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WORKING HARDER AND SMARTER: INVESTIGATING AN ASSOCIATION
BETWEEN PHYSICAL ACTIVITY BEHAVIOUR AND SOCIAL PHYSIQUE ANXIETY
IN A NATURALISTIC ENVIRONMENT

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A thesis submitted to the University of Huddersfield in partial fulfilment of the
requirements for the degree of MSc by Research

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Abstract

Social physique anxiety (SPA) is experienced when an individual perceives themselves to be the recipient of negative body evaluation by others, and has been hypothesised to deter physical activity participation for some individuals. Despite the recognised disparity between male and female body-image concerns, with females consistently reporting greater SPA than males, previous literature is yet to demonstrate a significant association between SPA and physical activity behaviour. The current study investigated an association between sex, physical activity frequency, physical activity intensity and SPA. Currently active users (N = 33 males; N = 31 females) of an on-campus university-run gym participated in this study. Participants were required to complete a background physical activity questionnaire and the 12-item social physique anxiety scale (SPAS) before performing an exercise session at a self-selected level of exertion, with the intensity of each session measured via heart rate monitor. An independent samples t-test revealed female participants (M=41.09, SD=10.46) reported significantly higher SPAS scores than males (M=26.96, SD=6.20). Subsequent ANOVA analyses revealed no significant differences in SPA by physical activity frequency, or physical activity intensity, with an interaction analysis also proving non-significant. Males and females differed in terms of physical activity choice, with females more likely to perform aerobic activity and males more inclined to perform anaerobic activity. The finding for female participants to report higher SPA is consistent with previous literature and may reflect a psychological manifestation of a disproportionate cultural emphasis for females to appear attractive. The current findings are also consistent with previous literature in failing to uncover a significant association between SPA and physical activity frequency, suggesting SPA may be able to be successfully negotiated in order to facilitate the performance of regular physical activity. SPA was not significantly linked to how strenuously an individual may exercise despite a tendency for those performing moderate intensity activity to report higher SPA. Findings are discussed in consideration of practical limitations for identifying links between SPA and aspects of physical activity behaviour.

Introduction

The pursuit of desirability

Prolonged personal and professional success is inherently linked to an individual's ability to continually construct and maintain desirable impressions (Leary, 1992). According to Schlenker (1980), available information from social others is internally assessed in order to create formative impressions of another's personality and predict their future behaviour. Resulting judgements are often used as guidelines for how an individual conducts their own behaviour during situation-specific social exchanges in a variety of differing environments (Leary 1992). All aspects of an individual's behaviour and appearance can be assessed in order to derive rudimentary impressions, including but not limited to: an individual's manner of dress, the presence of tattoos or piercings, the styling of hair/facial hair, the articulation, volume, and cadence of language, and the construction of one's body (Dimpleby & Burton, 1998; Schlenker & Leary, 1982). Non-verbal behaviour is especially critical to self-presentation and impression formation as it is often regarded as less flexible and harder to manipulate than verbal language, making it an immediately more reliable source from which to base impressions (DePaulo, 1992). Naturally, as individuals become mindful of the ongoing social evaluation process and the information they use to make initial judgements of others, it becomes possible to exercise a degree of control over the way they are perceived themselves, by manipulating verbal and non-verbal behaviour in a manner that projects a pre-determined appearance (Schlenker, 1980). The processes underlying this interaction have been conglomerated under the umbrella of self-presentation theory (Schlenker, 1980), representing the reciprocal exchange where upon initial meeting, each social member becomes conscious of both the impression they wish to project, and the rudimentary assumptions they are beginning to form of others. An ability to make favourable impressions has been linked to greater socioeconomic status (Benzeval, Green, & Macintyre, 2013), and higher intelligence, dating, and occupational success in adult life (Langlois, Kalakanis, Rubenstein, Larson, & Hallam, 2000). Accordingly, individuals are motivated to present themselves in a socially desirable manner, striving to appear attractive and competent (Baumeister, 1982; Weiss & Feldman, 2006). The rewards associated with desirable impression formation has led to a propensity of adults adopting acquisitive self-presentational strategies (Leary & Kowalski, 1990). An acquisitive self-presentational strategy is reflected by engagement in a particular activity (or activities) that the individual perceives will increase their probability of making a desirable impression in an undetermined future interaction(s) (Pontari & Glenn, 2012; Wolf, Spinath, Riemann, & Angleitner, 2009; Wolfe, Lennox, & Cutler, 1986). For example, as the appearance of one's physique is inherently linked to the impression they project, an acquisitive self-presentational strategy may be to begin a physical activity programme in order to improve certain aspects of one's physical appearance.

Aspects of an individual's physical appearance represent primary sources of available non-verbal information reflecting a prominent and inescapable domain of self-presentation (Leary, 1992). For example, each social encounter carries the prospect of mutual evaluation of the shape and formation of one's physique (Hart, Leary, & Rejeski, 1989). How closely an individual's physique may approximate prescribed cultural body-ideals is inherently used as a rudimentary assessment of

perceived physical attractiveness (Brewer, Diehl, Cornelius, Joshua, & Raalte, 2004). Cultural ideals represent fusiform physiological amalgamations that have become ingrained within popular culture. For example, Greenleaf, McGreer, and Parham's (2006) qualitative study of self-presentational concerns in female exercisers and aerobics instructors reported 10 of the 11 participants described the cultural body ideal for females as lean, toned and strong-looking without appearing too masculine. Male body ideals have been recognised as a complex interaction of body shape, body fat percentage and muscular mass, with a pronounced emphasis on muscularity (Brunet, Sabiston, Dorsch, & McCreary, 2010). Individuals may base internal assessments of overall body satisfaction depending on how closely their own appearance resembles ascribed cultural-ideals. Unfortunately, significant promotion of the prototype cultural-ideal within popular advertising and media has created an inescapable source of negative upward social comparison, negative comparisons against culturally recognised 'attractive' physiques represent a significant cause of negative body-related affect (Sabiston, Sedgwick, Crocker, Kowalski, & Mack, 2007).

Whilst the prospect for intra-individual variation regarding what an individual considers attractive exists, the relevant literature has provided supporting evidence for stereotypical beliefs about male and female attractiveness to be upheld (Greenleaf et al., 2006). Those whose bodies closely resemble cultural ideals are more likely to be perceived as physically fit and attractive, subsequently making more desirable impressions (Leary, 1992). Greenleaf and colleagues (2006) posit that beliefs about what it takes to achieve a physically fit body may be just as important as the aesthetic appeal. For example, the majority of females reported belief that the cultural ideal would be attainable with extreme levels of dedication and effort. They surmise:

this type of thinking contributes to the social value of "having" an ideal body—as the belief may be that those individuals are deserving of the ideal body and all of the social benefits that come with it because of their hard work and self-control (Greenleaf et al., 2006, p.193)

Greenleaf and colleagues (2006) support the view that individuals may utilise the appearance of another's body as a source of information that can be used to derive further (perceived) information, i.e., creating a holistic impression of an individuals' personality, hobbies, and interests. (e.g., disciplined) through limited information. Unashamedly, due to the promotion of unrealistic body-ideals it must be appreciated that only a select few may be able to achieve the idealistic 'prototype' physique, however, inter-individual variability regarding the degree of variation away from the cultural ideal may manifest itself as differential levels of physique-related anxiety recognisable in the wider population. Therefore, significant deviance from respective body-ideals may subsequently hinder an individual's prospects for making positive physique-based impressions. When an individual believes they will be unable to project a favourable impression, they may adapt their focus towards avoiding creating an undesirable one by employing protective self-presentational behaviour (Brewer et al., 2004), for example, emphasising a specific part of their personality/appearance to mask perceived inadequacies in other areas. A primary strategy of protective self-presentational behaviour is to withdraw from the social environment, however, withdrawal may not always be a viable option, particularly when withdrawal from the immediate environment comes in direct contrast to long term

goals (Leary & Kowalski, 1990; Pontari & Glenn, 2012). For example, withdrawing from stress experienced through entering a physical activity environment may mean an individual can never achieve the physique-enhancing adaptations that can result from long-term gym adherence. This example represents internal conflict between acquisitive and protective self-presentational behaviour. Accordingly, it is recognised that certain situations may elicit direct evaluation of a cost-benefit analysis between the rewards of acquisitive self-presentational behaviour and the immediate anxiety caused by the current stimuli. For example, in this case the costs of prospective negative interpersonal evaluation are weighed against potential physical and psychological benefits achieved through successful negotiation of the anxiety-inducing social environment (Wolfe et al., 1986).

When an individual is involved in a situation where they doubt their ability to create a desirable impression, and are unable to employ the requisite protective behaviour, they may suffer social anxiety (Schlenker & Leary, 1982). Social anxiety has been defined as "the prospect or presence of interpersonal evaluation in real or imagined social settings" (Schlenker and Leary, 1982, p.642). Social Physique Anxiety (SPA) refers to anxiety specifically experienced as a negative affective response to perceptions that others are unfavourably evaluating aspects of one's physique (i.e. body fat, muscular toning) and is commonly reported in physical activity environments due to the heightened salience of the body in performing physical exercise (Cox, Pila, Pinsonnault-Bilodeau, & Sabiston, 2014; Hart et al., 1989). When an individual first enters a gym they are likely to be entering an environment populated by individuals who have been exercising for a considerable period of time. As a result, these individuals may have modified their bodies through exercise to a point where they possess a physique more closely representative of the cultural ideal (Mülazimoğlu-Balli, Koca, & Aşçi, 2010). Perceptions of physical fitness may also play an important role when an individual perceives those around themselves to be fitter or stronger than themselves, serving to enhance SPA via negative upward social comparison (McAuley, Marquez, Jerome, Blissmer, & Katula, 2002; Treasure, Lox, & Lawton, 1998). It is reasonable to assume that negative body-related affect is a result of an internal assessment of body appearance and functionality compared to other social members. The weighting of this interaction may shift according to age and gender of both the individual and surrounding group members (McAuley et al., 2002). SPA has been significantly linked to physical activity motivation, behaviour, and post-exercise affective responses (Focht & Hausenblas, 2004; Raedeke, Focht, & Scale, 2007), with higher SPA commonly reported among younger adults (McAuley et al., 2002) and females of all ages when compared to similar aged males (Berry & Howe, 2004; Chu, Bushman, & Woodard, 2008; Kowalski, Crocker, & Kowalski, 2001; Treasure et al., 1998). These findings may be interpreted to suggest younger adults and females place greater emphasis on the importance of physical attractiveness, or alternatively, reflect disproportionate societal pressure for young adults and females to appear attractive (Greenleaf et al., 2006; McAuley et al., 2002).

Social physique anxiety and sex

The commonly reported sex invariance in SPA research (see Berry & Howe, 2004; Mack, Strong, Kowalski, & Crocker, 2007; Melbye, Tenenbaum, & Eklund, 2007; Smith, 2004), may indicate underlying disparity between male and female motivations for exercise and cultural expectation to

possess a desirable physique (Greenleaf et al., 2006). For example, individuals who are motivated to perform physical activity for weight-related purposes (e.g., exercising to manage weight) often report higher experiences of social physique anxiety (Chu et al., 2008). This trend has been reported in both male and female samples (Grogan, Conner, & Smithson, 2006; Strong, Ginis, Mack, & Wilson, 2006), though is commonly cited as the most salient motivator for female exercisers (Chu et al., 2008). One potential explanation for this discrepancy suggests females are under more externalised cultural pressure to adhere to an aesthetically pleasing physique (Greenleaf et al., 2006). Ingledew and Sullivan (2002) demonstrated a significant discrepancy between males and females in their reports of physical activity for weight-management purposes, with females reporting dissatisfaction with their physique regardless of actual body measurements compared to males who only reported dissatisfaction when they were actually overweight (Ingledew & Sullivan, 2002; Markland & Ingledew, 2007). Ingledew and Sullivan's (2002) findings may be interpreted as direct evidence for the power of cultural expectation to shape an individual's internalized beliefs and behaviour. Historically, western culture promotes a slender, toned physique as the desirable female body ideal (Greenleaf et al., 2006; Murnen & Don, 2012), with females under considerable societal pressure from popularised advertising and entertainment media to conform to the appropriate standards of physical attractiveness (Cafri, Yamamiya, Brannick, & Thompson, 2005b). Failure to suitably adopt a slender body image-ideal is oft-cited as a primary source of body-dissatisfaction and SPA among females (Murnen & Don, 2012). Significantly, sex differences in body dissatisfaction have expanded considerably over the last 50 years with body dissatisfaction prior to 1970 reflecting comparative levels for males and females (Feingold & Mazella, 1998; Melching, Green, O'Neal, & Renfroe, 2016). However, over time it has become suitably ingrained within modern westernized culture for females to exhibit substantially greater body-dissatisfaction as the recognised norm (Murnen & Dunn, 2012). This shift has coincided with technological advancements in image editing as techniques of image manipulation have become more prominent and sophisticated for creating ultra-realistic altered imagery (i.e., 'air-brushing' and 'Photoshop'). Minor augmentations designed to enhance the appearance of attractive cultural-ideal models may serve to even further transform the already unrealistic ideal into an impossible pursuit for an overwhelming percentage of the female population. Intervention and education programmes designed to raise awareness of the prominence of image-tampering within female body-image media have reported positive consequences, inhibiting female body-dissatisfaction for those cognizant of the way media images are artificially enhanced (Halliwell, Easun, & Harcourt, 2011). However, a disconcerting proportion of body-image literature suggests females still report a desire to strive towards portrayed cultural-ideals even after acknowledging the image is likely to have been manipulated (Sabiston et al., 2007). For example, Frederick and colleagues (2016) demonstrated female body image remains constant when examining non-altered or artificially enhanced images of female body-models (Frederick, Sandhu, Scott, & Akbari, 2016). Participants were shown 10 images of slender white females wearing bikinis at the beach, despite an experimental condition adding an explicit statement that the image had been artificially enhanced (i.e., photoshopped), findings indicated no significant variance in resulting body satisfaction. Frederick et al. (2016) findings are representative of recent body image literature to find no ameliorating effect of

adding consumer disclaimers to media images of female body-image ideals (Bury, Tiggemann, & Slater, 2016; Selimbegovic & Chatard, 2015). However, it must also be considered that males are frequently exposed to media representations of unrealistic body-images without demonstrating comparable increases in body dissatisfaction or social physique anxiety (Johnson, McCreary, & Mills, 2007; Leit, Pope, & Gray, 2001). Respectively, SPA sex differences may support the proposition that males and females differ in regards to their interpretation and internalization when exposed to cultural body-ideal imagery (Johnson et al., 2007; Ogden & Munday, 1996). For example, females have been reported to base internal body-related satisfaction on aesthetic appearance rather than functionality, whereas males emphasise functionality and performance over appearance (Murnen & Don, 2012). In the context of media imagery, it is much easier for females to perform negative appearance-based social comparison to a media model than it is for males to compare physique functionality, which may offer partial insight into why body-image concerns represent a much more pervasive threat to female body-satisfaction.

In consideration, men have been generally considered to be relatively unconcerned with the appearance or attractiveness of their physique (Hart et al., 1989). Recent research has sought to understand male body-image concern and SPA, concluding that males are indeed prone to self-presentational anxiety (Crozier, 2012), though likely not to the same extent as females (Berry & Howe, 2004; Chu et al., 2008; Mack et al., 2007; Melbye et al., 2007; Mülazimoğlu-Balliet al., 2010; Smith, 2004). Somewhat contradictory, Corson and Andersen (2002) propose the male body ideal in western culture to represent a physiological amalgamation even more 'unattainable' than the female body ideal. Typically, body-image literature has popularized a generalized view that males desire greater muscularity, whilst females express a desire for 'thinness' (Brunet et al., 2010). Corson and Andersen (2002) elaborate the term 'greater muscularity' to incorporate a large muscular frame, slender waist, and evidence of muscular toning. Accordingly, it may be considered that males face a more diverse and demanding set of body image concerns relating to a desirable interaction between muscle mass, toning and body-fat percentage (Brunet et al., 2010). Corson and Andersen's (2002) work may suggest men are subject to a greater 'volume' of potential body image concerns than females, indicating the commonly reported variation between male and female SPA may be a reflection of significance rather than prominence. For example, assuming a population where male and female participants are counter-balanced according to the degree in which they differ from recognised cultural body-ideals, females may still be expected to report higher SPA due to negative links between unattractiveness and personal success (Meltzer, McNulty, Jackson, & Karney, 2014). Interpersonal and professional 'success' is inherently linked to physical attractiveness for females in a manner incongruent to their male counterparts (Meltzer et al., 2014). For example, heterosexual males place greater emphasis for seeking physically attractive partners than do heterosexual females (Buss, 1989; Meltzer et al., 2014; Sprecher, Sullivan, & Hatfield, 1994). This trend is true for initial romantic attraction (Buss, 1989; Wincenciak et al., 2015) and relationship satisfaction over a prolonged period of time (Meltzer et al., 2014). Accordingly, possessing a physique perceived as undesirable may have significant negative consequences throughout a female's social and professional life. Females have also been identified to receive a greater extent of weight-based

discrimination in the work-place (Crandall, 1994; O'Brien, Hunter, Halberstadt, & Anderson, 2007). Overweight and obese populations especially are commonly perceived negatively based solely on the size and appearance of their bodies (Puhl, Andreyeva, & Brownell, 2008; Puhl & Heuer, 2010). A negative anti-fat sentiment often directed towards overweight individuals is proposed to stem from the connotations of a projected personal appraisal based on the appearance of a healthy or unhealthy body (Leary 1992). Overweight individuals are considered emotionally impaired, socially limited and as possessing negative personality characteristics, for example, overweight individuals are more likely to be considered lazy, weak-willed, and possessing low self-control (Crandall, 1994; Crocker, Cornwell, & Major, 1993; Jones, 2016; O' Brien et al., 2007). This perception has infiltrated public consciousness to an extent that 'anti-fat' prejudice is globally recognized (Jones, 2016). This prejudice has important implications for employability (Roehling, Roehling, & Pichler, 2007) with the potential for negative consequences across virtually all stages of an individual's career lifespan (i.e., recruitment, promotion, and dismissal) (Roehling, 1999). This trend is true for both males and females but is regarded as especially limiting to female career prospects (O' Brien et al., 2007).

Due to considerable sex-disproportionate consequences of possessing an undesirable physique (especially for those with high body fat), females may be more likely to report greater body-anxiety, greater self-monitoring, and being more proactively perceptive in noticing real or imagined changes and developments to their body (Greenleaf et al., 2006). The more a female is pressured towards internalizing dissatisfaction with her own physique is likely to increase her risk of encountering evaluative threat within social environments, as increased body consciousness may lead to an individual being more attentive to the possibility of negative interpersonal evaluation (Kowalski et al., 2001). Accordingly, there is a solid network of body-image literature to have investigated an association between sex and SPA that has identified females to report higher SPA than males (Berry & Howe, 2004; Mack et al., 2007; Melbye et al., 2007; Smith, 2004). An important next step is to investigate sex in consideration of other variables to assess whether differential pressures for males and females to exercise, have resulted in significant differences in the way individuals exercise. One approach has been to look at an interaction between sex and exercise frequency (Chu et al., 2008; Lanfranchi, Maïano, Morin, & Therme, 2014).

Social physique anxiety and exercise frequency

The surrounding literature is yet to discover a significant association between sex, exercise frequency, and SPA (Chu et al., 2008; Lanfranchi et al., 2014). This finding may be considered surprising in regard to the highly disparate SPA commonly reported between males and females (see Berry & Howe, 2004; Mack et al., 2007; Melbye et al., 2007; Smith, 2004), but also serves to highlight the complexities in linking SPA to relevant physical activity behaviour. A clear obstacle in the pursuit of linking SPA to exercise frequency relates to the ability for existing body-image concerns to promote similar physical activity adherence regardless whether their experiences of physique-related anxiety are high or low (Leary, 1992). For example, highly anxious individuals may perform significantly less physical activity (than those with lower SPA) as the threat of negative appraisal inhibits regular exercise (Hart et al., 1989). In contrast, high SPA individuals may be driven to exercise frequently in

an attempt to improve the appearance of their physique and thus reduce the prospect of experiencing future body-related anxiety (Sabiston et al., 2007). The inverse association proposes individuals who report low SPA may perform significantly less physical activity (than those with higher SPA) as they are confident of their self-presentational competence and/or are comfortable with the appearance of their physique (McAuley et al., 2002). However, they may also perform more frequent physical activity as they do not experience negative affect induced by interpersonally threatening environments that may actively deter exercise participation for those with high SPA. Ultimately, general consensus from the surrounding literature suggests these respective influences counterbalance each other in a manner that prevents a directional association between SPA and physical activity frequency from being suitably discerned (Chu et al., 2008; Lanfranchi et al., 2014; Mülazimoğlu-Balli et al., 2010). This trend for non-significance has unsurprisingly been extended to research that has attempted to incorporate sex into the relevant analyses (Chu et al., 2008; Lanfranchi et al., 2014). Closer inspection of the surrounding literature to investigate exercise frequency and SPA may serve to highlight factors that may have contributed to this commonly reported non-significance. For example, Crawford and Eklund (1994) reported SPA did not predict exercise frequency in relation to minutes per day, minutes per week, or days per week of exercise in a sample of female undergraduates undertaking an aerobics class. Similarly, Chu and colleagues (2008) reported a difference in SPAS score according to gender, with males reporting significantly lower SPA than females, but no significant difference in regards to exercise frequency. Lanfranchi and colleagues (2014) reported involvement or non-involvement in sporting practice did not predict SPA in a mixed-gender sample of adolescents. However, as participants were represented by school-age adolescents, participants reported as non-active still took part in frequent curriculum-required physical education programmes and may not reflect a true sedentary population. Treasure and colleagues (1998) conducted a 3-month physical activity intervention programme for obese females reporting significant differences pertaining to physical activity frequency and SPA according to age. Compared to their younger counterparts, participants aged 45 and over reported greater exercise adherence and lower SPA, providing support for the contention self-presentational concerns become less influential in later adult life (McAuley et al., 2002; Zach & Netz, 2014). Contrastingly, Mülazimoğlu-Balli and colleagues (2010) reported competitive athletes and exercisers had significantly lower SPA than non-exercisers to suggest increased exercise volume may be associated with positive psychological consequences (i.e., lower SPA). Mülazimoğlu-Balli et al. (2010) use of an all-Turkish sample may initially indicate the findings are of limited generalizability to Western civilization due to subtle discrepancies in culturally prescribed physique ideals, however, the SPAS has been reported to be suitably generalizable across European populations highlighting the potential for other factors to have contributed to their discrepant findings (Hagger et al., 2007).

Collectively, though diverse in design and origin the presented research adequately represents a disjointed association between SPA and physical activity frequency (Chu et al., 2008; Crawford & Eklund, 1994; Kowlaski et al., 2001; Mülazimoğlu-Balli et al., 2010; Treasure et al., 1998) Taken together, the general non-consensus created by surrounding literature may indirectly confirm physique concerns to be both a key motivator (Hart et al., 1989) and inhibitor of physical activity

participation (Kowalski et al., 2001). In this regard it may be argued that indiscriminate research findings are to be expected due to contrasting behavioural influences of acquisitive and protective self-presentational behaviour and represent conflict between a desire to enhance the body's appearance and the desire to avoid repeated exposure to an identified source of negative affect (i.e. the fitness environment) (Schlenker & Leary, 1982). Non-significant findings may also indicate a significant proportion of those with self-presentational concerns are finding ways to exercise frequently regardless of SPA. For example, Kowalski et al. (2001) suggest motivation to be physically active (for reasons of health or physical attractiveness) may outweigh the anxiety felt by performing in environments characteristic of heightened evaluative threat. This contention suggests SPA can be successfully moderated in order to negotiate anxiety-inducing environments (Leary, 1992). The distinction between individuals who feel similarly high levels of evaluative threat but choose different coping mechanisms, withdrawal or adherence, is becoming an increasingly important variable in identifying the influence of SPA on exerciser behaviour (Focht & Hausenblas, 2004; Raedeke et al., 2007). Critically, this may also suggest SPA is not the most salient variable for predicting physical activity frequency and attention may be best diverted to investigate SPA in a mediatory capacity in coordination with other psychological constructs (Brunet & Sabiston, 2009; Kowalski et al., 2001). Whilst recognised that physical activity behaviour is influenced by a myriad of affective, behavioural, and psychosocial variables, significant practical limitations of SPA methodology must be considered before dismissing SPA as a direct primary influence of physical activity behaviour (Scully, Kremer, Meade, Graham, & Dudgeon, 1998).

The two most prominent findings from SPA literature repeatedly demonstrate females and young adults/adolescents to report the highest social physique anxiety (Bowden, Dunsmore, Rust, & Briggs, 2005; Chu et al., 2008; McAuley et al., 2002; Mülazimoğlu-Balli et al., 2010; Treasure et al., 1998; Strong et al., 2006). Crucially, it should be considered that these variables represent stable entities that are easily defined and operationalised (i.e., age and sex). High variability in methodological approach may illustrate why a similar consensus has not been reached in other areas of focus. A key critique of the respective literature reflects the common practice for researchers to employ decidedly diverse measures to assess participant exercise frequency. For example, Chu and colleagues (2008) utilised a self-created measure to identify participants activity status they termed the 'Physical Activity Specification Survey' (PASS). Based on physical activity guidelines which recommend minimum 3 bouts of cardiovascular activity per week, 2 bouts of resistance (weight) training per week, and 2 bouts of flexibility training per week, participants were ascribed an exerciser status based on how often their typical week's physical activity met each of these requirements (Bull et al., 2010). For example, a participant who performed 2 bouts of resistance training a week but did no cardiorespiratory or flexibility work would score 1 on the PASS. A participant who reported 3 bouts of cardiovascular exercise, 2 bouts resistance training and 2 bouts of flexibility per week would score 3 on the PASS. Participants were ascribed low, moderate, or frequent exerciser status based on this format. An inherent limitation of this approach is that it is not solely recording exerciser frequency but is adding a stipulation in regards to what form of exercise is being carried out. For example, an individual who engages in 6 instances of resistance training, but no other forms of exercise, would be

classified as a low frequency exerciser. An individual who engages in 3 bouts cardiovascular activity and 2 instances of flexibility training would be quantified as a moderate exerciser despite a lower volume of weekly physical activity. Failure to accurately assign participants a corresponding physical activity status may have contributed to Chu et al. (2008) non-significant findings. This same criticism can be also be directed towards previous works to have utilised a common validated measure for collecting exercise frequency data. For example, Godin's Leisure time activity questionnaire (GLTEQ) (Godin & Shephard, 1985) is a frequently utilised measure in SPA research (Brunet & Sabiston, 2009; Focht & Hausenblas, 2003, 2004; Gammage, Lamarche, & Droiuin, 2014; Kowalski et al., 2001). The GLTEQ presents a set list of physical activities in which participant's select those in which they take part in a typical 7-day period, physical activities are assigned a sub category classification based upon how physically exerting they are perceived to be (pre-determined by the scale). For example, association football (soccer) is an example of strenuous exercise, badminton is categorised as moderate intensity exercise, and yoga is an example of mild physical activity. Participant's total scores are calculated by summing each instance of physical activity within each category (e.g. mild activities are multiplied by 3, moderate activities by 5, and strenuous activities by 9). A primary limitation of this approach is that the measure does not provide an exhaustive list of physical activities for participants to select. A key omission in this regard is the absence of weightlifting/bodybuilding. Gym-going behaviour (i.e. weightlifting) may be the most salient form of physical activity in regards to self-presentational exercise motives, particularly for males wishing to appear more muscular (Hurst, Hale, Smith, & Collins, 2000). For example, Frederick, Manning, and Morrison (1996) reported individuals with high SPA indicated preference for undertaking 'fitness-type' activities (i.e., using weight machines) over other forms of physical activity. An inability to report this particular form of exercise may lead to classification errors in determining physical activity status for participants, making the probability of making a significant association between SPA and exerciser frequency less likely. A further limitation of the GLTEQ is the subjective nature of which activities are classified as representing mild, moderate, or strenuous activity. The category to which each physical activity is assigned has implications for participants' overall scores as participants multiply their respective involvement in each of their strenuous, moderate, and mild exercises by 9, 5, and 3 respectively to create a total exercise score. Arbitrarily assigning certain forms of exercise higher intensity status ignores the possibility that any form of physical activity has the potential to be considered physiologically strenuous depending on how much effort an individual bestows upon it. In consideration of these limitations it is feasible that participants may easily be assigned to categories that do not accurately reflect their true physical activity behaviour. Additionally, utilising diverse measures to collect participant physical activity data hinders accurate cross-study comparisons and may directly contribute to an obfuscation of research findings. For example, the same participant could be assigned different exerciser status depending on the data collection strategy employed by each researcher (i.e., by using the PASS vs the GLTEQ) (Chu et al., 2008; Godin & Shephard, 1985).

Important considerations must also be recognised when interpreting the contributions of previous literature to have identified a significant association in this regard, for example, Mülazimoğlu-Balli et al. (2010) reported athletes and regular exercisers experience lower SPA than non-exercisers.

Mülazimoğlu-Balli et al. (2010) finding is important in the context of SPA literature as thematically similar research has repeatedly failed to distinguish a significant association between physical activity frequency and SPA (e.g., Chu et al., 2008; Lanfranchi et al., 2014). Closer inspection of the methodological approaches employed by each researcher may serve to illustrate why discrepant findings have been reported (Chu et al., 2008; Lanfranchi et al., 2014; Mülazimoğlu-Balli et al., 2010). Participant history of exercise is a potentially confounding variable and highlights the limitation of employing cross-sectional methodology in this domain (Cox et al., 2014). Mülazimoğlu-Balli et al. (2010) reported athletes and regular exercisers mean exercise participation to be 8.77 and 2.67 years respectively. In comparison, exercise history was not considered in the work of Chu and colleagues (2008). Similarly, Lanfranchi et al. (2014) reported 69% of their 'physically active' participants had been so for at least one year, however, as they do not discern exercise history further they may have underestimated the confounding influence that physical activity history may have on current SPA (Bowden et al., 2005). Attempts to modify existing SPA may require prolonged adherence to a designated programme of physical activity (Bowden et al., 2005; Hart et al., 1989). Mülazimoğlu-Balli et al. (2010) illustrate the importance of recognising physical activity history when comparing SPA and physical activity frequency. For example, regular exercisers in all three studies may report similar exercise frequencies, but the length of time each individual has been performing that volume of physical activity may considerably vary. Mülazimoğlu-Balli et al. (2010) work suggests a combination of exercise adherence (i.e., years) and frequency (i.e., weekly participation) may result in a more comprehensive representation of the relationship between physical activity behaviour and SPA. The representation of participants current exercise behaviour may also have contributed to the disputed findings. Non-exercising participants were either operationalized as those who did not engage in any form of physical behaviour (Mülazimoğlu-Balli et al., 2010), versus those who did not engage in any additional physical activity beyond the general physical activity programme in which all participants were enrolled (Chu et al., 2008; Lanfranchi et al., 2014). This may inhibit accurate cross-study comparisons due to different representations of participant physical activity behaviour. For example, Mülazimoğlu-Balli et al. (2010) can be argued to incorporate a representative sedentary sample into their analyses whereas comparable participants must be referred to as 'low-frequency exercisers' elsewhere due to their engagement in regular physical activity (Chu et al., 2008; Lanfranchi et al., 2014). Discrepant research findings may ultimately reflect inherent differences between true sedentary samples and infrequent exercisers. Collectively, these findings may suggest subtle differences between analysing samples of exercising individuals who engage in variable amounts of physical activity compared to investigating affective differences between those who exercise regularly and those who do not. For example, Mülazimoğlu-Balli et al. (2010) reported no significant interaction between athletes and regular exercisers in relation to SPA. Taken into consideration, the most prominent significant association reported between physical activity frequency and social physique anxiety thus far reflects a difference between those who perform some form of regular physical activity and those who do not (Mülazimoğlu-Balli et al., 2010).

Accordingly, limited generalizability is a prominent and pervasive consideration for SPA literature (Cox et al., 2014). A large proportion of research is undertaken utilising female-only samples (see Crawford

& Eklund, 1994; Focht & Hausenblas; 2003, 2004; Haase & Prapevessis, 2001; Kowalski et al., 2001; Lindwall & Lindgren, 2005; Raedeke et al., 2007; Treasure et al., 1998) and consequently cannot be assumed to explain SPA and self-presentational behaviour in males. An underrepresentation of male participants may ultimately lead to limited understanding of male body-image concerns (Crozier, 2012). Divergent cultural ideals for male and female body structures may indicate underlying psychological discrepancies in physical activity motives and behaviour. Accordingly, discrepancies in physiological goals have been identified as a 'Drive for Thinness' in females and 'Drive for Muscularity' in males (Brunet, et al., 2010; McCreary & Sasse, 2000). While these drives are not mutually exclusive, they do represent differential emphases along the same spectrum (Kelley, Neufeld, & Musher-Eizenman, 2010). An effective acquisitive strategy for socially anxious individuals may be to use physical activity to directly improve the appearance of their physique (Leary & Kowalski, 1990). Individuals who exercise regularly may be expected to report lower SPA due to possessing a more culturally desirable physique as consequence of a heightened physiological workload (Mülazimoğlu-Balli et al., 2010). In this regard it may be expected that research reflect higher frequency exercisers to report lower SPA compared to infrequent or non-exercisers. However, Haase and Prapevessis (2001) highlight the importance of taking into account contextual factors of the physical activity being performed. Haase and Prapevessis (2001) contend females report higher SPA due to greater involvement in physical activities that emphasise the physique's appearance. Participants who engage in forms of physical activity where the physique is of direct focus (e.g., aerobic dancers, divers) report higher SPA compared to those who engage in non-physique salient activities (e.g., rowing, association football) (Haase & Prapevessis, 2001). Swimmers and aerobic dancers may experience greater evaluative threat given the nature of their physical activity being performed in an environment where the physique is directly emphasised. Haase and Prapevessis's (2001) work suggests certain sub-groups of physical activity performers may be prone to reporting heightened SPA as a function of their environment. Accordingly, two participants who self-report the same physical activity frequency may report different SPA depending on contextual qualities of the environment in which they perform. For example, a swimmer may have attained a culturally desirable physique through regular exercise but still report inflated SPA as the prospect for their physique to be negatively evaluated remains inherently higher in comparison to other exercisers.

Fluctuations regarding research scope and sample specifications represent an integral obstruction to SPA literature being realistically compared and generalized (Cox et al., 2014). Who the participants are and what form/s of physical activity they engage in can have a pronounced effect on physical activity frequency. Notably, it is important to consider methodological discrepancies when comparing research that investigates self-presentational associations between single forms of physical activity versus those attempting to incorporate multi-activity behaviour (Chu et al., 2008; Crawford & Eklund, 1994). Literature focussing solely on the self-presentational qualities of one form of physical activity (E.g. Crawford & Eklund, 1994) will lack generalizability to other forms. For example, the results derived from Crawford and Eklund's (1994) sample of aerobic dancers may not accurately represent the self-presentational concerns of a group of hockey players or cyclists with similar levels of SPA and similar body anthropometrics. The validity of such findings may also be moderated by engagement in

other forms of physical activity separate from the one that is being directly analysed. For example, two participants may report the same frequency of weekly aerobic dance participation but one may perform significantly more physical activity through other forms. However, in response, attempting to create a holistic representation of an individual's physical activity participation by aggregating different physical activity types, may disguise significant interactions by ignoring the pervasive influence of specific physical activity motives and environmental contexts (Chu et al., 2008; Haase & Prapevessis, 2001).

Social physique anxiety and exercise intensity

The criticisms that have been presented indicate a multitude of physical activity determinants must be considered in order for a clear association between sex, physical activity frequency and SPA to be revealed. Beyond those already detailed, an inherent limitation of research that has attempted to identify links between physical activity frequency and SPA is an underappreciation of the physiological and psychological consequences directly linked to how strenuously an individual may exercise. Focussing exclusively on exerciser frequency as a predictor of SPA fails to acknowledge the importance of other key variables associated with physical activity programmes. Exercise frequency, duration, type of exercise, and exercise intensity represent core principles of physical activity training that can be tailored specifically to create personalised fitness plans (Bull et al., 2010). Out of these variables, exercise intensity may be considered the most directly influential to physical activity frequency and SPA (Ekkekakis, Hall, & Petruzzello, 1999). For example, weightlifting or any strenuous exercise regime may necessitate the incorporation of rest-days into long-term workout plans in order to give the body adequate recovery time between sessions. Rest days are inherently important to promote muscular growth and it may be in direct contrast to identified physique goals for a weightlifter to train as frequently as 5-6 times per week (Fry & Kraemer, 1997). An individual who adheres to a dedicated programme of resistance training 3-4 times per week may subsequently sculpt a more culturally desirable muscular physique when compared to an individual who takes part in other non-physique focussed activities more frequently (Frederick et al., 1996; Greenleaf et al., 2006; Hurst et al., 2000). Exercise intensity is also especially important due to a negative association with exercise adherence (Cox, Burke, Gorely, Beilin, & Puddey, 2003). Strenuous exercise is highly physiologically demanding and may act as a deterrent to long-term exercise for some individuals as intensity has been linked to negative post-exercise affect (Chu, Lu & Lin, 2010; Ekkekakis et al., 1999; Ekkekakis, Lind, & Vazou, 2010). For example, in a study comparing normal weight, overweight, and obese female participants Ekkekakis and colleagues (2010) reported all participants recorded a gradual decline in affect as task difficulty increased. Accordingly, governmental guidelines suggest exercise intensity and duration should be modified in order to reach high energy expenditure without being overlong or intense to a point that exercise becomes unpleasant or intolerable (Bull et al., 2010). Notwithstanding, progressive overload is a key principle of long-term training programmes and participants may have to progress through sessions of incremental intensity in order to make continued progress towards a desired physical goal (McNicol, O'Brien, Paton, & Knez, 2009). Intensity is a variable that must be progressively negotiated and increased in order to reap physical activity-induced physiological and physique enhancements. Accordingly, exercise intensity may

represent an important variable in relation to SPA and self-presentational concerns (Ekkekakis, 2003; Focht & Hausenblas, 2004).

Lind, Joens-Matre, and Ekkekakis (2005) advocate physiological, perceptual and affective influences as integrated variables that must be taken into account when attempting to explain why individuals work at designated self-selected intensities. Lind and colleagues (2005) suggest an individual will continually self-regulate exercise behaviour in order to strike an optimal balance between physiological, psychological and perceptual perspectives. For example, exercising at too low an intensity may provoke boredom or feelings of wasted time, whereas high intensity exercise may be deemed too physically demanding, facilitating the experience of unpleasant physiological sensations and negative affect. Ultimately, both may lead to non-adherence (Scully et al., 1998). Social physique anxiety may have a pervasive influence upon an individual's perceptions whilst performing physical activity (Leary, 1992; Sabiston et al., 2007). Importantly, Ekkekakis' (2003) dual-mode theory of physical exertion proposes that cognitive appraisals become variably important at different levels of physiological workload. For example, when an individual is comfortably able to meet the physical demands of the activity at hand negative cognitive appraisals are likely to be minimal. As task difficulty increases causing intensity to elevate, an individual may find it more difficult to mask physical cues that suggest fatigue or exertion. Ekkekakis (2003) postulates that it is in this stage where negative cognitive appraisals are most likely to be sought and formed within the individual. Finally, as physical task difficulty approaches near maximal levels the prevalence of cognitive appraisals diminish in place of more dominant interoceptive cues stemming from the stressful physiological sensations (Ekkekakis 2003; Ekkekakis et al., 1999).

In accordance with dual-mode theory (Ekkekakis, 2003), SPA is likely to be highly influential for individual's exercising at moderate intensity due to a higher propensity for the perception of negative interpersonal evaluation to infiltrate cognitive mechanisms. This proposition has received limited empirical support from Ekkekakis himself (Ekkekakis et al., 2010) and Focht and Hausenblas (2003, 2004). Focht and Hausenblas (2003), investigated links between exercise intensity and SPA in a sample of sedentary females, reporting females who exercised at moderate intensity experienced the highest levels of SPA. However, it is important to highlight that Ekkekakis' (2003) model is inherently focussed on physical performance and is not directly associated with physical appearance. Those with concerns of evaluative threat specifically relating to the appearance of their physique may experience negative cognitive appraisals (i.e., SPA) at low intensity exercise also. Certain individuals may enter the gym already possessing high SPA relating to their body's appearance, during moderate intensity exercise, the physiological demands of the activity may serve to augment existing SPA further by presenting additional limitations of their physical fitness (i.e., their body's performance). Boutcher, Fleischer-Curtain, and Gines (1988) presented evidence suggesting cognitive influences are still influential even at high intensity workloads (85% of maximal heart rate) as male participants displayed a tendency to under-report levels of exertion when exercising in front of a female instructor, compared to a male instructor. These findings suggest the potential for cognitive appraisal is suitably minimised but not eliminated by increasing exercise intensity. However, as Boutcher et al. (1988)

participants were observed in a controlled laboratory environment absent of other exercisers, results may not generalise to naturalistic environments where participants may not be expecting to be observed so directly.

A simplistic derivation of Ekkekakis's (2003) model may suggest the harder an individual is working physiologically, the less concerned they may be with perceived cognitive appraisals from social parties (Focht & Hausenblas, 2003). While this may create a conducive effect for diminished SPA, resulting negative affect and risks to physical health may make prolonged high intensity exercise impractical (Bull et al., 2010; Cox et al., 2003). However, in the absence of agreed research-informed guidelines to prescribe optimal exercise type, frequency, intensity, and duration, the identification of intensity as a potentially protective barrier against negative cognitive appraisal raises the prospect for exercise intensity to be employed and prescribed as self-presentational behaviour (Scully et al., 1998). No specific consensus has been reached in order to describe the preferred intensity an individual should strive to work at for maximal physiological or psychological benefit (Shepherd et al., 2015). There is also a lack of consensus in differentiating between exercise intensity boundaries (Scully et al., 1998). It has been identified that physical exertion that elicits between 40-54% of maximal heart rate indicates light intensity activity, between 55-69% indicate moderate intensity, and 70% and over represents strenuous activity (Hiilloskorpi, Pasanen, Fogelholm, Laukkanen, & Mänttari, 2003). As these boundaries are recognised as guidelines rather than represented as core principles of physiological health, researchers often distinguish between light, moderate, and strenuous exercise intensity at their own discretion. For example, whereas Boutcher and colleagues (1988) classify intensity as 60% of maximal heart rate for light activity, 75% for moderate, and 85% for strenuous, McAuley et al. (2002) define light physical activity between 50-55% of max HR and moderate intensity at 65%. Discrepancies in intensity boundaries may limit cross-study comparisons due to disparate participant classification structures. Other authors opt to use psycho-somatic indicators of physical intensity as in Appleton's (2012) exercise intervention study. Appleton's (2012) participants completed a two week exercise intervention programme in an attempt to analyse purely psychological adaptations to physical activity, participants were instructed to exercise at moderate intensity for 3 sessions of 40 minutes per week. As reported by Appleton (2012), "moderate intensity was operationalized as an exercise intensity capable of resulting in shortness of breath and perspiration in the individual" (Appleton, 2012, p.112). This approach to measuring intensity creates difficulty for accurate replication and cross study comparison due to high inter-individual subjectivity in determining current physiological work load. As there is non-agreement regarding what exercise intensity is considered superior (E.g. workloads of 40-50% vs 50-60% vs 70-75% of maximal heart rate have each been considered optimal), the intensities researchers impose on participants may be considered arbitrary (Scully et al., 1998). Focht and Hausenblas (2003) investigated the comparative effects of imposed vs self-selected intensity on state anxiety levels of 30 socially physique anxious females. Participants in the imposed-intensity group were instructed to maintain an intensity between 70-80% of their maximal heart rate. Results showed exercise intensity to be significantly lower in the self-selected sample suggesting studies that enforce pre-selected intensities may fail to accurately reflect the intensity that individuals choose to work at independently (Dishman, 1994). Accordingly,

Scully et al (1998) propose individuals exercise at a self-selected intensity agreed in consultation with a physician. For some individuals, optimal intensity may be operationalized as an adequate intensity sufficient to allow physiological enhancement whilst limiting the potential for negative cognitive appraisal. Chu and colleagues (2010) suggest accurate interpretation of one's optimal intensity is developed through experience. Chu et al. (2010) separated participants into conditions based on experience, with high-experience exercisers represented by senior students majoring in physical education and low-experience exercisers who neither majored in physical education nor exercised regularly. Heart rate responses of more experienced participants were significantly lower than that of their counterparts with less exercise experience during self-selected intensity running (Chu et al., 2010). This may suggest that those with greater exercise experience work hard enough to achieve self-determined physical activity benefits without over-exerting to a point of unpleasantness. An ability to successfully negotiate the plethora of incoming perceptual, physiological and affective information during physical activity may be key to continual exercise adherence and physique enhancement.

Exerciser intensity has also been found to be externally stimulated by social others within naturalistic exercise environments (Crawford & Eklund, 1994; Focht & Hausenblas, 2003, 2004). An individual may modify their workout to avoid exhibiting obvious indicators of strenuous exertion in an attempt to minimise negative interpersonal appraisals of physical fitness (McAuley et al., 2002). Contrastingly, an individual may wish to exercise 'harder' in order to conform with (perceived) similarly-abled nearby individuals (Worringham & Messick, 1983) highlighting how exercise intensity can be moderated by variables other than physical capability. Self-presentational concerns are linked to self-reports of perceived physical exertion through under or over-reporting of physical performance measures (e.g. the Rating of Perceived Exertion scale) (Borg, 1988), suggesting self-presentational concerns do influence the intensity at which an individual selects to exercise, and selects to report (Boutcher et al., 1988; Focht & Hausenblas, 2003). Such effects are especially pronounced in naturalistic exercise environments where participants generally report a trend towards exercising at higher intensities compared to a controlled laboratory environment (Chu et al., 2010; Focht & Hausenblas, 2003; Worringham & Messick, 1983). Accordingly, research that fails to include a naturalistic condition may have limited generalizability as exercise intensities may not be representative of those individuals self-select in real-life environments.

A primary goal of SPA research is to facilitate development of exercise environments that minimize the prospect of evaluative threat (Sabiston et al, 2007). Findings from self-presentation literature can effectively be reverse-engineered to offer prescriptive behavioural strategies for those with heightened SPA to minimise negative affect within physical activity settings (Crawford & Eklund, 1994). For example, research has identified the presence of mirrors and the wearing of certain forms of attire to have detrimental consequences for state anxiety, self-efficacy and SPA in those with self-presentational concerns (Brewer et al., 2004; Raedeke et al., 2007). By using this information exercise environments can be structurally modified in order to facilitate a less socially threatening experience for their clients (Crawford & Eklund, 1994; Focht & Hausenblas, 2004). Despite this overarching aim it is important to exercise caution when proposing modifications to fitness

environments, even those that are informed by research (Scully et al., 1998). Naturalistic exercise environments possess diverse properties that may individually and collectively influence SPA (i.e. mirrors, other exercisers, and clothing), alternatively, research to identify specific sources of self-presentational concern has done so by making significant manipulations to the exercise environment in order to isolate each factor's influence (see Crawford & Eklund, 1994; Ekkekakis et al., 2010; Focht & Hausenblas, 2003, 2004). This methodological approach can be identified as both a strength and weakness as it has aided in the identification of variables within fitness environments that can influence SPA, however, the approach does little to explain how these variables interact with one another holistically when present in real-life fitness facilities (Focht & Hausenblas, 2004). Consequently it may be viewed as arbitrary to manipulate exercise environments and control for specific influences on SPA whilst directly sacrificing ecological validity. For example, Focht and Hausenblas (2004) used researcher-designated gym-wear of a baggy t-shirt and shorts to standardize attire in order to control for the potentially confounding variable of participants utilising concealing attire as a form of protective self-presentational behaviour. Similarly, participants in Focht and Hausenblas (2003) naturalistic condition were instructed to exercise in front of a full-length mirror in an attempt to artificially maximise perceptions of evaluative threat. Whilst exercisers may not have ultimate control over the structural layout of a particular physical activity environment, they do have control in how they navigate it, and through the deployment of protective self-presentational strategies. Significantly, individuals have direct control over the frequency, duration and intensity of their physical activity (Bull et al., 2010). By investigating links between intensity and self-presentational behaviour it may allow current and prospective exercisers to utilise a key strategy for minimising SPA and perceived evaluative threat. It is proposed the next step in physical activity research is to attempt to mirror real-life physical activity environments and examine how variables associated with enhanced evaluative threat influence exerciser behaviour in a holistic fashion.

The current study

Regular physical activity has been frequently reported to be remarkably beneficial to physical and psychological well-being (Foulds, Bredin, Charlesworth, Ivey, & Warburton, 2014; Hurst et al., 2000), significantly reducing the risk of physical ailments in the form of cancers, heart disease and diabetes (Blair & Morris, 2009; Wilson, Ellison, & Cable, 2016; Scully et al., 1998), whilst also improving an individual's self-efficacy, self-esteem and physical self-perceptions (Kowalski et al., 2001; McAuley et al., 2002). Accordingly, it is becoming increasingly important to be able to accurately define the association between SPA and physical activity as concerns about the appearance of one's physique can represent a primary barrier to regular exercise participation (Kowalski et al., 2001; Treasure et al., 1998). Understanding social and environmental triggers that serve to enhance SPA may be the first step towards actionable change in the development of less threateningly appearance-orientated physical activity environments (Greanleaf et al., 2006). Literature may also be able to uncover considerable strategies for individuals to be able to exercise in a manner that minimizes the prospect of evaluative threat via the identification and employment of protective self-presentational behaviour. Through positive identification of sources of physique-related anxiety it may be possible for those with high SPA to reduce the impact of perceived negative interpersonal evaluation, facilitating prolonged

physical activity engagement and allowing sedentary individuals to be able to reap the psychophysiological benefits begetting regular exercise (Appleton, 2012). However, the existing literature demonstrates a distinct lack of clarity regarding how SPA may influence physical activity behaviour (Cox et al., 2014). Without a definitive understanding of SPA and self-presentational influences, research informed recommendations to behaviour for sedentary individuals are inherently limited. Accordingly, the current research aimed to further investigate the association between social physique anxiety and physical activity behaviour. A considered attempt was made to address a significant gap in the existing literature by incorporating exercise intensity into analyses of physical activity behaviour and SPA. The intensity at which an individual exercises may indirectly influence SPA by minimising the probability of (negative) cognitive appraisals being sought (Ekkekakis, 2003). As the physiological requirements necessary to perform strenuous physical activity suppress superfluous cognitive processes, the impact of SPA within physical activity contexts may be diminished as a result of regular bouts of intense exercise. Accordingly, exercise intensity may represent a considerable (if not accidental) form of protective self-presentational behaviour with participants' SPA being moderated as a by-product of how hard they are working physiologically. It is proposed that exercise intensity may potentially be of great significance for understanding the association between physical activity behaviour and SPA. Individuals have explicit control over their self-selected exercise intensity during physical activity and if an association is identified to suggest vigorous intensity exercise may ameliorate social physique anxiety, it may open up the possibility of prescribing short-term programmes of strenuous exercise for body anxious individuals.

There is also a considerable lack of prior research investigating the interaction effect between multiple variables identified as influencing SPA. For example, previous literature has repeatedly reported females as exhibiting greater SPA than males (Berry & Howe, 2004; Mack et al., 2007; Melbye et al., 2007; Smith, 2004), although up to this point there has been a distinct lack of exploration as to why sex differences are so frequently reported. Consequently, it remains unclear how sex disproportionate cultural expectations are manifested in terms of behaviour and attitudes (Murnen & Don, 2012). By analysing sex in accordance with specific physical activity behaviours such as exercise frequency and intensity, it may reflect contrasting strategies for how males and females utilise physical activity environments. The current research investigated links between sex, physical activity frequency, physical activity intensity, and social physique anxiety. In doing so, the current study made a considered attempt to analyse potential interaction effects between multiple variables to forge a more comprehensive understanding of SPA influence (i.e., sex, exercise frequency, intensity, and prior history of physical activity involvement). A deliberate attempt was also made to maintain a naturalistic representation of a 'real life' physical activity environment throughout data collection by avoiding extraneous experimental manipulation in order to preserve ecological validity. The hypotheses were as follows;

Hypothesis One) There will be a significant association between sex and social physique anxiety with females reporting higher SPA than males

Hypothesis Two) There will be a significant association between exercise frequency and social physique anxiety

Hypothesis Three) There will be a significant association between exercise intensity and social physique anxiety

Hypothesis Four) There will be a significant interaction effect between sex, exercise frequency and exercise intensity in relation to social physique anxiety.

Method

Design

The current study employed a 2 (sex: male, female) x 2 (exercise intensity: low, moderate/high) x 3 (exercise frequency: low, moderate, frequent) factorial design to investigate links between physical activity behaviour and SPA (DV).

Ethical approval was granted by the School Research Ethics Panel (SREP) at the University of Huddersfield prior to data collection.

Setting

A north of England University run gym open to both students and non-students.

Recruitment

Participants had to be a minimum of 18 years of age to be eligible to take part. Participation was not dependent on sex, ethnicity, or body composition and was open to both students and non-students. The decision to impose limited (e.g., age) restrictions during recruitment was made in consideration of previous research predominant focus on high SPA individuals who perform low frequency physical activity (e.g., Focht & Hausenblas, 2003, 2004). Opening up participation to all members over the age of 18 allowed an exploration of how body-image concerns may impact physical activity behaviour in a more representative sample of active gym-users. Accordingly, convenience sampling was used to recruit any individual over the age of 18 that used the gym during times of data collection who volunteered at their own discretion. Individuals were approached and invited to participate from within the gym environment by the researcher before the onset of their exercise regime. Participants were instructed to carry out their exercise regime as normal and encouraged to perform their preferred level of exertion using the available apparatus of their choice (i.e., rowing machine, treadmill, free weights).

Measurement tools

Social Physique Anxiety Scale

The Social Physique Anxiety scale (SPAS) (Hart et al., 1989) is a 12-item scale designed to measure the degree of anxiety an individual experiences as a result of perceived negative interpersonal evaluation of their physique. Participants are presented with a series of 12 statements and asked to respond according to how well that statement fits their interpersonal body-image beliefs. For example, participants are presented with the statement, 'It would make me uncomfortable to know others were evaluating my physique or figure'. Participants respond via a 5-point Likert scale with possible answers ranging from 1 (not at all characteristic of me) to 5 (extremely characteristic of me). For example, an individual may respond to the above question with a score of 5 (extremely characteristic of me) indicating high social physique anxiety. Five of the items represent positively worded body-image statements and require reverse scoring, for example, for item 5 'When I look in the mirror I feel good about my physique or figure', a score of 1 (not at all characteristic of me) would indicate a highly socially physique anxious individual. After successful completion of all 12 items, the scores are

totalled to represent an individual's SPA. Scores range from 12 to 60 with a higher score indicating greater physique anxiety, a score of 36 or higher is considered to indicate high SPA (Focht and Hausenblas, 2004). Both high internal consistency (Cronbach's alpha = 0.90) and test-retest reliability ($r = 0.82$ over an 8-week period) have been evidenced using the SPAS for assessing body-image related negative affect (Hart et al., 1989).

Demographic Questionnaire

Participants were also required to fill out a brief questionnaire designed to gather demographic information in order to provide accurate sample description (see appendix A). Accordingly, participants were asked to report their age, sex, employment status and ethnicity. Participants were also asked to report how long they had been an active gym member, and how many times they use the gym in a typical week in order to build a profile of each participant's exerciser status.

Heart Rate Monitors

Polar FT2 heart rate monitors were used to measure participant heart rate response during exercise. The FT2 model is comprised of a synchronised chest strap and wrist watch component with participants required to wear both to generate a heart rate reading. The monitors display the wearer's current heart rate as beats per minute (BPM) and provide information regarding the duration, average heart rate and max heart rate after each session.

Procedure

Recruitment posters were positioned in and around the gym environment informing participants that data collection would be taking place within the gym on selected dates. Participants were also notified of the intention for data collection and invited to volunteer for the present study via announcements posted on corresponding social media outlets attached to the gym. Participants were recruited from within the University campus gym before the commencement of their self-determined workout. The researcher was stationed within the corner of the gym located near the entrance where members would have to pass through in order to access fitness equipment. Active gym users who were present during times of data collection were invited to participate and were provided adequate detail regarding what the study would entail and what would be expected of them, however, participants were only given vague information that the research was due to investigate links between physical activity characteristics and personality in order to minimise the potential influence of demand characteristics. Subsequent volunteers were then presented with a participant Information Sheet (see appendix B) and consent form. Consenting participants were presented with a printed copy of both the demographic questionnaire and the SPAS and instructed to return the completed questionnaires to the researcher. Participants were fitted with a Polar FT2 heart rate monitor that consisted of a synchronised wrist watch and chest strap compartment. Participants were required to attach both components and to rest for one minute in order to ensure correct working of the equipment and to provide a baseline HR reading for analysis. Participants were then requested to complete their usual programme of physical activity. After successful completion of their exercise session, participants returned the HR monitor equipment and were fully debriefed with regards to the study's aims. The

debrief sheet also provided corresponding email addresses for the researcher, the research supervisors, and university counselling service should participants have any concerns about their participation in the study. This concluded participant study participation. Readings for each participant's exercise duration, average HR and max HR readings were taken from the HR monitor recordings. The heart rate monitor equipment was suitably cleaned and sanitised ready for next participant use.

Data Analysis

Sample size calculations indicated an optimal sample of 64 participants for medium ES at Power = 0.80 for $\alpha = 0.05$ to investigate mean differences in social physique anxiety (Cohen, 1992). Accordingly data were collected from 64 participants. Participant data from the SPAS and demographic questionnaire was coded and scored before being entered into the statistical package SPSS (Version 22; IBM Corp, 2013). Cronbach's alpha for the Social Physique Anxiety Scale was 0.92, indicating a high level of internal consistency comparable with Hart and colleagues (1989) original validation paper (0.90). Frequency of exercise was measured by asking participants 'On average, how many times per week do you use the gym/gym's facilities?' When participants did not give a single value (e.g., 2 – 3 times per week) the lowest value was used (e.g., 2). Prior to analysis, participants were allocated an 'exerciser status' to differentiate between levels of weekly physical activity frequency using a modified version of a model first proposed by Rodgers and Gauvin (1998). Rodgers and Gauvin (1998) suggested individuals performing two or fewer bouts of physical activity per week reflect low-frequency exercisers, correspondingly, those performing 3 or more bouts of physical activity per week reflect high-frequency exercisers. This approach has been employed previously in self-presentational literature (Rodgers & Gauvin, 1998; Gammage, Hall, & Martin, 2004). The current study opted to modify Rodgers and Gauvin's (1998) original classification in an attempt to incorporate moderate frequency exercisers, creating three groups. This decision was made to aid cross-study comparison with contemporary SPA research (see Chu et al., 2008; Mülazimoğlu-Balli et al., 2010), and in consideration of Gammage and colleagues (2004) failure to uncover a significant difference between high- and low- frequency exercisers in relation to their SPA using Rodgers and Gauvin's (1998) original specification. In the current study, participants were divided into groups according to how many physical activity sessions they performed in the gym in a typical week (Sessions per week = SPW) (Group 1: 0-1 SPW = low frequency exercisers (n = 11); Group 2: 2-3 SPW = moderate frequency exercisers (n = 32); Group 3: 4+ SPW = frequent exercisers (n = 21). Participants were also divided based on the length of their prior gym membership. Participants were separated according to if they had held their gym membership for less (under), or more (over) than 12 months at time of data collection. 12 months was selected as the cut off as it presented itself as a natural separating point when observing participant frequencies to create two comparable groups (54.7% (N = 35) of participants reported gym membership of one year or less vs 46.3% (N = 29) reporting over 12 months). 12 months was selected as it was recognised to be an adequate amount of time to allow positive physical-activity induced physiological adaptation (Bowden et al., 2005).

The Polar FT2 HR monitor calculates exercise intensity at the end of each exercise session in the form of average beats per minute (BPM). Each individual's maximal heart rate (max HR) was calculated using the formula $(220 - \text{age} = \text{max HR})$. Maximal heart rate was then divided by average beats per minute and multiplied by 100 to give percentage of maximal heart rate (e.g., $220 - \text{age} (21) = 199 \text{ max HR}$; $(\text{avg BPM} (140) / \text{max HR} (199)) = 0.70 \times 100 = 70\%$ average exercise intensity). An attempt was made to differentiate between variable levels of average session intensity in accordance with works that had previously utilised numerical representations of physical activity intensity boundaries. For example, Hiilloskorpi and colleagues (2003) attributed working at or below an Avg of 54% of age-predicted maximal HR to represent low intensity exercise; 55-69 to represent moderate intensity, and 70+ Avg HR as high intensity exercise. Conversely, Boutcher and colleagues (1988) attributed exercise intensity of 0-75% HR max as low intensity, 75-85% as moderate, and 85%+ as high intensity exercise. However, the present data did not produce good fit with either of these designated classification models with too few participants recognised as low intensity exercisers for Hiilloskorpi et al. (2003), and too few recognised as high intensity exercisers in Boutcher et al. (1988) model (see Table 1.)

Table 1. Suitability of identified classification models for recognising exercise intensity

Physical activity intensity classification	Hiilloskorpi et al (% of MHR)	Current study (N)	Boutcher et al (% of MHR)	Current study (N)
Low	≤54.9%	2	≤75%	35
Moderate	55-69%	20	75.1-84.9%	26
Intense	≥70%	42	≥85%	3

In consideration of the lack of a recognised classification system to distinguish between exercise intensity boundaries (Scully et al., 1998), frequency distributions were performed on the current data to allow the facilitation of three comparable groups to perform statistical comparison based on participant average percentage heart rate responses. Preliminary checks for accuracy and data entry error indicated no mistakes. Kolmogorov-Smirnov tests of normality indicated data were normally distributed enabling the use of parametric testing for the analysis of sex, weekly physical activity frequency and average physical activity session intensity. Accordingly, a combination of independent samples t-tests (two-tailed) and ANOVA were used for data analysis. Effect sizes are presented in terms of eta squared (η^2) for t-tests and partial eta squared (η_p^2) for ANOVA. In accordance with guidelines proposed by Cohen (1988) for interpreting effect size, 0.1 = small, 0.6 = moderate, and 0.14 = large effect size. Chi-square were used in instances where suitable parametric tests were unavailable.

Results

There were 64 participants, ranging in age from 18-53 years, with a mean (SD) age of 25.2 years (7.8 years). The numbers of males [$n = 33$, mean age 27.2 years (9.2 years)] and females [$n = 31$, mean age 23.0 years (5.2 years)] were similar; just under half were students (students $n = 29$; 45.3% vs. non-students $n = 35$, 54.7%). Participants were predominantly Caucasian ($n = 58$, 90.6%) and used the gym three times per week with a mean of 2.79 sessions reported over a 7-day period (1.46 per week). Table 2. shows male and female participant gym use preferences.

Table 2. Participant gym use preferences

	Total		Male		Female	
	Mean	SD	Mean	SD	Mean	SD
Weekly gym use (days/week)	2.79	1.46	3.09	1.52	2.48	1.33
Duration (mins/session)	46.81	14.22	48.60	13.26	44.92	15.16
Gym member (months active)	29.39	46.07	43.59	59.21	14.27	16.13

Social physique anxiety and sex

An independent samples t-test was conducted to compare male and female SPA. There was a significant difference in reported SPA between males ($M = 41.09$, $SD = 10.46$) and females ($M = 26.96$, $SD = 6.20$), with female participants reporting higher SPA, $t(62) = -6.517$, $p = <0.001$, two-tailed. The magnitude of the differences in the means (mean difference = -14.13, 95% *CI*: -18.40 to -9.86) was considered moderate ($\eta^2 = 0.12$).

Social physique anxiety and exercise frequency

A two-way between-groups analysis of variance was conducted to explore the impact of weekly gym frequency and gym membership length on feelings of social physique anxiety. Mean SPAS scores according to weekly gym frequency and gym membership length are presented below in Table 3. The main effects for both weekly gym use frequency, $F(1, 58) = 1.92$, $p = 0.17$, $\eta_p^2 = 0.03$, and gym membership length, $F(2, 58) = 0.17$, $p = 0.84$, $\eta_p^2 = 0.006$ were not significant. Further analyses also revealed the interaction effect between gym use frequency and membership length to be non-significant, $F(2, 58) = 0.41$, $p = 0.66$, $\eta_p^2 = 0.014$.

Table 3. SPA by gym use frequency and membership length

	N	SPAS Scores	
		Mean	SD
Weekly gym use frequency			
Low	11	34.55	14.20
Moderate	32	34.53	10.00
Frequent	21	32.33	11.10
Gym membership length			
Under 12 months	35	35.50	11.61
Over 12 months	29	31.80	10.20

Social physique anxiety and exercise intensity

Despite considerable variance in SPAS scores according to exercise intensity (see Table 4.), a one-way ANOVA failed to find significance at the $p < 0.05$ alpha level, $F(2, 61) = 2.96$, $p = 0.06$, $\eta^2 = 0.08$.

Table 4. SPA by exercise intensity

Physical activity intensity classification	N	SPAS Scores	
		Mean	SD
Low ($\leq 69\%$ MHR)	20	29.65	8.66
Moderate (69.1-78% MHR)	21	37.81	10.65
Intense ($>78\%$ MHR)	23	33.78	12.31

Social physique anxiety and sex x exercise frequency x exercise intensity

A $2 \times 3 \times 3$ (sex x exercise frequency x exercise intensity) univariate analysis of variance tested the effects of sex, weekly physical activity frequency, and average physical activity session intensity. However, the analysis indicated a non-significant interaction, $F(3, 47) = 1.40$, $p = 0.25$, $\eta_p^2 = 0.08$.

Further analyses

In respect of the results indicating a main effect only for sex and Social Physique Anxiety, further analyses were undertaken to investigate potential divergent male and female participant exercise preferences. A summary of descriptives are presented below in Figure 1. Male and female participant responses were investigated in terms of physical activity choice (whether participants chose to perform aerobic activity, anaerobic activity, or a mixture of the two), physical activity frequency (whether participants were attributed low, moderate, or frequent exerciser status based on the current study's classification model), and gym membership history (represented by the percentage of male and female participants reporting under or over 12 months prior gym membership at time of data collection).

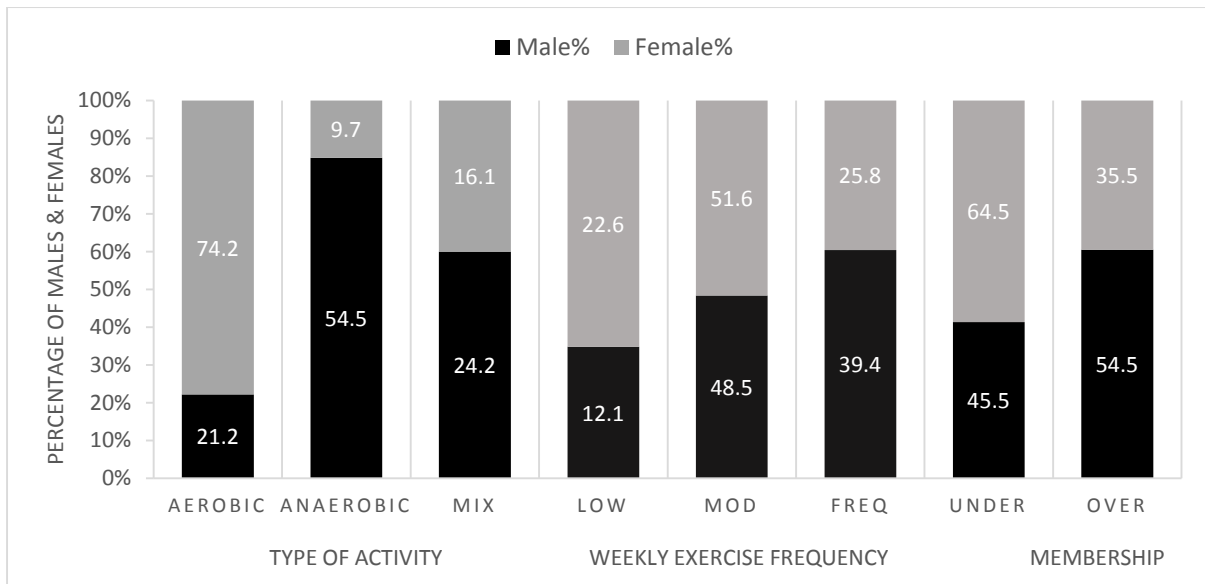


Figure 1. Male and female exercise preferences

A Chi-square test for independence indicated a significant association between sex and physical activity choice, $X^2(2, n = 64) = 19.90, p < 0.001$, Cramer's $V = 0.56$. As shown in Figure 1, 74.2% of female participants ($N = 23$) performed primarily aerobic physical activity compared to 21.2% of males ($N = 7$). Comparably, 54.5% ($N = 18$) of males performed anaerobic forms of physical activity compared to only 9.7% of females ($N = 3$). Subsequent Chi-square analyses reported non-significant associations according to both sex and physical activity frequency, $X^2(2, n = 64) = 1.95, p = 0.38$, Cramer's $V = 0.17$, and sex and gym membership length (with Yates Continuity Correction) $X^2(1, n = 64) = 1.64, p = 0.20, \phi = -0.19$. Additionally, males and females differed according to their heart rate (HR) responses recorded pre and post-physical activity. Participants' heart rate responses were collected at baseline and immediately following the completion of a self-directed session of physical activity. Output from the Polar FT2 HR monitor provided data regarding the average HR at which participants had performed throughout their physical activity session, and the maximum HR they had achieved, in the form of beats per minute (BPM). Participants' baseline, average, and max BPM were calculated as percentages of age-predicted maximal HR to control for possible age effects. Male and female HR percentages are presented below in Table 5. A series of independent-measures t-tests revealed significant sex differences between male and female heart rate responses, with females reporting significantly higher baseline heart rate responses, $t(62) = -2.647, p = 0.01, \eta^2 = 0.12$. Females also reported significantly higher Avg heart rate responses, $t(62) = -2.512, p = 0.02, \eta^2 = 0.11$, though there was no significant difference between males and females for max heart rate responses, $t(62) = 0.98, p = 0.92, \eta^2 = 0.01$.

Table 5. Male and female HR responses (% of max HR)

Sex	Intensity (% of Max HR)					
	Baseline		Average		Max	
	Mean	SD	Mean	SD	Mean	SD
Male	40.95	4.23	70.23	10.76	88.14	5.84
Female	43.70	4.07	75.73	6.31	88.00	5.26

Discussion

In the current study, results indicated female participants reported significantly higher social physique anxiety than males. This is consistent with previous literature to examine sex differences in regards to SPA (e.g., Berry & Howe, 2004; Mack et al., 2007; Melbye et al., 2007; Smith, 2004). An attempt was made to illuminate this discrepancy by investigating potential underlying differences in the way the sexes perform exercise. Male and female participants reported similar exercise frequency (over a typical 7-day period), and both sexes reported approximate duration for individual exercise sessions (approx. 45 minutes). Additionally, male participants were generally older ($M = 27.24$; $S.D = 9.20$) than females (23.03 ; $S.D = 5.19$) and reported a longer history of gym usage (albeit non-significant), with males reporting approximately three years of prior gym membership compared to one year for females at the time of data collection. Information was also collected regarding the intensity at which participants performed their physical activity via heart rate monitor. Males and females reached similarly high peaks of physical activity exertion (approx. 88% of age predicted maximal heart rate) during their exercise session; however, females reported significantly higher average heart rate (% of age-predicted maximal HR) throughout their workout and higher heart rate at baseline (pre-physical activity). No other significant differences were identified by the current study in regards to the identified hypotheses. Participants reported statistically comparable social physique anxiety despite variable reports of exercise frequency, exercise intensity, and length of physical activity involvement. An investigation regarding a possible interaction effect between these respective influences and SPA also proved to be not significant.

Social physique anxiety and sex

The heightened female SPA reported by the current study represents the latest evidence for the commonly reported sex invariance in the experience of social physique anxiety (Berry & Howe, 2004; Chu et al., 2008; Kowalski et al., 2001; Treasure et al., 1998). Zach and Netz (2014) investigation of physical activity and self-presentational concerns in three-generational families reported SPA differences between males and females manifest from a young age and persist across multiple generations. For example, adolescent girls, mothers, and grandmothers all reported significantly higher SPA than their age-matched male counterparts, with adolescent girls reporting the highest physique anxiety overall (Zach & Netz, 2014). Sex invariance throughout the SPA literature is commonly ascribed to a stronger emphasis for females to adhere to the corresponding cultural norms for body attractiveness (Greenleaf et al., 2006), with heightened female SPA interpreted to represent a psychological manifestation of the enhanced externalised pressure. In this regard, the current study's finding for females to report a significantly higher heart rate before their intended physical activity session had even begun is of particular interest. Due to the body's salience in performing physical activity, the prospect for perceived interpersonal evaluation of the physique within a physical activity environment is inherently high (Cox et al., 2014; Hart et al., 1989). Social self-preservation theory (SSPT; Dickerson, Gruenewald, & Kemeny, 2004) suggests when presented with a situation where the individual is apprehensive about experiencing negative interpersonal evaluation (e.g., perceived interpersonal evaluative threat within the gym environment), the individual will respond both

psychologically (i.e., shame, heightened SPA), and physiologically (i.e., increased arousal, elevated heart rate) (Bailey, Lamarche, & Gammage, 2014). The higher heart rate percentages reported by female participants at baseline may be interpreted as evidence that they did indeed perceive the gym environment to be self-presentationally threatening, and did so to a greater extent than their male counterparts. Interestingly, while not utilised during data collection throughout the current study, the enhanced SPA reported by females may evidence an ability for the self-presentationally threatening gym environment to have elevated participants dispositional SPA (Ginis, Murru, Conlin, & Strong, 2011). Ginis and colleagues (2011) demonstrated a strong positive correlation between trait and state SPAS scores (Ginis et al., 2011; Hart et al., 1989) suggesting those with high dispositional SPA would also report the highest SPA whilst inhabiting a characteristically physique-salient environment. The current study provides indirect support for Ginis and colleagues (2011) in this regard when interpreting heightened female baseline heart rate responses as a physiological manifestation of their situationally enhanced SPA. Crucially, this suggests both before and after upon immediately entering an exercise environment females may be apprehensive about negative interpersonal evaluation of their bodies. Western culture has predominantly raised females to uphold the belief that their personal worth is dictated by their physical appearance (Murnen & Don, 2012). As an individual places greater emphasis on the importance of projecting a desirable physique to others, the prospect for appearance-related anxiety increases (Greenleaf et al., 2006). Consequently, as females are culturally programmed to strive towards the presentation of an ever-present attractive aesthetic appearance (Miner-Rubino, Twenge, & Fredrickson, 2002), it is logical for females to have exhibited greater physique-related anxiety in the current study due to the socially threatening nature of the gym environment used throughout data collection (Melbye et al., 2007).

Furthermore, females have been socially reinforced to believe their body to be an ongoing 'work in process', with exercise always representing a viable option to create a more socially desirable physique (Greenleaf et al., 2006). Greenleaf and colleagues (2006) contention may infer why SPA responses were so high for females in the current study even after considering all participants were represented by active gym users. For example, whereas physical activity may create an ameliorating effect for existing body-image concerns in male participants, such an ameliorating effect may not be present for female exercisers as they are culturally programmed to seek out their bodies weaknesses in terms of their variation from the cultural ideal (Murnen & Don, 2012). Western culture 'educates' females that with the appropriate dedication and effort, a woman's body can be modified to represent any appearance she desires (Krane, Waldron, Stiles-Shiple, & Michalenok, 2001). Alternatively, (ignoring limitations regarding the validity or practicality of this upheld belief) individuals who do not possess an attractive physique are solely responsible and an inability to mould a physique in accordance with societal standards is likely indicative of some internal character flaw (Crandall, 1994; Krane et al., 2001; Wade, Loyden, Renninger, & Tobey, 2003). Conversely, males in western culture are more motivated by social recognition and competition (Kilpatrick, Herbert, & Bartholomew, 2005), for example, society emphasises it may be more important for males in terms of what they can do with their body (i.e., strength, size, technical ability), whilst de-emphasizing the importance of physical appearance. This disproportionate societal value for males and females to possess an attractive

physique is reflected when investigating the primary contexts in which individuals experience self-presentational anxiety (Pila, Stamiris, Castonguay, & Sabiston, 2014). Pila and colleagues (2014) investigated the role of body-related envy in determining physical activity behaviour, reporting males to experience body-related envy predominantly in contexts of competition and physical performance (Cohn & Adler, 1992). Females however, reported the highest body-related envy in contexts where the primary focus was on physical appearance (Else-Quest, Higgins, Allison, & Morton, 2012). Taken together, these findings reflect males and females may be prone to perceive and interpret differential sources of self-presentational anxiety dependent on contextual factors of the shared physical activity environment. As data collection for the current study was collected in a public university-run gym where participants predominantly exercised individually, in a non-competitive environment (at least indirectly non-competitive), the prospect for self-presentational anxiety may have been inherently higher for females than males.

Differential societal pressure for male and female body-ideal conformity may also have significantly impacted participant responses when exposed to the self-presentationally threatening environment during the current study (Pila et al., 2014). Cox and colleagues (2014) reported females experience body-related malicious envy to a greater extent than males in a physical activity domain. Females were identified to report body-related successes of other exercisers as unfair and undeserved, turning to maladaptive coping mechanisms such as avoidance and negative emotional responses (Kowalski, Mack, Crocker, Niefer, & Fleming, 2006). Contrastingly, males reported upward social comparisons to be inspirational in regards to the pursuit of their own appearance goals, acknowledging the dedication and hard work of others and using their template as a benchmark for success (Pila et al., 2014). Accordingly, not only do females face the potential for SPA stemming from negative interpersonal evaluation from others within the physical activity environment, but negative affect can also be generated by the individual themselves by performing upward social comparisons with existing gym members. This evaluation process involves the perception that others' bodies more closely resemble the cultural body ideal than one's own and is indicative that the individual has internalized the importance of an attractive appearance and adopted cultural body-ideals as their own (Melbye et al., 2007). The heavily mirrored environment of the gym facility in the current study may have served to exacerbate female participants' existing body-image concerns by drawing extra attention toward the physique's appearance (Focht & Hausenblas, 2004).

A non-significant difference was identified between male and female exercisers in regards to weekly physical activity frequency. Whilst this finding is consistent with previous SPA literature (e.g., Chu et al., 2008; Lanfranchi et al., 2014), it is also likely a reflection that the participants in the current study represented a relatively equal balance of currently active gym male and female gym members. Accordingly, the behavioural differences that may be especially pronounced between physically active and sedentary individuals (e.g., Mülazimoğlu-Balli et al., 2010) were unable to be investigated here. For example, females with particularly high SPA often report physical activity avoidance as a behavioural coping strategy and subsequently may not have been available for data collection in the current study (Hart et al., 1989). However, in respect of the considerably high SPA reported by the

females in the current study (compared to males respectively) ($M = 41.09$; $SD. = 10.46$ vs $M = 26.96$; $SD. = 6.20$), Kowalski et al. (2001) contention that individuals (especially females) with high self-presentational concerns are finding ways to perform physical activity on a regular basis is offered support. Additionally, though also non-significant, male and female participants in the current sample did differ in regards to length of gym membership, with males typically reporting far longer prior exercise involvement than females. Analyses revealed male participants reported congruous prior gym membership on either side of the 12 month divide with 15 male participants reporting membership of less than 12 months, compared to 18 participants reporting over 12 months membership. Though non-significant, the data for female participants reflects a much divergent trend with almost a 50% drop-off rate in participants after 12 months. Accordingly, at the time of data collection 20 females reported under 12 months gym membership compared to only 11 reporting over 12 months. Though it has to be considered that these are not the same participants and the drop-off does not reflect an actual drop-off rate in adherence from male to females, this discrepancy may suggest repeated exposure to an environment that magnifies self-presentational threat for females may have negative links to exercise adherence over a prolonged period of time (Frederick et al., 1996). However, females who are finding ways to complete regular exercise despite environmental pressures and body-related anxiety may experience lower exercise enjoyment as a result (Focht, 2011). Crucially, as affective states during physical activity are a significant predictor of continued exercise participation (Ekkekakis et al., 1999), repeated exposure to a primary source of self-presentational anxiety may create an unsustainable pattern for female exercise adherence. This finding may also indicate long-term exercise adherence has the potential to be a prominent predictor of physique-related anxiety, whilst also offering insight into why SPA literature often fails to find significant links between short-term exercise frequency (i.e., weekly) and social physique anxiety (see Chu et al., Crawford & Eklund, 1994; Lanfranchi et al., 2014). Individuals with a significantly longer history of physical activity involvement have been identified to report lower SPA (Bowden et al., 2005; Mülazimoğlu-Balli et al., 2010), as long-term physical activity adherence is likely to enable substantial positive physiological adaptations. The longer an individual has been engaging in physical activity (in a semi-consistent manner), the greater the likelihood that their physique will more closely resemble the cultural ideal, thus diminishing the prospect that they will encounter physique-related interpersonal evaluative threat and be able to perform negative upwards social comparisons within the physical activity environment. For example, in a rare longitudinal analysis of SPA and physical activity behaviour, Bowden and colleagues (2005) measured participant's social physique anxiety throughout the engagement of a 16-week exercise intervention programme. Participants did not report significant reductions in SPA until the halfway stage of the programme, providing support for the initial interpretation of SPA as representing a stable disposition (Hart et al., 1989). Bowden and colleagues' (2005) work suggests that positive psychological adaptations (i.e., reduced SPA) can result from long-term (8 weeks) adherence to a programme of regular physical activity. In respect to the current findings, once an individual has committed to a significant programme of physical activity (e.g. 8 weeks) in order to initiate a positive reduction of body-related anxiety, continued engagement in regular physical activity may yield additional, progressive improvements in both physical appearance,

and an individual's corresponding body-related cognitions. However, due to a dearth of longitudinal investigations into the effects of physical activity intervention programmes on participant SPA (Cox et al., 2014), it is not known if the relationship between SPA and physical activity adherence is linear (i.e., in the sense that continued engagement in activity will incite continued reductions in SPA), or is represented by a more complex interaction. The discrepant SPA identified by the current study in relation to male and female length of gym membership may be interpreted to provide support for the former. However, it must be noted any inferences made by the current study in this regard are inherently limited due to a reliance on cross-sectional methodology.

A discrepancy between male and female SPAS scores may also be linked to differences in male and female exercise choices. Ancillary analyses indicated male and female participants in the current study differed significantly in regards to their physical activity preferences, with males reporting greater anaerobic (i.e., weightlifting/resistance training) activity and females heavily favouring the performance of aerobic activity. This finding provides indirect support for the prominence of culturally perpetuated physique goals to influence physical activity behaviour, with males and females opting to perform their culture-salient forms of physical activity likely a reflection of the culturally-promoted emphasis for minimizing body fat for females and the pursuit of enhanced muscular mass, muscle definition and reducing low body fat for men (Corson & Andersen, 2002). The inclination for males to favour anaerobic and females to favour aerobic activity in the current study may also be interpreted as a behavioural manifestation of the male drive for muscularity and female drive for thinness in action (Brunet et al., 2010; McCreary & Sasse, 2000; Pila et al., 2014). Cultural expectancy may serve to create a cycle of self-presentational threat, particularly for female exercisers as they may feel restricted to performing aerobic activity as that is what is expected from them (Murnen & Don, 2012). For example, the modern physical activity environment is environmentally dichotomized into separate cardiovascular (i.e., treadmills, exercise bikes) and anaerobic equipment (i.e., free-weights, squat-rack). By extension, this can also indirectly create an environment which segregates male (anaerobic) and female (aerobic) exercisers into specific areas of the gym. Accordingly, for females to lift weights or attempt to perform other forms of activity (i.e., other than aerobic activity) it may serve to draw further attention to themselves, indirectly exacerbating the perception of real or imagined instances of interpersonal evaluation. Contrastingly, male exercisers can be viewed to have full reign over the physical activity environment whereas females may feel more constrained to certain forms of activity.

An enhanced female preference for citing weight-management motives for pursuing physical activity may also have links to long-term physical activity adherence (Chu et al., 2008; Strong et al., 2006). Male exercisers who internalize the muscular, masculine body image are required to consistently exercise in order to achieve and then maintain the accrued muscular mass (Cafri et al., 2005a), whereas the female cultural body-image of thinness may be recognised as a more goal-orientated target in the sense that a desired body fat percentage may be able to achieved, then much easier to maintain through diet. However, observational studies have suggested those who lose weight in pursuit of an idealised target (through diet, physical activity, or a combination of the two) often regain a considerable amount of any weight lost shortly after they stop adhering to their respective weight

loss programme (Curioni & Lourenco, 2005). In this regard, if females decide to stop exercising regularly after a certain goal is achieved, it may only be a matter of time before they revert to previous levels of body composition and corresponding body-dissatisfaction (Curioni & Lourenco, 2005). Alternatively, maintenance of the female body ideal may also be considered to require less exercise equipment, making the option of performing physical activity in the home environment a much more realistic alternative to the self-presentationally threatening atmosphere of the gym. This contention may offer a tentative explanation for the sharp cut off of female participants who reported gym membership over 12 months at the point of data collection compared to a much more balanced representation for male participants. However, despite these inferences, findings from the current study show males and females reported statistically comparable physical activity frequency when observed over a 7-day period. Crucially, this pattern is reflected despite female participants reporting considerably higher social physique anxiety.

Social physique anxiety and exercise frequency

Analyses from the current study revealed a non-significant association between exercise frequency and social physique anxiety. Participant SPA was statistically comparable regardless of their classification as either a low, moderate, or high frequency exerciser, operationalized as self-reported physical activity involvement over a typical 7-day period. Additionally, the reported non-significance was unaffected by the inclusion of participant history of exercise. Participant data were dichotomized according to their history of physical activity involvement (either under or over 12 months) prior to the point of data collection. History of physical activity involvement failed to yield a significant association with social physique anxiety when analysed independently (i.e., non-sig association between SPA and history of exercise), or when considered as a moderator between exercise frequency and SPA (i.e., non-sig association between exercise frequency and SPA when controlling for exercise history). In this regard, findings from the current study represent the most recent evidence from a long line of prior self-presentational literature to report a non-directional association between exercise frequency and social physique anxiety (see Chu et al., 2008; Crawford & Eklund 1994; Lanfranchi et al., 2014).

The non-significance reported by the current study may serve to reiterate methodological roadblocks relevant to the analysis of physical activity frequency (Cox et al., 2014). A key limitation in this regard remains the inconsistency in which participants are prescribed a respective exerciser status (Cox et al., 2014). There is an inherent need for researchers to segregate participants according to their volume of physical activity in order to perform statistical comparisons between sub-groups of exercisers (e.g., to compare participant SPA between low, moderate, and high-frequency exercisers). However, the manner in which this segregation has been performed represents a great source of variability between methodologically similar research (e.g., Chu et al., 2008; Focht & Hausenblas, 2003, 2004), through the utilisation of contrasting measures designed to assess physical activity frequency. Failure to adequately assign participants an accurate corresponding exerciser status is likely to contribute to the non-significance frequently reported in prior literature (Chu et al., 2008; Kowalski et al., 2001; Lanfranchi et al., 2014). For example, it may be futile to expect to uncover an association between variable frequency exercisers and SPA if the respective measure cannot

accurately discern between low, moderate, and high-frequency exercisers prior to analysis. Alternatively, the current study opted for a simplistic approach by asking participants to self-report both how long they had been a member of a gym, and, how many times did they use the gym in a typical 7-day period. This conceptualisation of participant physical activity volume was employed in a considered attempt to maximise participant response accuracy and classification, and to provide a simplistic means to compare participant responses with future research. However, in light of the current study's failure to uncover a significant association between physical activity frequency and SPA, potential limitations of the current methodological approach must also be addressed. A key limitation of the simplistic approach adopted here relates to the potential lack of specificity in participant responses (Sallis & Saelens, 2000). For example, participants were asked, 'Over a typical 7-day period, how many times do you use the gym/gym's facilities?' Due to the open-ended nature of the question participants were able to report multiple answers (e.g., 2-3 times per week). Accordingly, participant provided data in the current study may have lacked accuracy which may have contributed to an undesigned number of participants being ascribed an unrepresentative exerciser status. Inaccuracies in participant classification may have significantly impacted the ability for subsequent analyses to differentiate between low, moderate, and high-frequency exercisers according to their SPA. Additionally, the same criticism can be levelled at participant responses regarding their prior gym membership length. Participants were asked, 'How long have you been a current gym member?' Due to the retrospective nature of this question, participant responses may have been particularly prone to inaccuracy (i.e., failure to remember exactly when they joined the gym) (Sallis & Saelens, 2000), and specificity issues (i.e., participants may not be able to pinpoint exactly how many months they had held their gym membership and may have responded in rough estimates, e.g., 'just over a year'), which may have had significant connotations when attempting to segregate participants accordingly. Participant response bias may be especially prevalent in the current study due to the utilisation of an over simplified data collection tool.

Beyond specific criticisms of the current study's methodological approach, participant response bias may represent an inherent impediment relevant to all self-presentational literature in the form of social desirability (Adams et al., 2005). For example, self-report measures are commonly utilised in self-presentational research in order to assess participant physical activity involvement (e.g., Brunet & Sabiston, 2009; Chu et al., 2008; Dishman, Washburn, & Shoeller, 2001; Focht & Hausenblas, 2003, 2004; Gammage et al., 2014; Kowalski et al., 2001). Accordingly, as the performance of regular physical activity has been deemed socially desirable behaviour (Motl, McAuley, & DiStefano, 2004), there is an increased tendency for participants to over-report the frequency of their physical activity (Adams et al., 2005; Ainsworth et al., 2012; Brenner & DeLamater, 2014; Krane et al., 2001). This contention is of particular relevance when considering the origins of social physique anxiety are indebted to concerns of self-presentation and impression management (Hart et al., 1989). When individuals are presented with a situation in which they lack confidence in their ability to present a desirable impression they opt to employ various forms of protective self-presentational behaviour (Brewer et al., 2004). In this regard, participant responses via the social physique anxiety scale are considered to be substantially robust against the influence of social desirability (Hart et al., 1989; Motl

& Conroy, 2001), however, social desirability is likely to represent a pervasive influence when participants are asked to report the frequency of their weekly physical activity (Adams et al., 2005; Ainsworth et al., 2012; Brenner & DeLamater, 2014; Krane et al., 2001). The methodological approach of the current study may have served to heighten the prospect for an over-reporting of physical activity by asking participants to complete the SPAS first, before asking them to report their weekly physical activity frequency. Accordingly, after completion of the SPAS, participants may have been in a heightened state of self-presentational awareness and responded by over-reporting their involvement in physical activity under the assumption that more-frequent activity would be considered a desirable response (Ginis et al., 2011). It has previously been considered that the inconsistent methodology researchers choose to employ when assessing participant physical activity represents a significant limitation to SPA literature (Cox et al., 2014). Classification systems designed to ascribe participants a corresponding exercise frequency status are often only tenuously based on research-driven guidelines and variability between researchers may cause the same participant to be ascribed a different physical activity frequency classification by different measures (Cox et al., 2014). Alternatively, the repeated failure of methodologically flexible research to uncover a significant association between SPA and physical activity frequency may provide indirect support for the recognition of social desirability as an immeasurably confounding variable (Brenner & DeLamater, 2014). Social desirability is especially important in this regard due to its ability to considerably influence the accuracy in which participants are attributed a relevant exerciser status. For example, in the current study, the tendency for participants to over-report their true physical activity involvement may have led to a number of participants being falsely recognised as a low, moderate, or high-frequency exerciser. Accordingly, inaccurate participant physical activity classification may have served to disguise a significant association between physical activity frequency and SPA in the current study. An important step for future research may be to facilitate a move away from the utilisation of self-report measures to assess participant physical activity behaviour, particularly in the context of physical activity frequency (Adams et al., 2005; Yuen et al., 2013).

A failure to collect detailed information regarding supplementary forms of participant physical activity may also have contributed to the non-significance reported between physical activity frequency and SPA in the current study. Participants were originally asked to self-report any other forms of physical activity they performed external to the gym environment as part of the demographic questionnaire they were given. However, a decision was made to remove this question (and subsequent responses) from final analyses due to the lack of information regarding potentially important contextual data. For example, the type (team vs individual), (physique-salient vs non-physique salient), and level of physical activity performance (competitive vs recreational) have been recognised to have significant implications for feelings of social physique anxiety (Haase & Prapveesis, 2001). An inability to accurately differentiate between alternate forms of physical activity based on their level of self-presentational threat was deemed a potentially confounding variable in the analysis of physical activity frequency (Haase & Prapveesis, 2001). For example, separate participants who report the same weekly gym usage, and the same frequency of additional physical activity away from the gym, may report different social physique anxiety based on the nature of the exercise being performed. For

example, the performance of physique-salient activity (i.e., e.g. swimming) may serve to elevate SPA due to heightened focus on the physique. Similarly, the performance of team rather than individual forms of physical activity can serve to ameliorate self-presentational concern by inadvertently drawing (perceived) attention away from the individual (Cox et al., 2014). A lack of specificity in the data collection process made it impractical to validly differentiate between participants in this regard. For example, 53.1% (N = 34) of participants reported weekly engagement in at least one other form of physical activity (i.e., responses included; basketball, swimming, martial arts, walking). However, given the limited information provided it is not clear whether the activity stated should be considered team vs individual (e.g. swimming), physique-salient vs non-physique-salient (e.g., martial arts), or competitive vs recreational (e.g., basketball). For example, swimming may be recognised as both an instance of a team or individual form of physical activity. The issue of specificity has long been recognised as an inherent limitation of self-report measures (Mâsse & de Niet, 2012), representing a common limitation across wider self-presentational literature (e.g., Brunet & Sabiston, 2009; Kowalski et al., 2001). In the context of the current study, the potential lack of depth in participant response was deemed a necessary consequence in the pursuit of brevity, as the measures were designed to minimise disturbance to participant's regular physical activity routines. This criticism may be particularly poignant regarding the inability for the current study to adequately differentiate between physique and non-physique-salient forms of supplementary physical activity (Haase & Prapaveesis, 2001). Additionally, whilst it may be considered easier to accurately infer an activity to represent either physique or non-physique-salient behaviour, the current study did not boast the sample size (N = 64) to suitably investigate the possibility for contextual differences between certain forms of physical activity to have had a significant effect on participant SPA. In order to allow accurate analyses there would be a need to create small sub-groups of participants to represent the specific form of activity being performed, for example, separate conditions to represent participants who performed individual physique-salient forms of physical activity vs individual non-physique-salient activity. In light of these potential practical limitations the decision was made to focus directly on the physical activity frequency reported within the confines of the gym environment and to omit data relating to alternate forms of physical activity from the final analyses. Accordingly, practical limitations of the current study may indirectly serve to reflect the difficulties researchers face when attempting to conceptualise the multitude of physical activity behaviours an individual may engage in during a typical 7-day-period (Haase & Prapaveesis, 2001). The decision to isolate exercise frequency pertaining to participant gym use was made in accordance with the rationale for individuals with existing self-presentational concerns to self-select 'fitness-type' behaviours as their preferred form of physical activity (Frederick et al., 1996; Hurst et al., 2000). Fitness-oriented activities, specifically those performed in the gym, represent core behavioural strategies for directly improving certain areas of the physique (Frederick et al., 1996). Accordingly, variation in the frequency of which individuals perform such activity is likely indicative of their desire to modify certain aspects of their body and may be considered directly analogous to their sense of body-satisfaction and feelings of social physique anxiety (Murnen & Don, 2012). However, it must be considered the sole focus on gym-going exercise frequency may not be truly representative of the volume of physical activity participants performed in a typical 7-day period.

The current study's inability to account for bouts of physical activity performed away from the gym environment may have led to inaccurate participant physical activity frequency classification and indirectly contributed to the non-significance reported between low, moderate, and high-frequency exercisers and SPA. Accordingly, the potential association between physical activity-frequency and SPA must be assessed in consideration that it is currently impossible to feasibly calculate the potential influence of combined participant or researcher-led classification errors (Cox et al., 2014). However, until potential practical limitations can be definitively addressed by future research, alternative explanations must be considered.

A considerable body of work is emerging to suggest physical activity frequency alone is not significantly associated to feelings of social physique anxiety (e.g., Chu et al., 2008; Crawford & Eklund, 1994; Treasure et al., 1998). As an inevitable response to the repeated reports of non-significance, Kowalski and colleagues (2001) raised the contention of how important physical activity frequency is as a singular variable to provide a developed understanding of SPA. The reported non-significance in the current study may serve to indirectly highlight the importance of alternative barriers, or incentives, to engage in physical activity beyond concerns over the appearance of the physique (Kowalski et al., 2001; Radaeke et al., 2007). For example, emphasising adherence to an exercise programme for health rather than physique concerns. Previous literature has acknowledged physical activity behaviour to be inherently influenced by a combination of environmental, biological, and psychological variables of which SPA may form only a small sub-component (Scully et al., 1998). Failure to recognise the potential influence of external factors may have served to obfuscate a significant association between exercise frequency and SPA in both previous literature, and the current study. For example, in the current study an equal number (N=16) of male and female participants were classified as moderate frequency exercisers despite females reporting considerably greater social physique anxiety. This discrepancy in SPA between the sexes may support Kowalski and colleagues (2001) proposition that high SPA individuals (particularly females) are indeed finding ways to perform regular physical activity regardless of substantial self-presentational concern. Whilst beyond the remit of the current study to infer exactly how individuals identified as having high SPA were able to successfully negotiate heightened experiences of self-presentational concern, it is suggested these individuals are likely to have engaged some form of protective self-presentational behaviour (e.g., wearing of concealing attire, avoidance of mirrors) (Crawford & Eklund, 1994; Leary, 1992). Comparable exercise frequency despite highly variable SPA for males and females offers further evidence for the lack of a significant association between SPA and physical activity frequency in samples of currently active exercisers (Chu et al., 2008; Crawford & Eklund, 1994; Lanfranchi et al., 2014). However, it may also highlight the need for other factors to be realistically considered in order for a significant association between SPA and physical activity frequency to be suitably discerned (Kowalski et al., 2001; Cox et al., 2014).

Social physique anxiety and an interaction effect

The current study also investigated a potential interaction between participant sex, physical activity frequency, intensity, and prior history of exercise involvement. An important contention regarding the

role of SPA in physical activity behaviour suggests the performance of more frequent physical activity may inevitably lead to the development of a more culturally-attractive physique (Mülazimoğlu-Balli et al., 2010). Those who perform frequent physical-activity may be more likely to yield positive physiological enhancements that serve to alleviate prior feelings of social physical anxiety (Sabiston et al., 2007). However, self-presentational literature often overlooks other key variables inherently important to creating lasting physiological adaptations beyond the simple observation of physical activity frequency (Cox et al., 2014). For example, an individual performing the same frequency of activity (as other exercisers) for a longer period of time, at a more challenging intensity may be expected to yield both significantly greater physiological enhancements, and a greater exercise-induced reduction in SPA (Bull et al., 2010). The integration of exercise intensity and history of physical activity involvement into subsequent analyses represented a measured attempt to conceptualise a more characteristic profile of physical activity behaviour. For example, findings from the current study replicated those reported previously (e.g., Chu et al., 2008; Lanfranchi et al., 2014) to indicate males and females perform comparable physical activity frequency despite females reporting substantially higher SPA. The interaction analysis undertaken by the current study allowed further investigation of factors that may influence physical activity frequency, and to investigate if SPA-sex differences may manifest in other forms of physical activity behaviour (i.e., exercise intensity and/or history of physical activity involvement). However, the interaction model ultimately proved non-significant, suggesting male and females social physique anxiety is not significantly associated with the volume or intensity of the physical activity they perform.

The non-significance reported here may indirectly highlight the complexity of uncovering significant associations between SPA and physical activity behaviour (Cox et al., 2014). The integration of exercise intensity and history of physical activity involvement into analyses of physical activity frequency were considered logical inclusions due to their importance for facilitating positive physiological change (Bull et al., 2010; Fry & Kraemer, 1997; McNicol et al., 2009). However, it must be considered that the introduction of new variables bring their own potential limitations. For example, the decision for the current study to not account for participant anthropometrics prior to analysis may have been particularly relevant to the analysis of physical activity history (Cox et al., 2014). An assumption that longer history of physical activity involvement leads to diminished SPA may be moderated by physiological body measurements (e.g., body weight, BMI) prior to the onset of a physical training programme. For example, an individual who has only been performing physical activity for a short period of time may possess a more culturally attractive physique than someone who has engaged in frequent activity for a prolonged period. Furthermore, the proposition that a more culturally-attractive physique is likely to be accompanied by low-SPA is also contentious (Brewer et al., 2004; McCreary & Sasse, 2000). Whilst overweight and obese individuals tend to report higher SPA than their normal weight counterparts (Hart et al., 1989; McAuley et al., 2002; Treasure et al., 1998), physiological variation between normal weight individuals may be less influential to overall feelings of body-dissatisfaction and SPA (Brewer et al., 2004). The lack of a clear analogous link between objective physical appearance and SPA serves to further highlight the subtlety in which SPA may moderate physical activity behaviour (Cox et al., 2014). For example, Brewer and colleagues

(2004) reported SPA to be a better predictor of physical activity behaviour than actual body anthropometrics when considering preferred floor location within a physical activity environment.

Additionally, the respective non-significance may also reflect the potential for other factors to influence the success of a physical activity training programme beyond the implementation of frequency, intensity and history of involvement. For example, two individuals matched in regards to age, gender, and body measurement may perform the same volume and intensity of exercise but differ in other ways that may affect progress towards their physique goals (e.g., variations in accompanying sleep, stress, and nutrition) (Tufik, Andersen, Bittencourt, & Mello, 2009). Factors that have the power to influence physiological responses to physical activity may also inadvertently affect feelings of SPA and a failure to suitably account for their influence here may have ultimately contributed to the non-significance reported. However, it must be considered that it is impractical to expect to be able to account for a host of potential factors without devastating the corresponding ecological-validity. It would have also been especially difficult for the current study to collect participant responses of sufficient depth in order to allow meaningful analyses. Ultimately, in caveat, it must be acknowledged that unidentifiable factors may have contributed to the non-significance despite the current study's attempt to select three salient variables to the performance of physical activity and to investigate their potentially intertwining association with social physique anxiety. Accordingly, a more realistic approach moving forward may be to focus on the identification of factors that may serve to minimise feelings of SPA within the immediate physical activity context. For example, exercise intensity was also specifically chosen as part of the interaction model in the current study due to its potential to act as an inadvertent form of protective self-presentational behaviour (Ekkekakis, 2003; Focht & Hausenblas, 2003, 2004).

Social physique anxiety and exercise intensity

Analyses from the current study revealed a non-significant association between social physique anxiety and physical activity intensity, with participants reporting comparative SPAS responses regardless of their categorisation as either a low, moderate, or strenuous intensity exerciser. Accordingly, the proposed protective self-presentational qualities of strenuous intensity exercise were not supported, nor was physical activity intensity significantly associated with SPA at any level of exertion. However, the current study does offer partial support of Ekkekakis' (2003) dual-mode theory as moderate-intensity exercisers reported the highest overall SPA. Ekkekakis' (2003) dual-mode theory suggests the performance of moderate-intensity physical activity facilitates a critical peak of self-presentational vulnerability where the exerciser in question reaches a stage of exertion quickly accelerating past their comfort level, but not yet challenging enough for the body to streamline its attention towards the arduous physiological task at hand. Moderate-intensity can be operationalized as a level of exertion where the task is becoming visibly physiologically challenging, but the individual remains highly cognizant of their environmental surroundings (Appleton, 2012; Ekkekakis, 2003). The finding for moderate intensity exercisers to report the highest SPA may suggest individual's who remain in a heightened state of self-presentational awareness throughout the performance of physical activity are especially vulnerable to negative experiences of social physique anxiety. For example, the

ability for positive exercise-induced physiological adaptations to facilitate a reduction in SPA may be diminished if the physical enhancements have been achieved via the performance of moderate intensity activity. Accordingly, whilst regular adherence to a physical activity programme may enable positive reductions in SPA for some individuals, the effects may be less pronounced for those performing moderate intensity activity irrespective of actual improvements in physical appearance (Melbye et al., 2007). Alternatively, the repeated performance of low or strenuous activity may serve to desensitise the individual to self-presentationally threatening aspects of the exercise environment. Restricting an individual's ability to perceive negative interpersonal evaluations of their appearance in a highly physique-salient environment may also minimise perceptions of negative interpersonal evaluations in everyday life (Sabiston et al., 2007).

Notwithstanding, it must be considered this possible explanation relies heavily on the application of dual-mode theory (Ekkekakis, 2003), which is offered only partial support by the current findings. For example, Ekkekakis' (2003) model also suggests the increased physiological workload required to perform strenuous physical activity serves to indirectly suppress superfluous cognitive functioning. Accordingly, due to repeated exposure to an unequivocally physique-salient environment (i.e., like that of a busy gym) it was expected for strenuous intensity exercisers to report the lowest SPA in the current study due to their reduced capability for perceiving negative interpersonal evaluation (Ekkekakis, 2003; Focht & Hausenblas, 2003, 2004). However, in the current study, participants classified as low intensity exercisers reported the lowest SPAS responses. At this stage it must be considered contradictions between the current findings and those predicted by Ekkekakis' (2003) may reflect disparity between the perception of interpersonal evaluation of an individuals' physical performance as opposed to their physical appearance (Focht & Hausenblas, 2003, 2004). For example, dual-mode theory (Ekkekakis, 2003) may only recognize the potential for the perception of negative interpersonal evaluations of the body's physiological performance. In context of the current study it is perhaps surprising for low intensity exercisers' to report the lowest overall SPA as the prospect for negative appearance-related interpersonal evaluation still remained. In contrast, the ability to perceive such negative evaluations should have been inhibited for strenuous-intensity exercisers. However, previous literature has evidenced cognitive functioning to remain salient even during strenuous-intensity physical activity (Boutcher et al., 1988), suggesting the cognitively inhibiting effects of strenuous physical activity proposed by Ekkekakis (2003) may only be partially effective for lessening perceptions of negative interpersonal evaluation. The subsequent ability for all individuals to experience negative interpersonal evaluation during the performance of physical activity is likely to reflect why the current study reported a non-significant association between physical activity intensity and social physique anxiety.

Additionally, potential limitations of the current study's methodological approach may have also contributed to the non-significant findings. The current study utilised heart rate monitors in an attempt to promote standardisation in the assessment of participant physical activity intensity (Achten & Jeukendrup, 2003; Yuen et al., 2013). This decision was made as HR monitors were reasoned to be more objective than psycho-somatic indicators (i.e., the Borg scale, (Borg, 1988)), and less invasive

than the metabolic analysis systems used to collect other pertinent physiological data (e.g., Oxygen uptake, Carbon Dioxide production) (Sylvia, Bernstein, Hubbard, Keating & Anderson, 2014). In consideration, by opting to take this approach it must be recognised that participant heart rate responses in the current study were influenced by a combination of both physical activity-induced, and anxiety/affect-induced, physiological activation. It must also be considered that the weightings between each influence are likely to reflect high inter-individual variability and that this variation cannot be suitably discerned or accounted for (Ekkekakis et al., 1999). For example, an individual in the current sample with low social physique anxiety may have performed highly strenuous intensity activity, comparatively, a high SPA individual may have been performing moderate intensity physical activity but the additional anxiety-induced activation may have elevated their heart rate significantly. Both individuals in this example may have ultimately been classified as a strenuous intensity exerciser despite considerable disparity in their physical activity performance. For example, the higher heart rate responses-reported by female participants pre-exercise may be interpreted as evidence of the pervasive influence of situation-induced anxiety, and as a physiological response to the self-presentationally threatening environment (Bailey et al., 2014). This discrepancy may have had significant implications when attempting to assign participants a corresponding physical activity intensity classification, and when attempting the subsequent between-groups analyses, potentially serving to obfuscate the emergence of a significant association between exerciser intensity and SPA. However, it must be considered that any conceptualisation of a physiological response to specific stimuli will contain an indeterminable affective component and in consideration of what an individual may be experiencing cognitively, heart rate response remains an accurate representation of their physiological functioning (Achten & Jeukendrup, 2003).

A more salient criticism may pertain to how participants are segregated according to their heart rate responses as a representation of their physical activity performance. A deliberate effort was made by the current study to utilise previously established HR range parameters to assign participants a corresponding exerciser classification (i.e., as a low, moderate, or strenuous intensity exerciser). However, both Hiilloskorpi et al. (2003) and Boutcher et al. (1998) classification models were deemed unsuitable for use due to a bad fit with current data. In consideration of the absence of a research-informed consensus regarding the categorisation of separate physical activity intensity parameters (Scully et al., 1998), the current study reverted to participant frequency distributions in order to facilitate the separation of participant data into 3 statistically comparable conditions. This approach may limit the possibility for accurate cross-study comparison and undermines the generalizability of the current study's results to a wider population, however, it also serves to reinforce a key limitation regarding the variability of recognised physical activity intensity parameters and the flexibility researchers employ in their utilisation, highlighting how the lack of an approved classification system in this regard may have compromised the current study's opportunity to uncover a significant association between physical activity intensity and social physique anxiety.

Alternatively, the failure of the current study to statistically distinguish between participants based on their exercise intensity may represent a limitation of the endeavour to minimise the impact of external

manipulation. A considered effort was made to maintain ecological validity by allowing participants to navigate the physical activity environment at their own behest. Accordingly, participants were able to self-select their preferred forms of activity (and maintained the opportunity to switch activities during the same session), and also self-select their exercise-intensity and duration. This manner of researcher-restrictive observation was necessary to preserve a more representative naturalistic environment than has been evidenced in previous literature (e.g., Focht & Hausenblas, 2003), but comes with its own potential limitations in consideration of exerciser intensity. For example, the data used to compare exerciser intensities in the current study is representative of each participants' average heart rate from the point that the HR monitors are fitted (just before the onset of the physical activity session), through to the point of removal at the end of their session. Accordingly, the data is inclusive of all activities the participant performed during this time and is particularly susceptible to distractions that may interrupt their exercise session (Achten & Jeukendrup, 2003). For example, temporarily stopping exercising to answer a phone call, talk to a fellow gym member, or to refill a water bottle all have the potential to reduce a participant's heart rate considerably depending on the length of the interruption. Participant average heart rate responses will reflect such a disturbance which may have had significant implications when comparing participant intensity and SPA. For example, an individual may have been performing highly strenuous physical activity for the majority of their session but due to spending considerable time conversing with a fellow gym user at the water cooler, their average heart rate may have dropped dramatically to be recognised as a moderate intensity exerciser. Repeated incidents where participants were attributed an inaccurate average heart rate percentage may have contributed to the non-significance between physical activity intensity and SPA. However, whilst taking great care to remain an unobtrusive observer, the researcher maintained vigilant to this possibility throughout the data collection process to minimize the likelihood that instances such as the one described could have occurred in a frequent enough manner to significantly pollute participant responses.

A potentially more confounding limitation refers to the current study's practice to facilitate the amalgamation of both aerobic and anaerobic forms of physical activity into exercise intensity and SPA analyses. For example, it may be logical to assume those performing anaerobic activity (i.e., weightlifting) to report lower average heart-rate responses due to the incorporation of regular rest periods (to allow adequate recovery time in-between sets), and the flexibility to perform their session of physical activity whilst isolating specific body parts (e.g. performing 'arm day' or 'chest day' etc.). In contrast, those performing aerobic activity could be expected to report a higher average heart rate response as they are performing a more physiologically demanding workout (i.e., utilising the full body) in an uninterrupted manner (i.e., without regular rest periods). This contention may suggest subsequent analyses could potentially be compromised by the cross-pollination of aerobic and anaerobic exerciser data. For example, the incorporation of rest periods may lower the average heart rate responses of anaerobic exercisers to a point where the analysis is actually comparing participant exercise preferences (i.e., aerobic vs anaerobic vs combination of the two) and SPA rather than investigating links with physical activity intensity. For example, in this mould the strenuous intensity condition is made up of primarily aerobic exercisers, the low intensity condition made up of

participants engaging in anaerobic activity, and an unspecified composite of both aerobic and anaerobic exercisers being recognised in the moderate intensity condition. It is beyond the remit of the current study to offer comment regarding specifics of each participants' physical activity session in terms of content, therefore, no guarantee can be provided to definitively state that this possibility may not have contributed to the non-significant association reported here between physical activity intensity and social physique anxiety. Importantly, it must also be considered that this contention relies heavily on an oversimplification of the way individuals habitually exercise, requiring the majority of aerobic exercisers in the current study to have engaged in continuous training, at a relatively consistent intensity, for the duration of their session, in order to have had a substantial effect on the relevant analyses. For example, high-intensity interval training (HIIT), represents a popular alternative to continuous training due to a lower time-commitment being required to yield comparable physiological results (Coyle, 2005; Seiler & Tønnessen, 2009; Shepherd et al., 2015). HIIT is implemented when the exerciser performs bursts of explosive strenuous activity (e.g., sprinting) interspersed with short periods of recovery (very light jogging or walking) (Heinrich, Patel, O'Neal, & Heinrich, 2014). Accordingly, the use of designated aerobic equipment in the current study (e.g., treadmill, cross-trainer, rowing machine) are all suitable for the performance of interval-based training, therefore, despite participant preference for aerobic or anaerobic activity, the training sessions are likely to have followed a similar structure including both periods of activity and non-activity. However, this criticism also highlights the ability for participants (by design or default) to alternate between bouts of low, moderate, and strenuous forms of physical activity within the same session. This proposition illustrates both a potential limitation of the current study, regarding the applicability of utilising average heart rate readings to represent exerciser behaviour, and a wider criticism of the rigidity of designated 'heart-rate training zones' to classify physical activity intensity. For example, as participants switch between different stages of exertion it becomes difficult to ascribe them representative classification as a low, moderate, or strenuous intensity exerciser. This flexibility in physical activity approach is likely to have contributed to the non-significance between physical activity intensity and SPA in the current study and may offer partial explanation why the current study proved such a bad fit with the classification models prescribed by Hiilloskorpi et al. (2003) and Boutcher et al. (1988). Additionally, the realization that participants are likely to navigate variable levels of exertion throughout the duration of a physical activity session provides a considered limitation of the utility of applying Ekkekakis (2003) dual-mode theory as protective self-presentational behaviour. The current study was partially conceived to investigate the viability of performing strenuous activity in order to inhibit pervasive negative feelings of social physique anxiety and self-presentational threat, however, as participants navigate between stages of physiological exertion (i.e., low, moderate, and strenuous intensity activity), their corresponding affective states/states of cognizance are predicted to fluctuate also (Ekkekakis, 2003). Accordingly, participants may be able to reap the potential anxiety-inhibiting benefits associated with strenuous intensity exercise for only a small period of their full physical activity session. Unfortunately for those with strong self-presentational concerns, this may suggest the overall exercise experience is still an overwhelmingly

negative one, suggesting the performance of strenuous intensity physical activity may do little to diminish SPA.

The criticisms highlighted here raise significant limitations to be addressed before self-presentational literature may be able to offer prescriptive advice for minimising the prospect of evaluative threat for high SPA individuals within a physical activity context. Ultimately it must be acknowledged the recommendation of an optimal physical activity intensity range for particularly body-conscious individuals is beyond the scope of current research. Critically, the 'optimal' level of physical activity intensity being referred to in the current study is discussed primarily in terms of being 'psychologically optimal' (Lind et al., 2005). For example, for individuals with persistent body-image concerns, optimal training intensity in this regard may best be recognised as physical activity that can be performed whilst suitably minimising their perception of negative interpersonal threat. Accordingly, due to high inter- and intra-individual variability in how an 'optimal intensity' may manifest as physical activity behaviour, the contributions of large-scale quantitative analyses may be inherently limited (Cox et al., 2014).

Limitations and future recommendations

A key limitation of the current study reflects a need to find a more appropriate way to represent physical activity intensity beyond the rudimentary use of average heart rate response. However, this is a need that must not be met by adding extraneous experimental manipulation and compromising ecological validity in order to provide an accurate conceptualisation of how individuals with existing physique concerns are exercising in everyday life. For example, previous literature to examine links between physical activity behaviour and self-presentational concerns has required participants to perform one act of physical activity (e.g. treadmill walking), for an experimenter-designated period of time (see Focht & Hausenblas, 2003; Ekkekakis et al., 2010). It is reasonable to assume that this is not the way most individuals will self-select to perform physical activity, inherently limiting the generalizability of any research to employ such methods. One potential alternative to the current study's methodological approach may be to utilise more sophisticated technology to collect participant heart rate response data. For example, equipment that records participant average heart rate at regular time intervals may be able to account for specific training strategies being employed or adjust to compare the time each participant spent working at either low, moderate, or strenuous intensity.

A further limitation of the current study relates to the manner in which participant data was collected. The presence of a male researcher to recruit and instruct participants may have contributed to the heightened heart rate responses reported by female participants. The male researcher's presence may have also influenced female participant responses when completing the demographic questionnaire by encouraging the over-reporting of physical activity frequency as females may have perceived the exercise environment as a greater source of social evaluation and felt more pressure to present themselves desirably (i.e., in this case more physically active) (Yuen et al., 2013). Accordingly, the presence of the male researcher may have facilitated a heightened physiological (heart-rate) and psychological (social desirable) response in female participants that may have

impacted the accuracy of their responses. Repeated instances of inaccurate reports may have led to inaccuracy when designating participants a corresponding physical activity frequency and intensity classification and contributed to the non-significance reported here when investigating the association between both variables and social physique anxiety. However, it must be considered the impact of researcher gender is typically more pronounced in male participants (in the presence of a female observer), with previous research commonly reporting no significant differences in female response regardless of the presence of either male or female observer (Melbye et al., 2007; Worryingham & Messick, 1983). Accordingly, whilst possible the presence of a male researcher in the current study may have influenced female participant response, the severity of the influence is not predicted to have had significant consequences for subsequent analyses.

The time of day in which participants were recruited may also represent a potential source of conflict with the current findings. For example, participant data in the current study were typically collected on weekdays between the hours of 11:00 and 17:00. An inherent limitation of this approach is that self-presentationally threatening aspects of the exercise environment may fluctuate accordingly depending on how busy the gym is at any given time. For example, a busier gym may increase the number of potential sources of interpersonal evaluative threat prompting individuals to utilise the gym at certain times to minimise the experience of evaluative threat (i.e., those with high SPA may exercise at off-peak times). The particularly high SPA reported by females in the current study may be interpreted as indirect support for this contention. Accordingly, the current study's inability to provide support for the implementation of strenuous intensity activity as a form of protective self-presentational behaviour may suggest other protective strategies may already have been employed. For example, the variability of intensity workload as protective behaviour may be more salient for those with high physique concerns who have to navigate the exercise activity during especially busy periods. The current study's decision to recruit participant data during the early afternoon may have excluded a significant percentage of the general population from being able to take part, limiting generalizability to the wider population.

Additionally, the data collection methodology of the current study requires the participant data provided to generalize to their wider performances of physical activity, particularly in the context of physical activity intensity. Participant heart rates were collected for a bout of activity at a self-selected level of exertion and using this information participants were deemed to be a low, moderate, or strenuous exerciser. However, there is no guarantee that the exertion reported by the participant during their observed session is truly generalizable of the activity they typically perform in any given week. For example, the simple act of asking participants to wear a heart rate monitor invites the inference that the study in which they are taking part is at least partially concerned with physiological performance. In this regard, the study may have been susceptible to demand characteristics as some participants may have opted to perform at a much higher intensity than which they were normally accustomed (Worryingham & Messick, 1983). Additionally, this approach ignores the possibility for individuals to perform sessions of variable intensity throughout the week. The likelihood for participants to employ flexibility regarding the intensity of their physical activity sessions may provide

one explanation for why the current study was unable to uncover a significant difference between participant SPA based on their intensity classification, highlighting the potentially arbitrary nature in trying to assign participants an exercise intensity classification in the manner attempted by the current study. Similarly, the typical weekly physical activity participants reported in the current study may not provide an accurate representation of their true physical activity volume. Accordingly, one assumption for an association between SPA and physical activity frequency suggests increased exercise volume leads to a more desirable physique (subsequently reducing corresponding SPA) (Mülazimoğlu-Balliet al., 2010). Increasing accuracy in the way physical activity volume data is collected will allow a more considered evaluation of this potential link between exercise frequency and SPA. For example, many gym memberships are now fully automated with participants scanning a fingerprint or key card to gain access to the fitness facility. In this regard, there is an electronic record of participant activity usage that could be mined in future research as a superior alternate to self-report without impacting ecological validity. However, this approach may still require some form of participant provided data to provide sufficient depth (e.g., what exercise they performed and at what intensity), but may still be regarded as a viable option for data collection in future self-presentational research.

Conclusion

The current study's attempt to uncover a directional association between social physique anxiety and physical activity behaviour served to highlight the difficulties researchers face in this domain of self-presentational literature. While considerable sex differences remain, the current study was unable to offer any significant understanding as to how discrepant experiences of SPA may manifest in the performance of physical activity. It is clear individuals with considerable concerns over their physical appearance are finding ways to perform regular physical activity (Kowalski et al., 2001), however, it is still not clear how vital a role SPA may have in moderating physical activity adherence. Findings from the current study may also suggest the identification and recommendation of an 'optimal' intensity to protect against the experience of negative evaluative threat during exercise may be beyond the remit of large scale quantitative analyses due to a high degree of inter-individual variability (Lind et al., 2005). Considerable limitations in methodological approach must be addressed by future research to warrant the continued exploration of SPA in relation to physical activity frequency and related physical activity behaviour.

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Appendices

Appendix A

Exercise Questionnaire

The following questionnaire contains statements concerning your body physique or figure. By physique or figure we mean your body's form and structure; specifically, body fat, muscular tone, and general body proportions.

Instructions: Read each item carefully and indicate how characteristic it is of you according to the following scale;

1 = Not at all characteristic of me

2 = Slightly characteristic of me

3 = Moderately characteristic of me

4 = Very characteristic of me

5 = Extremely characteristic of me

1. I am comfortable with the appearance of my physique or figure.

2. I would never worry about wearing clothes that might make me look too thin or overweight.

3. I wish I wasn't so up-tight about my physique or figure.

4. There are times when I am bothered by thoughts that other people are evaluating my weight or muscular development negatively.

5. When I look in the mirror I feel good about my physique or figure.

6. Unattractive features of my physique or figure make me nervous in certain social settings.

7. In the presence of others, I feel apprehensive about my physique or figure.

8. I am comfortable with how fit my body appears to others.

9. It would make me uncomfortable to know others were evaluating my physique or figure.

10. When it comes to displaying my physique or figure to others, I am a shy person.

11. I usually feel relaxed when it's obvious that others are looking at my physique or figure.

12. When in a bathing suit, I often feel nervous about how well-proportioned my body is

Participant background questionnaire

Are you male/female?

How old are you?

Are you: A student, Employed, No Current Employment (Please circle/select as applicable)

Please state ethnicity:

How long have you been a member of a gym?

When did you become a member of teamHUD?

On average, how many times per week do you use the gym/gym's facilities?

What other forms of organised physical activity do you typically engage in over a 7 day period?

What is the primary goal/s of your exercise regime? Please select: Weight loss, Muscular gain, Maintenance/muscle toning

What form of exercise will you be partaking in today (Or your preferred method of exercise)? Please select: Cardio, Weights, Mix

For researcher use only:

Baseline HR:

Max HR:

Post workout HR:

Exercise Duration:

Appendix B

University of Huddersfield

School of Human and Health Sciences

Participant Information Sheet

Research Project: Investigating potential links between personality and exerciser characteristics.

You are being invited to take part in a research project. Before you decide it is important for you to understand why this research is being undertaken and what it will involve. Please take time to read the following information and discuss it with others if you wish. Ask if there is anything that is not clear or if you would like more information. May I take this opportunity to thank you for taking time to read this information sheet.

What is the purpose of the project?

The research project is intended to investigate links between personality and exerciser characteristics.

Why have I been chosen?

You have been chosen as representing a gym-going individual in 2016.

Do I have to take part?

Participation on this study is entirely voluntary, so please do not feel obliged to take part. Refusal will involve no penalty whatsoever and you may withdraw from the study at any stage without giving an explanation to the researcher.

What do I have to do?

You will be invited to complete a pair of brief questionnaires which should take no more than **10 minutes** of your time. You will also be requested to wear a HR monitor for the duration of today's workout. However, you are urged NOT to deviate from your pre-planned workout session in any manner.

Are there any disadvantages to taking part?

There should be no foreseeable disadvantages to your participation. If you are unhappy or have further questions at any stage in the process, please address your concerns initially to the researcher if this is appropriate. Alternatively, please contact the research supervisor **Dr Kiara Lewis and/or Dr Jane Bradbury**, University of Huddersfield.

Will all my details be kept confidential?

All information which is collected will be strictly confidential and anonymised before the data is presented in the project, in compliance with the Data Protection Act and ethical research guidelines and principles.

What will happen to the results of the research study/assignment?

The results of this research will be written up as a project and presented for assessment in **2016**. The final report may also be presented at conference and stored in the university repository. If you would like a copy please contact the student.

Who has reviewed and approved the study, and who can be contacted for further information?

The research supervisors are **Dr Kiara Lewis** and **Dr Jane Bradbury**. They can be contacted at the University of Huddersfield; kiara.lewis@hud.ac.uk; j.bradbury@hud.ac.uk

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