals into physical activity groups, based on established recommendations, allow for specific psychosocial differences to be found between those who are achieving adequate levels of physical activity and those who are not. Given that there is evidence of a link between personality traits and in-group identification (related to exercise identity) (Jenkins, Reysen, Stephen & Katzarska-

Miller, 2012; Reynolds et al., 2010;), and the fact that community dwelling adults often exercise within a group context, the investigation of the differences in psychosocial constructs between activity groups warrants further analysis.

The present study has four main aims; (i) to investigate whether the Big Five personality traits are associated with physical activity over a two week period, (ii) to test the utility of social cognitive constructs in predicting physical activity over a two week period, (iii) to investigate group differences in social cognitive constructs and personality factors when comparing participants of different activity levels (i.e. low, moderate, highly active), and (iv) to investigate whether personality and social cognitions interact to influence physical activity behaviour.

Methods

Participants and Procedure

Participants in this study were adults (N=94, 64 females, 30 males). Participants' age ranged from 21 to 65 years, with a mean age of 42.3 years (SD = 12.27). Participants were recruited from the surrounding area of a West of Scotland University. All participants were Scottish, and consisted of community residents, university staff, and students (no incentive was received for taking part). The institution's research ethics committee approved this study. Participants were given a brief introduction to the study, and those who interested were invited to take part. After obtaining informed consent, a questionnaire pack was then given to participants to complete, which included demographic information, a general health questionnaire, and instruments measuring SCT constructs, personality, and physical activity. Participants were also given a pedometer with instructions on its use. Participants were asked to wear the pedometer all day for a consecutive period of 14 days. Participants were also instructed to record all non-ambulatory physical activity (i.e. structured sport/exercise) in activity log-books. After completing the 14 days, all data was collected for analysis.

Measures

Socio-demographic information included age, gender, nationality, educational achievements, and employment status. General health and ability to take part in this study was assessed using a 16-item physical activity readiness questionnaire. At the start of the study, participants were asked to complete questionnaires assessing social cognitive constructs and personality traits. Thereafter, participants provided 14 days of physical activity data.

Physical Activity Record. A composite measure of physical activity was derived from utilising pedometer step-counts and by using self-report diary measures of non-ambulatory physical activity (following the guidelines recommended by the American College of Sports Medicine (ACSM; 2014)). The step-counts were obtained using a Yamax Digi-Walker SW-701 pedometer (Yamax. Corp.,Tokyo, Japan). Participants were instructed to provide 14 days of results that reflect their physical activity routine. Kang et al. (2009) have demonstrated that 14 days of wearing a pedometer is a useful monitoring period as it reduces the mean error level to below 10%. Participants were instructed not to change their daily routine in any way, and also to wear the pedometer at all times during the 14 day period, except when showering, sleeping, or taking part in structured sport or exercise (Tudor-Locke et al., 2005). Participants who did not provide at least 12 hours of pedometer data on each day, and who did not wear the pedometer for 14 days in total were excluded from the study. This resulted in 11 participants being excluded from the final analysis. The number of steps accumulated each day was recorded by participants in a log-book. In addition, participants also recorded all non-ambulatory activity (i.e. structured sport or exercise) that they participated in, during the 14 days, in the log-book. Participants recorded the type of activity (i.e. football), the intensity (i.e. moderate), and the time spent in the activity (i.e. 30 minutes). All activities were converted into "step equivalents" using their appropriate metabolic equivalent of task (MET) value, obtained from the compendium of physical activities (Ainsworth et al., 2000). The "steps" obtained from the log books were then combined with the pedometer steps to give an overall physical activity value measured in steps/day. This method of quantifying non-ambulatory activity has been used in previous literature (De-Cocker, Bourdeaudhuij, Brown, & Cardon, 2011; De-Greef, Van Dyck, Deforche, & Bourdeaudhuij, 2011; Miller, Brown, Tudor-Locke, 2006).

Personality Traits. Personality traits were assessed using the Big Five Inventory (BFI) (John, Donahue, & Kentle, 1991; John & Srivastava, 1999). The BFI is a 44-item scale that measures Big Five personality traits, including openness ("I see myself as someone who…is curious about many different things"), conscientiousness ("I see myself as someone who…does a thorough job"), extraversion ("I see myself as someone who…is talkative"), agreeableness ("I see myself as someone who…is helpful and unselfish with others"), and neuroticism ("I see myself as someone who…worries a lot"). Participants rated each item on a 5 point scale ranging from 1 (disagree strongly) to 5 (agree strongly). Each scale possessed acceptable internal reliability within this study Previous studies have demonstrated that the BFI has acceptable internal reliability (John et al., 1991).

Enjoyment of physical activity. The 18-item Physical Activity Enjoyment Scale (PACES) (Kendzierski & DeCarlo, 1991) was used to measure how much enjoyment participants gain from being physically active. Participants rated each item on a 7-point scale ranging from 1 (I hate it) to 7 (I enjoy it), with higher scores on the scale relating to higher perceived enjoyment of physical activity. The scale has been shown to have acceptable internal reliability in previous studies (Kendzierski & DeCarlo, 1991).

Self-efficacy. Self-efficacy was measured using the 9-item Barrier Self-Efficacy scale. The scale assessed an individual's confidence to overcome barriers that may limit their physical activity engagement (Resnick, Palmer, Jenkins & Spellbring, 2000). Participants rated each item on a scale from 1 (not very confident) to 10 (very confident). Each item started with the statement "how confident are you that you could exercise for 20 minutes 3 times per week if…". Possible barriers included "weather", "feeling stressed", and "being too busy". Internal reliability for the scale has been shown to be acceptable in previous studies (Ayotte, et al., 2010).

Outcome Expectations. Outcome expectations were measured using the Benefits of Physical Activity Scale (BPA; Rogers et al., 2005; Sallis et al., 1985). The scale assessed the expectations individuals had regarding their engagement in physical activity across 12 outcomes. Participants responded to statements such as "participating in regular physical activity will…*make me feel more attractive/ less tired/ improve my muscle tone/etc*". Each item was rated on a scale from 1 (not likely/important) to 5 (very likely/important). This instrument has previously been shown to possess high internal reliability (Ayotte et al., 2010).

Self-regulatory Behaviours. Two measures were used to assess self-regulatory behaviour, the Exercise Planning and Scheduling Scale (EPS) and the Exercise Goal-Setting Scale (EGS) (Rovniak et al., 2002). Both measures consist of ten items and assess an individual's ability to plan, schedule, and set goals in relation to physical activity. Participants rated statements such as "I schedule exercise at specific times per week" and "I have developed a series of steps for reaching my exercise goals". Each item was rated on a scale from 1 (does not describe me) to 5 (completely describes me). Internal reliability for this scale has been demonstrated previously (Rovniak et al., 2002).

Perceived Barriers to Exercise. The Perceived Barriers to Exercise Scale is an 18-item scale that assessed the personal and environmental barriers an individual perceives in relation to physical activity engagement (Salmon et al., 2003). Participants rated statements such as "in general, how much does *lack of time/weather/cost/lack of equipment/etc.* interfere with you engaging in physical activity". Participants responded on a scale ranging from 1 (is not a barrier) to 5 (very much a barrier). The scale has been shown to exhibit acceptable internal reliability in previous studies (Salmon et al., 2003).

Social Support. Social Support was measured across two components (Friends and Family) using the Social Support for Exercise Survey (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). This measure consists of 13 items that assesses the amount of support for exercising that an individual receives from friends and family. Participants responded to statements such as "In the last 3 months, my family/friends have exercised with me/discussed exercise/criticised me for exercising/etc". Participants rated each item on 5-point scale ranging from 1 (none) to 5 (very often). Previous studies have demonstrated the internal reliability of the scale (Sallis, Hovell & Hofstetter, 1992).

Statistical Analyses.

All data were analysed using the Statistics Package for the Social Sciences (SPSS, version 20.0). Outliers, normality, linearity, homoscedasticity, and independence of residuals were inspected using normal P-P plots and scatterplots. All assumptions were within acceptable ranges. First, in order to assess the association between SCT constructs, personality, and physical activity, Pearson correlations were used. Second, in order to determine whether the SCT constructs and personality traits could predict physical activity, hierarchical linear multiple regression analyses was used. Third, in order to determine if there were any differences in SCT constructs and personality between physical activity groups (i.e.

low, moderate, and highly active), analysis of variance (ANOVA) were used. Differences between groups were then examined using Tukey post hoc analyses.

For the physical activity group analysis, participants were categorised into one of the following groups retrospectively, based on their pedometer step counts: low activity (< 8000 steps/day), moderate activity (8-12,500 steps/day), or high activity (> 12,500 steps/day), based on Tudor-Locke and Bassett (2004). Finally, interactions between the Big Five broad personality traits and SCT constructs were tested using a series of hierarchical multiple regression analyses as recommended by Baron and Kenny (1986). To interpret the nature of the interactions, a simple slope analysis was conducted and illustrated by plotting separate regression lines (predicting physical activity levels) using the interaction program derived by Soper (2012). Predictor variables were centered and regression lines for high levels (+1 SD) and low levels (-1 SD) of the moderating variable were analysed using the method described by Aitken and West (1991).

Results

Participants' Characteristics

Participants' characteristics are presented in Table 1. Based on the pedometer and log-book data, participants' overall mean daily step count was 12,535 steps/day (SD: 5,656). Males were more active than females, reporting a mean count of 14, 307 (SD: 6,521) compared to 11,704 steps/day (SD: 5,200) for females, respectively, $t\ (92) = 2.12$, $p = .04$. A large percentage of the participants were educated to at least degree level (59%), and the majority of participants were in either full time or part time employment (91.5%). With regards to group differences, 22% of the participants were in the low active group, 38% were in the moderately active group, and 39% were in the highly active group based on their daily step counts. Preliminary analyses revealed that there was no significant difference between the groups for age, F (2, 93) = 0.03, p = .97, and gender, χ^2 (2) = 2.90 p = .24.

Insert Table 1 here.

Correlations Between SCT Constructs, Personality Traits and Objective Physical Activity

The correlation analysis (see Table 2) revealed that a number of social cognitive measures were significantly correlated with physical activity (p < .05). The strongest correlates of physical activity were; barrier self-efficacy (r = 0.53), goal setting (r = 0.51), planning (r = 0.53), and enjoyment (r = 0.50). There was also small to medium strength correlations with physical activity for task self-efficacy (r = 0.38), outcome expectations (r = 0.32), perceived barriers (r = -0.30), and social support (friends) (r = 0.32). All correlations between SCT constructs and physical activity were statistically significant (p < .05), with the exception of social support (family), which was not significantly correlated (r = .013, ns). In addition, none of the personality traits were significantly correlated with physical activity (see Table 2).

Insert Table 2 here

Regression Analysis - Predicting Physical Activity

Hierarchical multiple regression analyses was conducted to determine how much of the variance in objective physical activity could be explained by the predictor variables (Table 3). The choice of predictors entered into the regression model was both theory-driven and based upon the predictive strengths of each individual variable. After controlling for age and gender, only SCT constructs (and not personality traits) were entered into the model as these were found to be the only significant correlates of physical activity.

The following variables were entered into the regression model; age and gender (step 1), barrier self-efficacy, goal setting, planning, enjoyment, perceived barriers, outcome expectations, and social support (friends) (step 2). Hierarchical regression analysis revealed that SCT constructs explained 35.6% of the variance in objective physical activity, F (9, 84) = 6.72, p < .01 (R^2 = 0.356), with goal-setting (β = 0.24, p < .05) emerging as a significant independent predictor of physical activity.

Insert Table 3 here

Differences between Physical Activity Groups (Low, Moderate, High) on Personality

One way between groups ANOVAs were carried out to examine the differences in personality constructs between the physical activity groups (Table 4). Of the five personality traits that were examined, only neuroticism yielded a statistically significant difference between the activity groups, (F (2, 93) = 4.15, p = .02. η_p^2= 0.08). Post-hoc comparisons using the Tukey HSD test indicated that the mean neuroticism score for the low activity group (M = 24.95; SD = 5.58) was significantly higher than the moderate activity group (M = 20.8; SD = 4.85, p = .02) and the high activity group (M = 21.05; SD = 6.36, p = .04). There was no significant difference between the moderate and high activity groups, p = .98. There were also no significant differences in levels of conscientiousness, extraversion, agreeableness, or openness across the activity groups.

Differences between Physical Activity Groups (Low, Moderate, High) – SCT Constructs

There was a statistically significant difference in barrier self-efficacy and task self-efficacy between the activity groups, (BSE, $F(2, 93) = 17.85$, $p < .01$. $\eta_p^2 = 0.28$) (TSE, $F(2, 93) = 9.95$, $p < .01$, $\eta_p^2 = 0.18$). Post-hoc comparisons using the Tukey HSD test indicated that the mean barrier self-efficacy score for the high activity group (M = 7.05; SD = 1.73) was significantly higher than the moderate (M = 4.95; SD = 2.16, $p < .01$) and low activity groups (M = 4.29; SD = 1.72, $p < .001$). For task self-efficacy, the high activity group (M = 93.76; SD = 18.75) scored significantly higher than the low activity group (M = 66.75; SD = 27.07, $p < .01$). The moderate activity group (M = 84.17; SD = 22.29) also had a significantly higher mean score than the low activity group, $p = .01$.

There was also a statistically significant difference in exercise planning (EPS) and exercise goal setting (EGS) between the activity groups, (EPS, $F(2, 93) = 23.97$, $p < .01$ $\eta_p^2=0.35$) (EGS, $F(2, 93) = 9.64$, $p < .01$, $\eta_p^2 = 0.17$). Post-hoc comparisons indicated that the mean EPS score for the high activity group (M = 3.17; SD = 0.91) was significantly higher than the moderate (M = 2.31; SD = .093, $p < .01$) and low activity groups (M = 1.62; SD = 0.50, $p < .01$). The moderate activity group also scored significantly higher than the low activity group, $p = .01$. For EGS, the mean goal setting score for the high activity group (M=2.19; SD = 1.08) was significantly higher than the moderate (M = 1.62; SD = .09, $p = .02$) and low activity groups (M = 1.15; SD = 0.26, $p < .01$).

A statistically significant difference in social support (friends) between the activity groups was also found, ($F(2, 88) = 3.35$, $p = .04$, $\eta_p^2 = .07$). Post-hoc comparisons indicated that the mean social support score for the high activity group (M = 2.48; SD = 0.81) was significantly higher than the low activity group (M = 1.95; SD = 0.46, $p = .03$). There was also a statistically significant difference in outcome expectations between the activity groups,($F(2, 93) = 4.32$, $p = .02$, $\eta_p^2 = 0.09$). The mean outcome expectations score for the high activity group (M = 198.76; SD = 63.79) was significantly higher than the moderate activity group (M = 164.64; SD = 59.19, p = .05) and the low activity group (M = 156; SD = 59.36, p = .03). In addition, there was a statistically significant difference in enjoyment between the activity groups, ($F (2, 93) = 14.80$, $p < .01$, $\eta_p^2 = 0.25$), with the mean enjoyment score for the high activity group (M = 6.02; SD = 1.0) being significantly higher than the moderate (M = 5.02; SD = 1.44, $p < .01$) and low activity groups (M = 4.29; SD = 1.11, $p < .01$). Finally, there was a statistically significant difference in perceived barriers between the activity groups, ($F (2, 93) = 4.56$, $p = .01$, $\eta_p^2 = 0.09$). The mean barriers score for the low activity group (M = 2.18; SD = 0.54) was significantly higher than the high activity group (M = 1.75; SD = 0.58, p = .02).

Insert Table 4 here

Interactions between SCT Constructs and Personality Traits

The combination of personality traits and SCT constructs entered into the regression models were based on the findings from the current study and previous literature. Only barrier self-efficacy and goal setting were investigated for interaction effects with personality (extraversion, conscientiousness, neuroticism) as they have been found to be significant independent predictors of physical activity in previous research (Anderson et al., 2006; Petosa et al., 2003; Rovniak et al., 2002; Ayotte et al., 2011, Rhodes et al., 2006).

The interaction between goal setting and conscientiousness was tested and was found to be significant, $\beta = -0.40$, $p < .01$, indicating that conscientiousness moderated the effect of goal setting on physical activity, $F (1,90) = 14.88$, $p < .01$. The R^2 change accounted for an additional 5.6% of the variance in physical activity behaviour over and above that explained by the first order effects of goal setting and conscientiousness alone (Table 5).

A simple slope analysis was conducted as outlined by Aitken and West (1991) (Figure 1). At low levels of goal setting, the low conscientiousness group had lower levels of physical activity than the high conscientiousness group, indicating that even when goal setting strategies are not utilised, highly conscientious individuals are still reasonably active. Furthermore, although physical activity increased for both the low and high conscientiousness groups when goal setting was high, only the slope for the low conscientious group was significant, $t(90) = 6.36$, $p < .01$ (high conscientious group, $t(90) = 1.73$, $p =$ ns).

Insert Table 5 here

Insert Figure 1 here

The interaction between barrier self-efficacy and neuroticism was tested and was also found to be significant, $\beta = 0.24$, $p = .03$, indicating that neuroticism moderates the effects of barrier self-efficacy on physical activity, $F(1, 90) = 14.28$, $p < .01$. The R^2 change accounted for an additional 3.6% of the variance in physical activity behaviour over and above that explained by the first order effects of barrier self-efficacy and neuroticism alone (Table 6).

As shown in Figure 2, at low levels of barrier self-efficacy, the emotionally stable (low neuroticism) group had higher levels of physical activity than the high neuroticism group. This suggests that having high levels of neuroticism may have a limiting effect on physical activity when barrier self-efficacy levels are also low. Further analysis revealed that both high and low group’s slopes differed significantly from zero ($p < .01$), indicating that self-efficacy for overcoming barriers is effective for both groups. However, the gradient was greater for the high neuroticism group (simple slope = 1956.43) compared to the low group (simple slope = 941.28), suggesting that higher levels of barrier self-efficacy is especially influential in individuals who are less emotionally stable.

Insert Table 6 here

Insert Figure 2 here

There was no significant interaction effects for goal setting and extraversion, $\beta = -0.17$, $p = .34$, goal setting and neuroticism, $\beta = 0.02$, $p = .83$, barrier self-efficacy and extraversion, $\beta = 0.01$, $p = .94$, and barrier self-efficacy and conscientiousness, $\beta = -0.27$, $p = .08$.

Discussion

The aim of this study was to investigate the influence of SCT constructs and personality traits on physical activity behaviour. Three main findings emerged: (i) SCT constructs were useful for explaining physical activity, (ii) significant personality differences in neuroticism was found between low and high activity groups, and (iii) SCT constructs and personality traits interacted to influence physical activity behaviour.

The present study provided evidence of the usefulness of SCT in predicting physical activity behaviour. We demonstrated that self-efficacy, self-regulatory behaviours, social support (friends), outcome expectations, enjoyment, and perceived barriers were significantly correlated with physical activity. It was also demonstrated that SCT constructs could explain 35.6% of the variance in physical activity when controlling for age and gender, with goal setting emerging as a significant independent predictor. Furthermore, the current study also indicated that individuals in the high activity group (> 12,500 steps/day) had significantly higher scores on SCT constructs than those in the low activity group (< 8,000 steps/day), further highlighting the importance of SCT construct in explaining physical activity.

Previous literature has identified a role for SCT constructs within physical activity. For example, Petosa and colleagues (2003) found that SCT constructs significantly explained 27% of the variance in physical activity behaviour, while Ayotte and colleagues (2011) demonstrated that 66% of the variance in physical activity could be explained by SCT constructs. A limitation within these studies was the use of self-report instruments to measure physical activity. However, a similar study by Anderson and colleagues (2006), using objective measures, demonstrated that SCT constructs explained 46% of the variance in physical activity.

Consistent with previous studies we found that goal setting emerged as an important construct for predicting physical activity. Anderson et al (2005) and Petosa et al (2003) both highlighted the importance of self-regulation (goal setting and planning) for physical activity adoption and maintenance. Furthermore, Bandura (1997) argues that having the ability to self-regulate may be the key social-cognitive approach to changing behaviour. Although the current study suggests that the full social cognitive model can explain physical activity, the findings indicated that goal setting may be the most important construct in terms of predicting physical activity behaviour.

The current findings also provide evidence for the influence of personality on physical activity behaviour. Although personality was not significantly associated with physical activity overall, it emerged that significant personality differences occurred between the physical activity groups. Individuals in the high activity group (> 12,500 steps/day) reported significantly lower levels of neuroticism than those in the low activity group (< 8,000 steps/day). This finding supports the literature suggesting that individuals who are anxious and insecure (neurotic) are less likely to meet physical activity recommendations (Hoyt, Rhodes, Hausenblas & Giacobbi, 2009; Rhodes & Smith, 2006; Sutin, Ferrucci, Zonderman, & Terracciano, 2011). A surprising finding was that no difference in levels of conscientiousness and extraversion were found between the groups, despite both being previously established as physical activity correlates (Rhodes & Smith, 2006). Therefore, our findings suggest that neuroticism may be the key personality construct that could determine whether an individual is likely to meet currently recommended physical activity levels.

We also found that there were significant interactions between social cognitive constructs and personality traits. Firstly, it was found that when goal setting was low, people who had low levels of conscientiousness were less likely to be active than highly conscientious individuals. When goal-setting strategies were utilised, however, individuals low in conscientiousness demonstrated a significant increase in physical activity. This possibly suggests that goal setting may be useful for increasing physical activity in people who have low levels of conscientiousness. Similarly, we also found that when barrier self-efficacy was low, people who were highly neurotic were significantly less likely to be active than emotionally stable individuals. When barrier self-efficacy levels were high, however, those with high neuroticism were statistically more likely to be active. This possibly suggests that having high self-efficacy for overcoming barriers serves as a defence mechanism in people who are highly neurotic, and also suggests that strategies to increase barrier self-efficacy may be useful for increasing physical activity levels among this population.

The current study had several limitations. First, although the measure of physical activity used in the current study incorporated an objective measure, participants were required to record the amount of activity (step counts) they participated in each day. This "feedback" may have influenced their physical activity levels to some extent. It has been suggested that the simple act of wearing a pedometer may act as a motivational intervention in itself (e.g., Bravata et al., 2007). Therefore, blinding participants to their physical activity levels would be an advantage in future studies. Second, although our study includes a broad age range, all participants were white, well educated, and residing within the local community. It would be beneficial to recruit a more representative sample of the Scottish population, including those from ethnic minorities and lower socioeconomic backgrounds. The current sample also had a high average step count (greater than 12,500) and a greater proportion of females to males. Therefore, the study would also benefit from including a greater proportion of males as well as less active participants. Finally, although we demonstrated that the low active group had higher levels of neuroticism than the high active group, the current study could not determine whether this was a result of differences in personality, or if long term physical activity participation leads to a decrease in neuroticism.

The present study adds to the existing literature in several key ways. First, we have identified that although social cognitive constructs (with the exception of social support provided by family) may play an important role in physical activity, an individual's goal setting abilities may be the key factor that will determine whether they engage in physical activity related behaviours. Second, we also provided evidence that neuroticism may influence physical activity behaviour as it was found that significant differences in neuroticism existed between activity groups. Additionally, we also found that personality significantly interacted with social cognitions to influence behaviour. These findings highlight the important role of personality and social cognitions on physical activity engagement, and may help in developing future interventions aimed at increasing physical activity among the population.

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Table 1 – Sample Characteristics

Variable (Scale)	**M**	**SD**	**Study Range**	**α**
Age (years)	42.33	12.27	21-65	n/a
Barrier self-efficacy (1-10)	5.63	2.22	1 - 10	0.92
Task self-efficacy (0-100)	84.05	24.20	1.67-100	0.96
Exercise goal setting (1-5)	1.74	0.97	1 - 4.4	0.95
Exercise planning (1-5)	2.49	1.03	1 - 4.9	0.90
Outcome Expectancies (1-300)	176.14	63.22	12 - 295	0.95
Social support – Friends (1-5)	2.32	0.78	1.46 – 4.69	0.90
Social support – Family (1-5)	2.40	0.69	1.46 – 4.15	0.85
Perceived barriers (1-5)	1.97	0.59	1 – 3.22	0.83
Enjoyment (1-7)	5.23	1.37	1 - 7	0.97
Openness to Experience (1-50)	34.53	7.00	19 – 50	0.83
Conscientiousness (1-45)	35.19	5.33	22 - 45	0.73
Extraversion (1-40)	26.90	6.27	12 - 39	0.82
Agreeableness (1-45)	35.88	5.32	20 - 45	0.75
Neuroticism (1-40)	21.83	5.83	9 – 35	0.78
Physical Activity (steps/day)	12,535	5,656.57	3,168 – 34,007	-

Table 2: Correlation matrix of SCT variables, personality and physical activity.

Variable (scale)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Covariates																
1. PA (steps/day)																
2. Age	-.112															
3. Gender	.216*	-.106														
4. Barrier self-efficacy	.531**	-.108	.322*													
5. Task self efficacy	.380**	-.184	.248*	.594**												
6. Goal setting	.513**	-.267**	.126	.457**	.395**											
7. Planning	.527**	-.157	.070	.584**	.521**	.637**										
8. Outcome Expectancies	.319**	-.131	.156	.379**	.354**	.383**	.403**									
9. Social support (Friends)	.319**	-.066	.093	.190	.202	.401**	.481**	.345**								
10. Social support (Family)	.127	.000	-.006	.175	.228*	.134	.246*	.219*	.176							
11. Enjoyment	.495**	-.057	.175	.592**	.654**	.499**	.603**	.593**	.326**	.285**						
12. Perceived barriers	-.298*	-.189	-.010	-.269**	-.241*	-.153	-.399**	-.184	-.263*	-.079	-.328**					
13. Openness to experience	-.049	-.042	.148	-.047	-.041	.052	-.072	.006	.059	.025	.089	.098				
14. Conscientiousness	.047	.191	-.076	-.002	-.105	-.121	.090	-.184	-.129	.081	.057	-.093	-.030			
15. Extraversion	-.017	-.119	.069	-.061	-.047	.148	-.100	-.012	.124	.109	.050	.043	.036	-.069		
16. Agreeableness	-.145	.113	-.179	-.030	-.073	.004	.183	.147	.268*	.008	.219*	-.174	.072	.199	.084	
17. Neuroticism	-.135	-.239*	.000	-.123	-.038	-.002	-.042	-.059	-.095	-.105	-.251*	.319*	.205*	-.185	-.131	-.265

Notes: *p < .05, **p<.01, ***p<.001

Table 3 - Multiple regression analysis results predicting physical activity.

Predictor	**β**	***t***	***p***	***Adj R^2*** **(cum)**
Step 1				
Age	-.09	-.87	.38	
Gender	-.21	-2.0	.047*	.034
Step 2				
Age	-.012	-.14	.89	
Gender	-.079	-.87	.39	
Barrier self-efficacy	0.24	1.92	.058	
Goal setting	0.24*	2.08*	.041*	
Planning	0.10	.75	.45	
Enjoyment	0.13	.99	.32	
Barriers	-0.12	-1.2	.24	
Social support (friends)	0.067	.32	.75	
Outcome Expectations	-0.02	-.22	.83	.356**

Notes: *p < .05, **p < 0.01

Table 4 – Group Differences in SCT constructs and personality.

	Low Active (< 8000 steps/day)	**Moderately Active** (8-12,500 steps/day)	**Highly Active** (> 12,500 steps/day)
N	21	36	37
Mean Age - years	42.71 (12.49)	41.94 (11.64)	42.49 (13.04)
Mean steps/day*	6,522 (1209)	10,236 (1310)	18,185 (4582)
Social Cognitive Variables			
Barrier self-efficacy (1-10)*	4.29 (1.72)	4.95 (2.16)	7.05 (1.73)
Exercise goal setting (1-5)*	1.15 (0.26)	1.62 (0.90)	2.19 (1.08)
Exercise planning (1-5)*	1.62 (0.5)	2.31 (0.93)	3.17 (0.91)
Outcome Expectancies (1-300)*	156.00 (59.36)	164.64 (59.19)	198.76 (63.79)
Social support – Friends (1-5)*	1.95 (0.46)	2.32 (0.81)	2.48 (0.81)
Social support – Family (1-5)	2.32 (0.58)	2.26 (0.65)	2.59 (0.75)
Enjoyment (1-7)*	4.29 (1.11)	5.02 (1.44)	6.02 (1.0)
Perceived barriers (1-5)*	2.18 (0.54)	2.06 (0.57)	1.75 (0.58)
Personality			
Openness to Experience (1-50)	35.76 (5.05)	34.53 (7.39)	33.84 (7.61)
Conscientiousness (1-45)	33.00 (4.40)	35.611 (5.90)	36.03 (5.02)
Extraversion (1-40)	26.9 (4.58)	27.11 (7.11)	26.70 (6.36)
Agreeableness (1-45)	34.9 (6.02)	36.92 (4.42)	35.43 (5.68)
Neuroticism (1-40)*	24.95 (5.58)	20.81 (4.85)	21.05 (6.36)

Note. * denotes significant difference between the groups

Table 5 - Testing the interaction effect of goal setting and conscientiousness on physical activity (pedometer steps) using hierarchical multiple regression.

Independent variable	**β**	***t***	***Adj R^2* (cum)**
Step 1			
Goal Setting	0.51***	5.74***	0.26***
Step 2			
Goal Setting	0.53***	5.86***	
Conscientiousness	0.11	1.26	0.013
Step 3			
Goal Setting	0.85***	5.81***	
Conscientiousness	0.09	1.06	
Goal Setting x Conscientiousness	-0.40**	-2.74**	0.056**

***p < 0.05, **p < 0.01, ***p < 0.001**

Table 6 - Testing the interaction effect of barrier self-efficacy and neuroticism on physical activity (pedometer steps) using hierarchical multiple regression.

Independent variable	**β**	***t***	***Adj R²* (cum)**
Step 1			
Barrier Self-efficacy	0.53***	6.0***	0.28***
Step 2			
Barrier Self-efficacy	0.52***	5.84***	
Neuroticism	-0.068	-0.76	0.004
Step 3			
Barrier Self-efficacy	0.67***	6.08***	
Neuroticism	-0.04	-0.5	
Barrier Self-efficacy x Neuroticism	0.24*	2.2*	0.036*

***p < 0.05, **p < 0.01, ***p < 0.001**

Figure 1 – Graphical representation of the simple moderation effect of conscientiousness in the relationship between goal setting and physical activity.

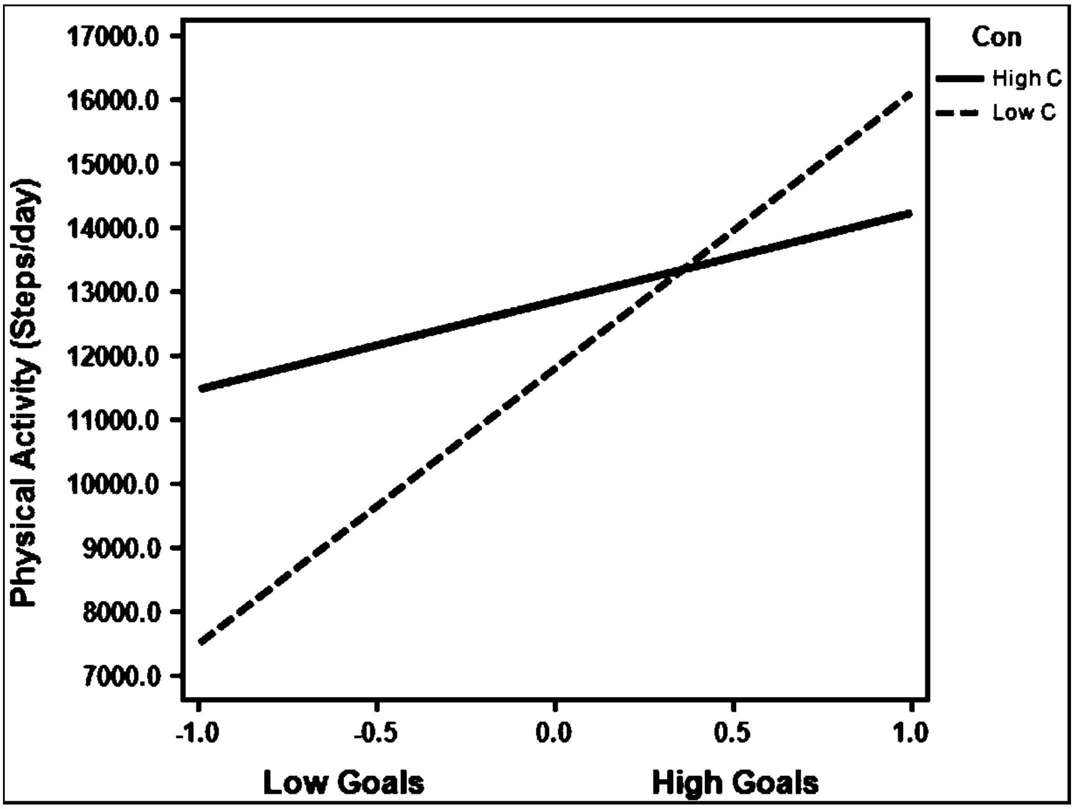

Figure 2 – Graphical representation of the simple moderation effect of neuroticism in the relationship between barrier self-efficacy and physical activity.