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SOCIAL PHYSIQUE ANXIETY ACROSS PHYSICAL ACTIVITY SETTINGS: A META-ANALYTIC REVIEW

by

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Abstract

The purpose of this meta-analytic investigation was to review the empirical evidence specific to the effect of physical activity context on social physique anxiety (SPA). English language studies were located from computer and manual literature searches. A total of 146 initial studies were coded. Studies included in the meta-analysis presented at least one empirical effect for SPA between physical activity participants (i.e., athletes or exercisers) and non-physical activity participants. The final sample included thirteen studies, yielding 14 effect sizes, with a total sample size of 2846. Studies were coded for mean SPA between physical activity participants and non-physical activity participants. Moderator variables related to demographic and study characteristics were also coded. Using Hunter and Schmidt's (2004) protocol, statistical artifacts were corrected. Results indicate that, practically speaking, those who were physically active reported lower levels of SPA than the comparison group (d_{corr} = -.12; SD_{corr} = .22). Consideration of the magnitude of the ES, the SD_{corr}, and confidence interval suggests that this effect is not statistically significant. While most moderator analyses reiterated this trend, some differences were worth noting. Previous research has identified SPA to be especially salient for females compared to males, however, in the current investigation, the magnitude of the ES's comparing physical activity participants to the comparison group was similar (d_{corr} = -.24 for females and d_{corr} = -.23 for males). Also, the type of physical activity was investigated, and results showed that athletes reported lower levels of SPA than the comparison group (d_{corr} = -.19, SD_{corr} = .08), whereas exercisers reported higher levels of SPA than the comparison group (d_{corr} = .13, SD_{corr} = .22). Results demonstrate support for the dispositional nature of SPA. Consideration of practical significance

suggests that those who are involved in physical activity may experience slightly lower levels of SPA than those not reporting physical activity participation. Results potentially offer support for the bi-directionality of the relationship between physical activity and SPA; however, a causality may not be inferred. More information about the type of physical activity (i.e., frequency/nature of exercise behaviour, sport classification/level of athletes) may help clarify the role of physical activity contexts on SPA.

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Social Physique Anxiety across Physical Activity Settings: A Meta-Analytic Review

It would be difficult to find a topic that has generated more scholarly interest than the self and its related constructs (Fox, 1998). From a psychological standpoint, the resultant drive for enhanced understanding of the development, structure, and importance of the self has transcended scientific inquiry to become commonly used terms (Fox, 1998). Terms such as self-esteem, self-concept, self-efficacy, and, of most relevance to the present investigation, self-presentation are often used in an attempt to explain and predict behaviour. *Self-presentation* refers to the processes by which people monitor and comparison how they are perceived by other people (Schlenker, 1980). This differs from *impression management* which is more broadly conceptualized as a goal-directed activity designed to shape an audience's impressions of a person, object, event, or idea (Schlenker, 1980).

Understanding the Self as Influenced by Others

Greek philosophers such as Socrates, Plato, and Aristotle defined the self in terms of the soul, as immaterial and spiritual (Fox, 1998). Their conception of an individual's sense of self as a spiritual entity separate from the physical body formed the foundation for subsequent conceptions of mind and body duality (Fox, 1998). A turning point in the thinking about the non-physical being came in 1659, when Rene Descartes proposed that doubt was a principal tool of inquiry. He reasoned that if he doubted, he was thinking, and therefore must exist (Fox, 1998). The Cartesian *self* is built on the idea that "the individual is, above all else, a thinking thing," (Bakhurst & Sypnowich, 1995, p.2). As thinking beings/entities, we inhabit our own subjective worlds, and mental life exists independently of our interaction with others. The emphasis on mind-body duality

identified in Cartesian thought emphasized the inner process of self-awareness which remains a powerful force in philosophical and psychological thought.

Psychologists interested in the self believe that it has an organizational function, which is most often recognized as *self-direction* (Fox, 1998). The self gathers and acts on the information that is constantly fed into it through its interactions with the world. Contemporary theories and definitions of self-concept stem from James (1892; as cited in Fox, 1998) who differentiated between the self as knower, or the "I", and the self as known, or "me". The "I" instigates change or action, while the "me" represents the accumulation of knowledge. The "me" was thought to be comprised of three components: the material, the social, and the spiritual self. Of particular interest to any investigation of self-presentation in physical activity contexts are the material and social self. James suggested the body reflects the innermost part of the material self, whereas the social self is developed through the recognition an individual gets from others (Fox, 1998). According to James, people have an innate propensity to get themselves noticed favourably. As there are distinct groups of persons whose impression is of importance, an individual generally demonstrates a different side of him/herself to each of these different groups.

Cooley (1902; as cited in Fox, 1998) advanced the belief that the self is primarily determined by the beliefs and actions of others. This approach assumed that the individual is an active agent (compared to the passive agent proposed by James) in the formation of the self (Fox, 1998). Cooley advanced the notion of the *looking-glass self* in that the appraisals of others provide the information used to define our sense of self (Fox, 1998).

Goffman (1959) laid the foundation and defining principles of what is commonly referred to as self-presentation in his monograph, *The Presentation of Self in Everyday Life* (1959). Self-presentation, as conceptualized by Goffman, required the presence of others. Social life was advanced as a theatre stage. Actors play "roles" and as such are required to comparison the impressions they give off, so as to comparison how others will relate to them. Performers, seeking certain ends, must work to adapt their behaviour in such a way as to "give" and "give off" the correct expression to a particular audience. The distinction between public *vs*. private selves is instrumental. The goal of self-presentation is for a person to present him/herself the way in which they would like to be thought of, either due to their own self-depictions (i.e., private selves), or to satisfy the desires of the individual or group they are interacting with (i.e., public selves).

The Relationship between Self Constructs

"Act the part, and it becomes incorporated into the self-concept."

(Schlenker, 2003, p.502)

The work of the influential scholars listed above, along with others, has resulted in an enhanced understanding of the self. Not only can aspects of the self be conceptually differentiated, but the self is usually known as a hierarchical and multidimensional entity comprised of different subdomains (i.e., the physical, social, emotional, and academic) that contribute to overall sense of the self (Shavelson, Hubner, & Stanton, 1976). Impressions conveyed influence how individuals are perceived and treated by others and how they perceive themselves (Goffman, 1959; Kowalski, Crocker, & Kowalski, 2001; Schlenker, 1980). The perceived opinions of others influence self-esteem which has been defined as 'the awareness of good possessed by oneself' (Campbell, 1984, p.9). Self-

esteem has also been linked to self-presentational tactics, with those higher in self-esteem engaging in "acquisitive" self-presentational strategies (i.e., efforts to receive positive attributions from others; Roth, Snyder, & Pace, 1986) compared to those lower in self-esteem who report a propensity to engage in "protective" strategies (i.e., efforts to avoid negative characterizations; Roth et al., 1986) (Baumeister, Tice, & Hutton, 1989; Raskin, Novacek, & Hogan, 1991; Tice, 1991; Wolfe, Lennox, & Cutler, 1986).

Another aspect of the self that is often used interchangeably with self-esteem, albeit erroneously, is that of self-concept. Self-concept has been described by Murphy (1947; as cited in Ziller, 1990) as "the individual as known to the individual" (p.28) or the "me" as known by the "I", if we return to James' conceptualizations. Fox (2002) explains that self-concept is based on the abilities, activities, qualities, traits, personal philosophies, morals and values, and roles adopted by the self. Therefore, self-concept is seen as more descriptive in nature, whereas self-esteem is more evaluative. Public self-presentational behaviours are thought to produce more change in self-beliefs than ones that are privately performed (Schlenker, Dlugolecki, & Doherty, 1994; Tice, 1992). Schlenker (2003) suggested that public self-presentations are most likely to generate changes in private self-beliefs when they occur in contexts that make the public images appear to be representative of self. For example, if someone is interested in impressing faculty or academic peers, they may attempt to present themselves as an academic being. If they then believe that they were successful in portraying the image of someone of a high academic standard, it may begin to shape their private self-beliefs into believing that this public image is representative of themselves. Though thought to be deceptive or

manipulative, the images portrayed are usually consistent with one's own self-concept (Leary & Kowalski, 1990).

Increasing evidence suggests that self-presentational concerns (i.e., concerns that the desired impression is not being presented) are related to various physical self-perceptions (McAuley & Burman, 1993; Martin, Engels, Wirth, & Smith, 1997). Also, examining multiple components of physical self-concept, Crocker and colleagues found that perceived body fatness (r = -.74), appearance (r = -.56), and global physical self-worth (r = -.68), were all related to physique specific self-presentational concerns in adolescents (Crocker, Snyder, Kowalski, & Hoar, 2000). Assessments of coordination (r = -.46), endurance (r = -.35), and sport competence (r = -.38) were also related (Crocker et al., 2000).

Self-presentation

Self-presentation is not simply behaviour that occurs under limited circumstances, (i.e., sport competition) or evidenced by only certain types of people (i.e., high self-monitors); rather, it is a fundamental feature of interpersonal experience (Goffman, 1959). Many patterns of self-presentation are habitual or unconscious; however, there are situations where people are motivated to comparison how others perceive them (Leary & Kowalski, 1990; Schlenker, 1980). In such situations, information is not assimilated randomly, but individuals consciously "package" themselves to help others draw a desired conclusion (Leary & Kowalski, 1990). Therefore, in any situation, people monitor others' reactions (or the images they believe they should be portraying) and often try to convey images of themselves that are positive and consistent with their desired image (Leary & Kowalski, 1990). Desired social and material outcomes are more likely following favourable than non-

favourable presentations (Leary & Kowalski, 1990). Individual differences in the extent to which self-presentational processes (i.e., the processes that people take to convey the desired image) are engaged in arise from personal characteristics that influence the degree to which they are motivated to impress others and perceive self-presentational difficulties (Schlenker & Leary, 1982).

A Framework for Understanding Self-presentational Processes

Desired impressions that are conveyed vary depending on the social context, the identities of others present, and the inclination of the individual (Leary & Kowalski, 1990). The processes that motivate self-presentational behaviour and how such behaviours are constructed have been advanced (Leary & Kowalski, 1990). First, *impression motivation* refers to the desire with which people are motivated to comparison how they are perceived in a social encounter (Leary & Kowalski, 1990). The degree to which people are motivated to self-present is influenced by a variety of factors including: the degree to which making a particular impression will facilitate the achievement of one's goals (i.e., goal relevance), the value of these goals, and the discrepancy between an individual's current and desired image (Leary & Kowalski, 1990).

Once motivated to create a certain impression, the mechanism through which the impression is created is considered. *Impression construction* involves the processes by which people decide (implicitly or explicitly) which images they want to convey (Leary & Kowalski, 1990). Two dispositional influences – self-concept and desired/undesired identity images – contribute to the impressions constructed. Three situational influences (i.e., role constraints, target values, and the individual's current social image) have also been advanced. Behavioural expectations are inherent to all roles that people occupy (Sarbin & Allen, 1968);

therefore, people try to ensure that the image they are portraying is consistent with role-demands. People tend to tailor their public images to the perceived values and preferences of significant others (Leary & Kowalski, 1990). Finally, the impressions people try to create are affected both by how they think they are currently regarded and by how they think others may perceive them in the future.

The Relationship between Self-presentation and Social Anxiety

People generally feel secure in social settings when they believe that they are successful in portraying a certain desired impression or when they are not concerned with others' reactions to the impression they are portraying (Schlenker & Leary, 1982). Although people may want to create a particular impression, they may (a) be uncertain about how to go about doing so, (b) think they will not be able to project the quantity or quality of image that will produce preferred reactions, or (c) believe that some event will occur that will disclaim their self-presentations, resulting in a loss of public esteem. When people doubt their ability to achieve their self-presentational goals, social anxiety may result (Leary & Kowalski, 1990). Social anxiety is defined as "anxiety resulting from the prospect or presence of personal evaluation in real or imagined situations," (Schlenker & Leary, 1982, p.642).

A variety of theoretical approaches for understanding social anxiety have been advanced. Although several conceptualizations exist, most emphasize one of three antecedents: biological mechanisms (e.g., temperament, psychophysiological factors); cognitive patterns of how people think about themselves and their social worlds; and interpersonal processes. Self-presentational frameworks accounting for social anxiety (Leary & Kowalski, 1995a, 1995b; Schlenker & Leary, 1982) propose that people experience social anxiety when they are motivated to make a desired impression on others, but doubt that they

will successfully do so. Because the impressions that people make on others have important implications for how they are evaluated and treated, people are understandably motivated to convey (and avoid) certain impressions (Goffman, 1959; Leary, 1995; Schlenker, 1980). Self-presentation is able to account for both the kinds of interpersonal situations that evoke anxiety as well as individual differences in the tendency to feel socially anxious. Any situational factor or dispositional trait associated with either a high motivation to convey desired impressions to others, or low confidence in one's ability to make the desired impression, should increase social anxiety. Understanding social anxiety from a self-presentational perspective is most often linked with the cognitive approach through its focus on the role of cognitions that underlie social anxiety. However, other approaches to social anxiety can be supported. For example, research has demonstrated that deficits in social skills predispose individuals to be socially anxious and that social skills training can reduce social anxiety (for a review, see Leary & Kowalski, 1995a).

Social anxiety has been linked to a lower quality of life, as indicated by negative perceptions of their own health and indices of life dissatisfaction (Statistics Canada, 2004). Approximately 30% of those with social anxiety disorder rated their physical health as fair or poor and 37% rated their mental health as fair or poor, compared with people who had no history with the disorder (13% and 5% respectively; Statistics Canada, 2004). Although most often linked to clinical disorders, sub-clinical social anxiety has been reported to be quite prevalent in the general population with 50% – 61% of individuals reporting social anxiety in at least one situation (Hofmann & Roth, 1996; Stein, Walker, & Forde, 1994). Researchers have suggested that sport and exercise settings create an atmosphere where the potential for social anxiety is substantial (Crocker, Sabiston, Forrester, Kowalski, &

McDonough, 2003; Crocker et al., 2000; Focht & Hausenblas, 2003; Gammage, Martin Ginis, & Hall, 2004). This potential exists because during sport or exercise, it is likely that their physiques will be on display, which could allow for more social anxiety about their bodies to occur.

Social Physique Anxiety

One subtype of social anxiety that has received considerable attention is that of social physique anxiety (SPA), which may result from the prospect or presence of negative interpersonal evaluation involving one's physique (Hart, Leary, & Rejeski, 1989). The influence of others' physique-related evaluations is communicated from an early age. VanderVelde (1985) suggested that, "every child learns that such bodily features as size, weight, strength, complexion, or looks are used with often painful accuracy by peers, classmates, teachers, and coaches to determine the pecking order in social and athletic activities. Bodily 'flaws' become social liabilities and are ever-present potentials for rejection and humiliation" (p.532). Consistent with the dispositional conceptualization of SPA, those who think others view their bodies favourably, or who are disinterested in others' reactions, may rarely experience SPA. Others may be chronically concerned, either because their bodies are objectively unattractive or because they hold an unrealistically negative perception of their physique (Hart et al., 1989). Those who are highly anxious may avoid situations in which their physique is scrutinized, become very distressed when their physiques are displayed, avoid activities that accentuate their physiques, suffer depression related to their bodies, and attempt to improve their physiques through a variety of means (i.e. excessive exercise, eating disordered behaviour; American Psychiatric Association, 1994; Frederick & Morrison, 1996; Frederick & Morrison, 1998; Martin & Leary, 2001)

Correlates of Social Physique Anxiety

Researchers interested in SPA have developed their understanding through consideration of the demographic, perceptual/cognitive, and environmental correlates of the anxiety experienced as a result of elevated physique evaluation. These correlates are summarized below.

Demographic correlates. Variables including increased height (David & Johnson, 1998; Thompson & Chad, 2002), increased weight (Eklund & Crawford, 1994; McAuley, Bane, & Mihalko, 1995), and body mass index (Greenleaf, 2004; Hausenblas & Fallon, 2002; Lundgren, Anderson, Thompson, Shapiro, & Paulosky, 2004; Russell, 2002; Russell & Cox, 2003) have been positively correlated with and predictors of SPA. Age as a demographic variable has been plagued with inconsistent findings. For example, Thompson and Chad (2002) found that SPA was positively correlated to age, when looking at a young female sample, whereas Reel and Gill (1996) found that adolescent females reported higher levels of SPA compared to their older counterparts.

Research has indicated that SPA may also be reported differentially depending on gender and race. Females have consistently reported greater SPA compared to males (Berry & Howe, 2004; Eklund, Kelley, & Wilson, 1997; Mack, Strong, Kowalski, & Crocker, in press). Further, Caucasians have consistently reported higher levels of SPA than their African-American counterparts (Jordan, Smisson, Burke, Joyner, & Czech, 2005; Russell, 2002; Russell & Cox, 2003).

Perceptual and cognitive correlates. A number of physical self and cognitive correlates associated with evaluative concerns have been linked to SPA. Researchers have found that higher self-esteem was associated with lower SPA (Bas, Asci, Karabudak, &

Kiziltan, 2004; David & Johnson, 1998; Martin, 1999; Martin et al., 1997; Russell, 2002; Williams, Diehl, & Mahoney, 2002). Physical self-concept has also been demonstrated to be a predictor of SPA (β = -.22; Crocker et al., 2000).

Body dissatisfaction has been examined extensively in terms of its relationship with SPA with correlations between variables reported ranging from r = .60 to .74 (Krane et al., 2001; Thompson & Chad, 2002) and body dissatisfaction predicting SPA (β = .40 to .54; Krane et al., 2001; Thompson & Chad, 2002). This association has held despite varied operational definitions of body dissatisfaction. Finally, drive for thinness has been found to be related to SPA (r = .48 to r = .62; Krane et al., 2001; Thompson & Chad, 2002), as well as a predictor of SPA (β = .43; Thompson & Chad, 2002).

SPA has been linked to a number of other self presentational variables. Fear of negative evaluation (Holle, 2004; Lundgren, Anderson, & Thompson, 2004), public self-consciousness (Martin & Leary, 2001; Thornton & Maurice, 1999), social anxiety (Carron & Prapavessis, 1997; Hart et al., 1989), maladaptive or neurotic perfectionism (Haase, Prapavessis, & Owens, 2002; Krane, Stiles-Shipley, Waldron, & Michalenok, 2001), and social comparison (Heinberg & Thompson, 1995; Irving, 1990; Stice & Shaw, 1994; Thornton & Maurice, 1997; Thornton & Moore, 1993) have all been positively correlated to SPA.

The Influence of Environmental Conditions

In their attempt to explain behaviour, psychologists typically adopt either a trait or a situational approach. The trait approach assumes that people are born with certain personality characteristics (traits) which will be usually exuded regardless of the situation (state) in which they find themselves (Allport, 1927). Inherent to this approach is the belief

that every stimulus encountered will generate a particular response depending on the traits that a person possesses.

Walter Mischel and his revolutionary work *Personality and Assessment* (1968) contended that behaviours are more controlled by the situation, and behaviours change as situations change. Mischel's research noted that behaviours are not consistent across time or situation, and therefore the inner consciousness of the individual and the existence of traits are not strong predictors of future behaviour (Mischel, 1969). The situational approach is useful as a mechanism from which to explain inconsistent behaviour. Mischel argued for an interactionist approach in which both personality variables and situational variables were considered as equal contributors to behaviour. Most psychologists today adopt an interactionist approach and consider both trait and situation conditions to describe behaviour.

The environment influences the display of various personality characteristics, which can be held especially true in sport and exercise environments (e.g., anxiety, aggression, and confidence). For example, sport psychology researchers have investigated confidence from a trait perspective (Cresswell & Hodge, 2004; Vealey, 1986) and a state perspective (Magyar & Feltz, 2003; Vealey, 1986).

Leary and Kowalski (1990) suggested a variety of dispositional and situational influences on the motivation to engage in self-presentational behaviour and the construction of a desired image. At one extreme are situations in which people are completely oblivious of other's reactions to them. When in such a state, people do not hold themselves as an object of their own thoughts and thus do not process information in a self-relevant fashion (Duval & Wicklund, 1972). Therefore, they are not concerned

with how they are viewed by others, or who are completely unaware of the impression they are portraying. At the other extreme are situations characterized by acute public self-awareness in which people attend consciously to the aspects of themselves observable to others (Buss, 1980). When under others' intense scrutiny, people find it difficult *not* to think about the impressions they are forming.

Contextual Correlates of Social Physique Anxiety

Individuals' experiences with their bodies are complex and contextual (Paquette & Raine, 2004). As a result, Blood (2005) suggested people may experience different emotions at different times with respect to their bodies. Sport and exercise activities may create an environment that is especially anxiety-provoking for some. Both contexts create an environment where SPA can occur, as one's physique (e.g., muscular development) and physical attributes (e.g., coordination) are continually on display. Regardless of whether it is the presence or simply the prospect of evaluation which may lead to elevated levels of anxiety, one's perception of the environment may result in an increased feeling of anxiety.

Although originally conceptualized as a trait, researchers have recently argued that SPA may reflect contextual influences (Haase & Prapavessis, 2001; Van Raalte, Cunningham, Cornelius, & Brewer, 1998). The argument that SPA may reflect contextual influences is thought to lend itself to the interactionist approach, in that both a person's traits and the situation in which they find themselves will help shape the level of SPA reported. As a result, it was thought that the amount of SPA reported may be different for those who engage in physical activity compared to those who do not. To

this end, those engaged in physical activity (i.e., athletes and exercisers) were contrasted with a comparison group in the present investigation.

SPA in Physical Activity Contexts

To understand the relationship between SPA and physical activity contexts, it is essential to consider sport and exercise and why it may be a situation in which people experience heightened self-presentational concerns. Self-presentation is one factor that has been suggested to affect people's exercise behaviours, cognitions, and attitudes (Hausenblas, Brewer, & Van Raalte, 2004). For example, there are those who exercise to create the impression of being "fit" or an "exerciser" more so than for health reasons (Leary, Tchividjian, & Kraxberger, 1999).

Leary and Kowalski (1990) have suggested that people are likely to participate in activities that convey impressions consistent with goal-directed activities, roles, social norms, and/or others values. Extending this to SPA, research has indicated that people are more motivated to impression-manage when the impressions they make are relevant to the fulfillment of one or more of a person's goals (Leary & Kowalski, 1990). One factor that determines how relevant one's impressions are to the fulfillment of these goals is the publicity of one's behaviour. Overall, the more public one's behaviour, the more likely one is to be concerned with how it appears to others, and the more motivated one will be to impression-manage (Leary & Kowalski, 1990). This credence is especially true for athletes and exercisers as much of sport and exercise takes place in a public setting, where the potential for public scrutiny and/or praise exists.

Role constraint is another aspect of the self-presentational framework that can be linked to physical activity contexts. Social roles carry expectations regarding how

individuals who occupy those roles are to behave (Sarbin & Allen, 1968). In addition to specific behavioural prescriptions, most roles require that people who occupy them appear to be a particular kind of person or possess certain personal characteristics (Leary & Kowalski, 1990). Specifically, if athletes/exercisers perceive their physiques, either through their musculature or body composition, are not consistent with their "role", then they may report higher levels of SPA.

A third situational influence of the self-presentational framework is that of target values. Some targets prompt individuals to monitor and comparison their impressions more so than others because the target is powerful, of high status, likeable, or simply can help them achieve their goal. In such a case, the individual is more likely to impression-manage. Also, the framework would suggest that people tailor their public images to the perceived values and preferences of others. Therefore, if in a public setting, as many sporting and exercise environments are, the target audience has certain expectations of how an exerciser/athlete should look and act. If athletes/exercisers perceive that their physiques are not consistent with the expectations of the values of their target audience (which can change depending on the situation they are in), then they are likely to report higher levels of SPA.

Therefore, it is possible that athletes/exercisers may report higher levels of SPA than those not in physical activity contexts due to the evidence of the situational influences of the self-presentational framework on SPA. However, this line of inquiry has been riddled with inconsistent findings. In fact, the opposite has been shown, in that non-exercisers and non-athletes reported higher levels of SPA in comparison to athletes (Berry & Howe, 2004; Hausenblas & Mack, 1999), whereas other researchers have found

no differences between athletes and exercisers, and those who are not physically active (Cox, Lantz, & Mayhew, 1997; Haase & Prapavessis, 2001).

It has also been suggested that athletes in physique-salient sports (e.g., gymnasts, divers, figure skaters, aerobic competitors) train and compete in an environment where the physique is constantly under scrutiny (Borgen & Corbin, 1987). For example, athletes participating in physique-oriented sports wear revealing attire that places the physique on display, and success is determined, in part, by the athlete's ability to convey physical impressions of beauty and grace to those who subjectively evaluate their performance (Haase & Prapavessis, 2001). As a result of evaluative pressures, social anxiety may occur (Leary, 1992). Related literature has shown that those who compete in physique-salient sports report a higher incidence of eating disordered behaviour (*ES* = 0.38 for aesthetic sport athletes compared to *ES* = -0.17 for ball-game athletes and *ES* = -0.04 for endurance-sport athletes; Hausenblas & Carron, 1999). Extending the above to SPA, athletes who participated in physique-salient sports may report higher levels of SPA than other athletes who participated in sports where the focus was not necessarily on one's physical appearance or physique (Haase & Prapavessis, 2001). However, empirical literature has not consistently supported the above. Hausenblas and Mack (1999) found that physique-salient athletes reported lower levels of SPA compared to athletes and non-athletic comparisons, whereas Haase and Prapavessis (2001) found no significant differences between physique-salient, weight-restricted, non-physique-salient, and non-athletes.

Specific to exercise, self-presentation has been shown to influence a wide variety of behaviours, such as motivation to engage (Frederick & Morrison, 1996; Lantz, Hardy,

& Ainsworth, 1997), the activity and context chosen (Crawford & Eklund, 1994; Spink, 1992), effort and exertion put forth, (Conroy, Motl, & Hall, 2000), and affective responses to exercise (Leary, 1992). In accord with the above, researchers have reported a negative relationship between SPA and exercise behaviour (Crawford & Eklund, 1994; Eklund & Crawford, 1994; Frederick & Morrison, 1996; Hausenblas & Fallon, 2002; Kruisselbrink, Dodge, Swanburg, & MacLeod, 2004; Lantz et al., 1997; Spink, 1992; Yin, 2001). That is, as one's frequency of exercise behaviour increases, the level of SPA reported decreases.

In contrast, research has shown that participants reporting higher level of SPA have also reported engaging in more physical activity (Belling, 1992; Frederick & Morrison, 1996). It was thought that those who reported being highly anxious about their physiques might engage in more physical activity behaviour as a way to enhance the appearance of their bodies and consequently reduce the level of SPA reported.

To further confuse the SPA-exercise behaviour relationship, research has also found that one's level of SPA was not predictive of physical activity levels (Kowalski et al., 2001). Kowalski et al. suggested that SPA may not be the critical variable in determining physical activity levels, and that there was potentially another variable moderating the effects. Biddle (1997) speculated that the weak relation between SPA and physical activity level was because for many, the motivation to be physically active (whether for health-related or appearance-related reasons) may be more powerful than the anxiety they feel regarding the self-presentation of their physiques. Considering the disparate literature, a systematic integration of SPA research in the physical activity domain may help clarify the relationship.

SPA in Comparison Groups

To date, the literature reviewed has been specific to physical activity contexts; however physique-specific anxiety is not limited to those who engage in physical activity. As such, the research considering SPA is also not limited to those engaged in physical activity. Other samples that have been examined include physical education professionals (Mookerjee, Singh, & Cash, 2002), different ethnic groups (Jordan et al., 2005), out of body experients (Murray & Fox, 2005), and subjectively underweight females (Lox, Osborn, & Pellett, 1998). Research conducted on adolescents has reported that females report higher levels of SPA than males and that positive correlations to measures of body mass composition are found (Kowalski, Mack, Crocker, Niefer, & Fleming, 2005; Mack et al., in press). Further, SPA has been found to be positively related to other body related constructs such as body dissatisfaction and drive for thinness in a university aged sample (Mack, Strong, Kowalski, & Crocker, in press).

The Role of Meta-analysis

A major goal of science is to provide explanations for how various physical, biological, and social systems work (Mayer & Anderson, 1991). In essence, this means the development of theories that attempt to explain a phenomenon of interest. Without precise conclusions of relationships between variables (e.g., whether participation in sport or physical activity leads to elevated levels of SPA), theory construction and its consequent advancement of knowledge is delayed. Meta-analyses allow for the integration of disparate literature spread over many journals, generated over many years, and frequently carried out in diverse settings (Davies & Crombie, 2003). Reviews of research have been valuable to many fields, but when presented and described only

qualitatively, the results of conflicting studies can be confusing (Rosenthal & DiMatteo, 2001). Yet, it may be all too tempting for authors of narrative reviews consciously or unconsciously to select and describe studies to support their own understanding of the literature and/or their own established theoretical positions.

Quantitative methods for combining studies have been available since the early 1900's. But the term "meta-analysis" was coined by Glass (1976) as:

> "...the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings. It connotes a rigorous alternative to the causal, narrative discussions of research studies which typify our attempts to make sense of a large volume of research literature (p.3)."

In other words, meta-analyses reflect combined data from several studies to produce a single estimate, thereby offering a more systematic and quantitative approach to reviewing important questions (Davies & Crombie, 2003).

Traditional criticisms of narrative literature reviews have prompted the rise in meta-analytic techniques. For example, quantitative narrative reviews tend to rely on statistical significance for evaluating and comparing studies. Given that statistical significance is dependent (in part) on sample size, even weak effects can be made to look stronger simply by adding more participants. Narrative reviews further lack systematic rules of inference for going from the findings of studies to overall generalizations. Finally, narrative reviews are not well-suited for analyzing the impact of moderating variables. Well-conducted meta-analyses can provide a more precise estimate of treatment effects and may explain heterogeneity between the results of individual studies (Egger & Davey Smith, 1997). They may also increase statistical power, resolve uncertainty, and improve estimates of effect size (Egger & Davey Smith, 1997).

There are many advantages to using a meta-analysis when attempting to integrate findings from various studies. First, when a researcher has a number of small studies that cannot conclude anything due to their small sample, they can be combined together to allow for a clearer picture and perhaps show the presence (or absence) of an effect (Rosenthal & DiMatteo, 2001). Further, meta-analysis prevents an over-reliance on the statistical significance test of any one finding as a measure of its value. Repeated results in the same direction across several studies, even if none are significant, are much more powerful evidence than a single significant result (Rosenthal & DiMatteo, 2001). Second, inherent to any narrative review is some degree of bias, either due to including only significant results, or prior beliefs of the researcher (Davies & Crombie, 2003). This can be somewhat avoided, as meta-analyses include all studies on a topic, regardless of the significance of the results. Third, the magnitude of an effect can be estimated depending on the number of participants included (Davies & Crombie, 2003). Meta-analyses can take the smaller studies (in specific subgroups) to show a clearer picture. Finally, meta-analyses allow for the wasting of minimal data. When researchers fail to write-up results that were not significant, or when journals reject articles with non-significant findings, data is lost. This could lead to publication bias, in which the results could be inflated due to the exclusion of non-significant findings (Hunter & Schmidt, 2004).

However, there are certain criticisms of meta-analyses that have been expressed. The first criticism is that there could be bias in selection of the information to be included (Davies & Crombie, 2003). Every meta-analysis has some inherent bias by virtue of the inclusion/exclusion criteria and the methods chosen to review the literature (Rosenthal &

DiMatteo, 2001). Ideally, one would obtain every piece of data ever collected on the topic of concern; however, some data are not published or untraceable. The majority of published work report statistically significant findings, which could lead to a misleading meta-analysis and an overestimate of the treatment effect. Secondly, heterogeneity, which refers to the variation in the study outcomes between studies, has been identified as a major concern, and unavoidable fact of performing a meta-analysis (Davies & Crombie, 2003). The extent to which researchers mix studies of different groups, interventions, and settings, can influence the outcome of the analysis, as they may be too different and disparate to compare. If these variables are not linked closely enough, then the results may be misleading. These variables, however, can then be used as moderators to help clarify their influence, thereby attempting to eliminate this problem.

A third criticism levelled against meta-analyses is that there exists the potential for a loss of information on important outcomes. In order to have some 'common currency' of outcome on which to combine data from different studies, meta-analyses may have to discard some data (Davies & Crombie, 2003). Meta-analyses tend to be concerned with dichotomous outcomes, and in order to fit this framework, data from individual studies may have to be discarded. Another criticism levelled against meta-analytic findings is inappropriate subgroup analyses. At times, researchers will do separate analyses on specific subgroups of the entire sample, sometimes as a way of finding any overall effect if the larger meta-analysis failed to do so. Although the analyses could offer insight for future studies, caution should be exercised in interpretation (Davies & Crombie, 2003). Despite the underlying studies being randomised, this randomisation between the comparison groups does not extend to

subgroups after the fact. Thus, there is great potential for confounding and misleading effects (Davies & Crombie, 2000; Egger, Davey Smith, & Phillips, 1997).

Next, another criticism is that of inadequate sensitivity analyses. Because there are many ways in which data is selected and included, it may affect the findings – to help with this, it is not unusual for meta-analysts to carry out sensitivity analyses. These analyses explore the effect of excluding various categories of studies, and may examine how consistent the results are across various subgroups (Davies & Crombie, 2003). If these sensitivity analyses are not carried out, then the reader is left to make guesses about the impact of these factors in the findings. Finally, a saying that is often linked to meta-analyses is "garbage in-garbage out" (Davies & Crombie, 2003). Meta-analyses are often criticized for integrating good and bad studies together. This means that if a study is poorly done, it can generate poorly supported outcomes, which will then be included in the meta-analysis, perhaps making the overall effect misleading. But despite all the criticisms, a meta-analysis is a helpful tool in synthesizing findings across studies, and it can help facilitate generalization of the knowledge gain through individual studies.

Moderators of Social Physique Anxiety

A moderator is a qualitative (data that is not in numerical form; e.g., sex, athletic descriptor) or quantitative (data that is in numerical form; e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent and a dependent variable (Baron & Kenny, 1986). Besides examining the overall effect of SPA in physical activity settings, a selection of plausible moderator variables was considered including demographic, environmental, and measurement issues. These moderator variables were

chosen to be coded based on previous literature that examined SPA and different physical activity contexts.

Gender. Females appear to consistently report higher levels of SPA than their male counterparts (Berry & Howe, 2004; Eklund et al., 1997; Frederick & Morrison, 1996; Haase et al., 2002; Hart et al., 1989; Kruisselbrink et al., 2004; Lantz et al., 1997; McAuley et al., 1995; Martin & Mack, 1996; Williams et al., 2002).

Age. Inconsistent findings have been reported in that some find age to be positively related to SPA (Thompson & Chad, 2002), and others have found SPA to be greater in younger samples compared to their older counterparts (Ransdell, Wells, Manore, Swan, & Corbin, 1998; Reel & Gill, 1996). Consequently, the influence of chronological age as a moderator was considered in an attempt to clarify the previous findings.

Race. Race appears to be another variable that affects SPA levels regardless of physical activity status. The definition of physical attractiveness is not uniform across ethnic groups and Caucasians tend to experience the cultural pressures to be thin more so than their African-American counterparts (Rand & Kuldau, 1992; Striegel-Moore, McAvay, & Rodin, 1986). Cultural ideals of thinness may lead to experiencing an elevated level of SPA, which has been shown to be more prominent in Caucasians (Russell, 2002; Russell & Cox, 2003; Jordan et al., 2005).

Anthropometric measures. Anthropometric measurements including increased height (David & Johnson, 1998; Thompson & Chad, 2002), increased weight (Eklund & Crawford, 1994; McAuley et al., 1995; Thompson & Chad, 2002), and percent body fat (Ransdell et al., 1998) have been associated with higher levels of SPA. Composite measures (i.e., body mass

index), have also been associated with heightened SPA (Greenleaf, 2004; Hausenblas & Fallon, 2002; Lundgren et al., 2004; Russell 2002; Russell & Cox, 2003).

Athletic descriptors. Physique-related anxiety may not be uniformly experienced in all athletic environments. Athletes that participate in physique-salient sports may report higher levels of SPA than other athletes who participated in sports where the focus was not necessarily on one's physical appearance or physique (Haase & Prapavessis, 2001). Findings in comparable samples have not supported the above claim (Crocker et al., 2000; Hausenblas & Mack, 1999)

Exercise setting. Just as the physique may be more salient in different athletic settings, engaging in exercise in certain exercise settings may result in more physique anxiety than others (Frederick & Morrison, 1996; Gammage et al., 2004). The public vs. private nature of the setting may also influence the level of SPA reported, with high levels of SPA associated with exercising with others (Spink, 1992; Yin, 2001). The gender composition of the exercise setting may influence one's level of SPA. For instance, Kruisselbrink et al., (2004) found that women tended to feel more anxious about their physique in exclusively male company and that their ratings of physique anxiety were greater for the mixed-sex scenario than the all-female exercise scenario. It was also found that more women shortened their workout in response to the all-male compared to the all-female and mixed-sex scenarios. This is in contrast to the findings of Walton and Finkenberg (2002) who found that women attending all-female facilities did not report higher levels of SPA than women attending coeducational facilities.

Frequency of exercise. Physical activity participation offers one mechanism through which concerns over one's physique may be managed. As such, researchers have speculated

that those with higher levels of SPA may report lower levels of physical activity (Lantz et al., 1997). However, inconsistent findings have been found. Crawford and Eklund (1994) found a negative relationship between SPA and exercise behaviour, whereas other researchers found no relationship between the level of SPA and exercise behaviour (Kowalski et al., 2001; Walton & Finkenberg, 2002).

The measurement of SPA. Research on SPA has focused on both conceptual and measurement issues. Measurement research has tended to be more controversial, with attempts to determine the uni- or multi-dimensional factor structure of specific instruments, optimal number of items in scales, gender invariance, and developmental factors (Eklund, Mack, & Hart, 1996; Hart et al., 1989; Martin, Rejeski, Leary, McAuley, & Bane, 1997; Motl & Conroy, 2000; Smith, 2004). Hart et al. (1989) originally developed a 12-item unidimensional dispositional measure called the Social Physique Anxiety Scale (SPAS) with preliminary validation evidence offered with a college-aged female sample. In the last decade, researchers have attempted to "improve" the original 12-item SPAS. Eklund et al. (1996) found a two-factor model provided a better fit to the data in a large sample of women, and this factor structure was replicated with a sample of men (Eklund et al., 1997). Eklund et al. (1997) also confirmed that item 2 in the SPAS was problematic. Martin et al. (1997) later argued that SPA is a unidimensional construct and that the 2-factor model structure was due to problems in the original SPAS. They proposed reducing the SPAS to nine items (dropping items 1, 2, and 5). Motl and Conroy (2000) employed both confirmatory and data driven methods to evaluate previous SPAS models and to develop a shorter measure. In a sample of male and female college students, Motl and Conroy found problems with the 12-item, 11-item, and 2-factor

models. Further, they noted the 9-item model provided a reasonable, but not optimal fit to scores for both males and females. They argued that a 7-item model provided a strong fit to the data and was invariant across gender. Smith (2004) continued the research when he examined various SPAS models in a large sample of 14-16 year old female and male high school students. Confirmatory methods found both the 9-item and 7-item models provided reasonable fits to the data. There is still much debate as to which SPAS is favourable across different types of people and different age groups, therefore the version of the SPAS used was coded for as a moderator.

Source of data. Concern has been expressed over the possibility that journals might favour the publication of research results that are statistically significant, generally consistent with previously published findings, and/or supportive of theoretical predictions (Rosenthal, 1966; Spence & Blanchard, 2001). While some (e.g., Eysenck, 1994) suggest that studies with methodological flaws specific to quality and source should not be meta-analyzed, Hunter and Schmidt (2004) vehemently disagree. These researchers argue that the exclusion of poorer quality and unpublished studies may produce over-inflated results. Results from refereed publications and the results from other sources (i.e., conference proceedings, theses, dissertations) were compared and publication type coded. As such, publication bias may be addressed and evaluated in the present study.

Statement of Purpose

The primary purpose of the present investigation was to examine the influence of physical activity participation on SPA. This purpose was examined through meta-analytic procedures. The influence of a number of potential moderator variables was assessed.

Research hypotheses advanced were:

1. Given the current conceptualization of SPA as a trait, it was hypothesized that no differences in SPA across physical activity and more general contexts would be found.

Research hypotheses advanced for moderator analyses[1]:

2. Research has consistently demonstrated higher SPA values for females than males (e.g., Berry & Howe, 2004; Haase et al., 2002; Hart et al., 1989). Although no contrasts between male/female physical activity participants to comparison groups have been made, it was still hypothesized that there would be larger effects for females in comparison to males.
3. Given the equivocal nature of the literature (Randsell et al., 1998; Thompson & Chad, 2002) it was hypothesized that age classification would not influence the magnitude of the effect.
4. The importance of type of physical activity has not been systematically quantified across studies. Therefore, it was hypothesized that the type of physical activity engaged would not influence the magnitude of the effect, in that there would be no differences in the magnitude of the effect between exercisers/comparisons and athletes/comparisons.
5. Given the lack of comparative data, it was hypothesized that the design of the study (non-, quasi-, or true-experimental) would not influence the magnitude of the effect.
6. Given the lack of comparative data, it was hypothesized that the sampling procedure would not influence the magnitude of the effect.

7. Given concerns over publication bias (Hunter & Schmidt, 2004; Spence & Blachard, 2001) , it was hypothesized that larger effects would be found for refereed publications than non-refereed.

Method

Selection of the Data

Literature searches were completed to identify studies that recorded the use of the SPAS in various groups and situations. Literature searches did not extend prior to the publication date (i.e., 1989) of the SPAS. Studies were obtained through two primary processes: computer and manual searches. Computer searches included exhaustive examination of the following databases: Academic Search Premier, MEDLINE, PsychLIT, PsychInfo, SPORTDISCUS, and ERIC. Keywords entered for the computer searches were social physique anxiety, SPA, SPAS, social anxiety, appearance anxiety, impression management, and self-presentation, as they were thought to be the words most logically associated with social physique anxiety, and the words that were most often linked to SPA in the literature.

Manual searches involved obtaining articles from reference lists contained in empirical studies and narrative reviews identified through the computer search. In addition, a hand search of select journals (those where a significant number of relevant articles were found) was conducted. Published abstracts from relevant professional meetings (e.g., NASPSPA, ACSM) were manually searched for relevant information. Four authors were contacted where information was missing for the calculation of effect sizes. Of these, one author provided the requested data, while the other three were either unwilling or unable to provide the data.

Data Coding

Each study obtained was coded for study characteristics and potential moderators (see Appendix A). Consideration to developing clear and detailed coding rules was generated to limit concerns over ambiguity and reliability. The variables coded included the source of the study, different sample characteristics (sample size, gender, age, body composition, race), different study characteristics (quality of study, presence of manipulation, study design, method of sampling, and setting), various moderators (competitive level, sport classification, exercise setting, frequency of exercise behaviour, and version of SPAS used), and information necessary for the calculation of the effect sizes. Two reviewers with expertise in meta-analytic investigations and knowledge of the sport and exercise and self-presentation literature reviewed the coding form for clarity and comprehensiveness. Based on their recommendations, modifications to the coding form (e.g., wording various moderators on the form) were made.

Two coders independently coded all studies selected for inclusion. The primary investigator served as one of the coders and then trained the second coder both with the constructs of interest (e.g., SPA) and the coding sheet. Training entailed coding five studies together with ambiguities discussed. Due to time constraints, the faculty supervisor acted as second coder for 70% of the studies, while the second coder completed the remaining 30%. As a final check, the faculty supervisor randomly selected 10% of the studies coded by the second coder to ensure consistency. Any discrepancies that were found between the two coders were brought to the faculty supervisor, and a decision was made after deliberation between coders and supervisor.

From the original search, 146 articles that included the use of the SPAS were coded independently by two coders[2]. The final database included 13 studies of the initial search (see Table 3) that directly addressed the primary research question. Therefore, to be included, the studies had to incorporate participants that were physically active as well as a comparison group. The final sample yielded a sample size of 2846 with a total of 28 effect sizes (see Table 4 for a list of relevant studies not included in the meta-analysis). To reduce the amount of dependence in each analysis, individual studies with multiple effect sizes were averaged (Cooper, 1984; Hunter & Schmidt, 2004), with the intent that each included study contributed one effect size to the overall analysis. The end result was that 13 studies resulted in 14 effect sizes. Although other moderator variables were originally hypothesized to influence SPA in different physical activity settings, their influence could not be tested due to the limited sample size[3]. Age was reported in 76.9% (n = 10) of final studies with a mean age of 20.12 (SD = 2.44). Age was then recoded into a dichotomous variable in which 15.4% (n = 2) of the studies could be classified as 'adolescent' (13-18 years), while the remaining 84.6% (n = 11) considered university-aged (>18 years). Gender was reported in 92.3% (n = 12) of studies, where male participants comprised 16.7% (n = 2), female participants 50.0% (n = 6), and studies that included both male and female participants 33.3% (n = 4). True experimental designs were reflected in 7.7% (n =1) of the studies, 38.5% (n = 5) were quasi-experimental, and 53.8% (n = 7) were non-experimental. In terms of sampling, 61.5% (n = 8) of the studies utilized a convenience-based sampling, whereas 38.5% (n = 5) used purposive sampling techniques.

Data Analysis

Calculating effect sizes. Various methods exist for calculating effect sizes (see Tables 1 and 2). These methods are dependent on study design and the information provided. Further there are two main types of meta-analyses—a fixed-effects and random-effects methods. With a fixed effects model, conclusions derived are valid for the studies included in the analysis, and it assumes common variance for all studies, in that effect sizes will not differ across studies. Therefore, a fixed effects model ignores heterogeneity, and gives one real value for the treatment effect. In contrast, a random effects model allows for heterogeneity of variance across studies as it assumes that effect size estimates vary across studies with acknowledgement of within study variation (sampling error) and between study variation (heterogeneity). Based on the recommendations by Hunter and Schmidt (2004) a random-effects model was employed. To test the random-effects model, the two-step process identified by Hunter and Schmidt (2004) was conducted. In the first step, the total variance of the observed study outcome was estimated, and the variance due to artifacts such as sampling error, reliability of measurement, and range restriction was subtracted to yield residual variance. As recommended by Hunter and Schmidt (2004), when the internal consistency reliability of the SPAS was not reported, the internal consistency estimate from the validation study (i.e., Hart et al., 1989; $\alpha = .90$) was used[4]. In the second step, the residual variance was increased through consideration of reliability and range restriction distributions to generate an estimate of the population variance ES. In essence, the Hunter and Schmidt method corrects ES's for the attenuating effects of error such as unreliability of scores and provides an estimate of the amount of ES variance due to sampling error or other

artifacts. A summary of typical ES calculations used in the present investigation are provided below.

Standardized mean difference (Cohen's d). For between subjects designs, athletes/exercisers were compared to a comparison group. The following calculation was used when means and standard deviations were identified:

$$d = \frac{\bar{Y}_E - \bar{Y}_C}{SD_{Pooled}}$$

where $$SD_{pooled} = \sqrt{\frac{(n_e - 1)s_e^2 + (n_c - 1)s_c^2}{n_e + n_c - 2}}$$

Mean values and pooled standard deviations (SD_{pooled}) were used to calculate ES's. The use of SD_{pooled} results in Cohen's d statistic (Cohen, 1977).

For a within subjects design, the calculation was similar to that for a between subjects design, except that the measure of variability was based on the standard deviation of the difference score rather than the pooled standard deviation. As such, effect sizes derived from within subjects designs were typically based on:

$$d = \frac{\bar{Y}_{time1} - \bar{Y}_{time2}}{SD_{time1-time2}}$$

For within subject designs, the following within-subjects ES's were calculated: pre-post athlete/exerciser, pre-post comparison, pre-athlete/exerciser vs. pre-comparison and post-athlete/exerciser vs. post-comparison. For mixed methods study designs, both within and between subjects ES's were calculated. The between-subjects ES's included pre-athlete/exerciser vs. pre-comparison and post-athlete/exerciser vs. post-comparison

and the within-subjects ES's included pre-post athlete/exerciser and pre-post comparison. For studies having both within and between ES's, the average was entered to maintain statistical independence (Hunter & Schmidt, 2004, p. 431).

Bias in effect size. The effect size is subject to a statistical phenomenon known as bias. Bias in meta-analyses reflects the discrepancy between the average sample effect size and the population effect size (Hunter & Schmidt, 2004). For sample sizes greater than 20, the bias is trivial in magnitude. However, biased methods have been advanced as a criticism of meta-analyses; therefore the correction for small sample size was employed (Hunter & Schmidt, 2004, p.266).

$$D_{bias} = 1 + \frac{3}{(4N - 12)}$$

Interpretation of effect sizes. Cohen (1969, 1992) has recommended that ES (d) values of .20, .50, and .80 be viewed as "small", "medium", and "large" respectively. Cohen established the medium effect size as one that was large enough to be naturally recognized in every day life. A small effect size is noticeably smaller, but not considered trivial. The large effect size was equidistant from medium effect compared to the small effect size.

Confidence and credibility intervals. As part of the analysis, 95% confidence intervals and 80% credibility intervals were computed. A confidence interval gives an estimated bandwidth of potential population values that are reasonable given the observed value. The confidence interval examines the extent to which a finding may be due to sampling error, with a wide interval that includes zero indicating definitive conclusions cannot be derived. A confidence interval that does include zero reflects that

the corrected ES is not significantly different from zero. A confidence interval that does not include zero indicates that the mean corrected ES is significantly different from zero. Confidence intervals have been criticized because of their over-emphasis on significance testing (Schmidt, 1996). Further, given their emphasis of the mean when computing confidence intervals, credibility intervals are deemed more important in meta-analytic research unless the corrected SD is very small (Hunter & Schmidt, 2004).

Credibility intervals are specific to meta-analyses and are a test of moderator effects. Credibility intervals represent an indicator that the true relationship generalizes across samples and situations. If the lower 80% credibility value is greater than zero, confidence that a relationship generalizes across situations examined in the study can be concluded. However, if the credibility interval does include zero, it is indicative of another variable moderating the effect, and therefore, a continued search for additional moderators is appropriate (Whitener, 1990). This is especially true when the SD_{corr} is large relative to the d_{corr}.

Moderator analysis. As a first step, a moderator variable correlation matrix was generated to explore the possibility that moderators were substantially intercorrelated, making the results difficult to interpret. Next, the appropriate ES subgroups for each moderator variable were meta-analyzed. Moderators were explored by examining differences between d_{corr} values and changes in the SD_{corr} across moderator subgroupings (Hunter & Schmidt, 2004). One indication of the possible presence of a moderator is the difference in mean effect size between subsets. A second indicator was based on a reduction in the variance in SD_{corr} compared to the overall SD_{corr}. The consideration of a reduction in SD_{corr} was afforded more attention when the number of studies and sample

size was relatively equal across subsets. Where inequality in either the number of studies or sample size included in the moderator analysis, attention to the difference in mean effect sizes is recommended (Hunter & Schmidt, 2004). Finally, the 80% CrI values were used to determine the likelihood that the effect generalized across situations, or to suggest the presence of additional unexamined moderators.

File drawer. A file drawer analysis provides a measure of certainty that your effect is not caused by publication bias. This calculation identified the number of unreported studies with null findings there would have to be such that the mean effect size was not significantly different from zero. In other words, the fail-safe *N* provides an estimate of the number of unlocated ES's with null results needed to reduce d_{corr} to a small effect (.20). The formula employed was based on recommendations by Orwin (1983).

$$N_{fs} = \frac{N_o (d_o - d_c)}{d_c - d_{fs}}$$

where N_{fs} is the fail-safe *N*, N_o is the number of studies, d_o is the mean *d* obtained for the N_o studies, d_c is the criterion value, and d_{fs} is the mean *d* of the fail-safe studies.

Also, homogeneity of effects (i.e., the Q-statistic) was not calculated to determine if the variability in outcomes was greater than expected from sampling error and measurement artifacts. Although often reported in meta-analyses, Hunter and Schmidt (2004) recommend against using the homogeneity test as (a) it suffers from flaws inherent to all significance tests and (b) if the number of studies is small, the real moderator variable must be extremely large to be detected by this test (National Research Council, 1992).

Meta-analyses. The following was computed: total sample size (*N*), number of ES's (*K*), mean sample-size weighted observed (d_{obs}), d_{obs} 95% confidence interval (95% CI), mean sample-size weighted corrected ES (d_{corr}), corrected standard deviation (SD_{corr}), residual standard deviation (SD_{res}), percent of d_{obs} variance due to sampling error (*%VARe*), 80% credibility interval (80%CrI), and d_{corr} fail-safe *N* (d_{fs}). The d_{corr} fail-safe *N* estimates the number of unlocated ES's with null results needed to reduce d_{corr} to the lowest critical ES considered practically or theoretically important (Hunter & Schmidt, 2004). However, when the d_{corr} was less than an ES deemed theoretically important (i.e., ES < .20), then the fail-safe *N* was calculated to examine the number of unlocated ES's with a d_{corr} of .40 to increase the current ES up to .20. The critical ES was set at 0.2, the value typically associated with a small effect. The d_{corr} and SD_{corr} were interpreted as best estimates of the population parameters. Effect sizes were corrected at both the individual (e.g., measurement error in dependent variable) and group level which render reporting of effect sizes at the individual study level inappropriate (Hunter & Schmidt, 2004). Therefore, forest plots are not included.

Results

Overall Analyses: Descriptive Statistics

An examination of basic descriptive statistics demonstrated that participants, regardless of physical activity classification, reported moderate levels of SPA. Across the 5-point Likert scale, those classified as physically active reported an average score of 2.98 (*SD* = .27). Those in the comparison group reported SPA score of 2.95 (*SD* = .21). The range of scores for the active sample was 2.32 to 3.32 and 2.59 to 3.51 for the comparison group.

Overall meta-analytic results. Given the current conceptualization of SPA as a trait measure, it was hypothesized that no differences in SPA across physical activity and more general contexts would be found. Results showed that differences between physical activity participants and a more general population were very small (d_{corr} = -.12; SD_{corr} = .22). This indicates that, on average, there was .12 of a SD difference in SPA between those who are physically active and those who were not. The mean true effect size being negative is indicative that, on average, those who are physically active report lower levels of SPA than the comparison group. However, when looking at the 95% CI, one can see that interval does cross zero (-.15 to .31), which would signify statistical insignificance. Therefore, a search for moderators is appropriate. The SD_{corr} and the 80% CrI were then used to identify moderators. The width of the 80% CrI depends on SD_{corr}. If SD_{corr} is large relative to d_{corr} and the 80% CrI includes zero, d_{corr} is the mean of several population parameters, indicating the presence of moderators (Reed & Ones, in press). If the 80% CrI does not include zero, d_{corr} estimates a single population parameter and moderators are not operating (Whitener, 1990). This interval also determines whether d_{corr} is a generalizable effect. When the 80% CrI does not include zero, the magnitude of ES's may vary, but 80% of the true ES's will retain a positive sign (or a negative sign for negative ES's) and generalize across settings (Ones, Viswesvaran, & Schmidt, 1993).

The SD_{corr} was greater than .20 for the overall meta-analyses, which, for the purposes of this study, was determined to be the maximum acceptable deviation from the mean before the presence of moderators was plausible (Reed & Ones, in press). For most meta-analyses in the social sciences, the critical value of *d* is set at .20; therefore if the *SD* is greater than .20, then it would seem that the results are not stable, as the variability

is large enough that the d_{corr} may cross zero. Also, the 80% CrI includes zero, which suggests the presence of moderators, and that the effects of physical activity participation on SPA may not generalize. However, this effect should be interpreted with caution as the mean effect size was based on fourteen primary effect sizes, suggestive of the possibility of second-order sampling error (i.e., sampling error that stems from sampling of studies in a meta-analysis; Hunter & Schmidt, 2004). The calculated fail-safe *N* of 5.6 does not suggest strong tolerance to availability bias. That is, 5.6 additional ES's with a d_{corr} of .40 would have to be found and included in the present analysis to increase d_{corr} values to .20. Results are presented in Table 5.

Moderator Analyses

Results for moderator correlations and correlations between moderators and corrected ES's (d_{corr}) are presented in Table 6. In general, the magnitude of the bivariate correlations were small, which suggests that most of the *apriori* hypothesized moderators were unrelated. Three correlations were considered moderate to suggest some relationship between variables, but none were highly correlated (>.80). Therefore, no moderators were excluded from the analysis due to excessively high inter-correlations. Most moderators were positively related to d_{corr} values, with the exception of study design and sampling procedure.

Table 7 displays the moderator analyses for relevant demographic, study, and measurement characteristics included in the present investigation. Table 8 displays the means and standard deviations of the moderator variables included in the analysis.

Gender. It was hypothesized that gender would differentiate the magnitude of the effect. Specially, it was hypothesized that the ES would be higher for physically

active females compared to their non-active comparisons than physically active males in contrast to their comparison group. This hypothesis was not supported. Both females and males who were physically active reported less SPA than those who were not (d_{corr} = -.24, SD_{corr} = .14 and d_{corr} = -.23, SD_{corr} = 0 respectively); however males still reported less SPA than females overall [M = 2.48; SD = .13 and M = 3.03; SD = .12 respectively]. The SD_{corr} was reduced from that reported in the overall analysis and the 80% CrI for both genders did not assume zero; therefore confidence that the relationship generalizes across situations involving SPA and physical activity is appropriate.

Age. Age was recoded into a dichotomous variable of university-aged participants (>18 years) and adolescents (13-18 years). It was hypothesized that the age of participants would not influence the magnitude of the effect. Results showed that a weak, negative effect size was found for university students (d_{corr} = -.20, SD_{corr} = .08) and a negligible effect size for adolescents (d_{corr} = -.06, SD_{corr} = .26). So, although it was found that those who were physically active report less SPA than the comparison group, in both age groups, caution should be exercised when interpreting the adolescent age group. The SD_{corr} was greater than .20 for the adolescent sample, and the 80% CrI crossed zero, which is suggestive of non- statistically significant findings, and of another variable moderating this effect. However, for the university age group, it would seem that the results are more stable as the magnitude of the ES was small (-.20), a substantially reduced SD_{corr} =.08), and the 80% CrI did not include zero. Therefore, confidence that this effect would generalize to similar situations is appropriate.

Type of physical activity. The type of physical activity (i.e., athletes *vs*. exercisers) engaged in was investigated as a moderator. No hypotheses were advanced

specific to this moderator analysis. It was found that athletes reported lower levels of SPA than their comparison group (d_{corr} = -.19, SD_{corr} = .08). Conversely, exercisers were shown to report higher levels of SPA than their respective comparison groups (d_{corr} = .13, SD_{corr} = .22). For athletes, the 80% CrI did not cross zero, and the SD_{corr} was less than .20, therefore one would have some confidence that this relationship would generalize to similar situations. However, for the exercisers, the SD_{corr} was above .20 and the 80% CrI crossed zero. However, given the difference in sample size between those classified as exercisers and athletes, less influence to the SD_{corr} is afforded. Hunter and Schmidt (2004) suggest that when inequality in sample size exists in a moderator analysis, attention to the difference in mean effect sizes is recommended.

Study design. It was hypothesized that the design of the study would not influence the magnitude of the effect size. Results showed that for non-experimental designs, physical activity participants reported lower levels of SPA (d_{corr} = -.19, SD_{corr} = .17) in contrast to the comparison group. For quasi- or true-experimental designs, the comparison group reported lower levels of SPA compared to those who are physically active (d_{corr} = .11, SD_{corr} = .17). However, caution must be exercised with interpretation as the 80% CrI for both variables includes zero.

Sampling procedure. It was originally hypothesized that the sampling procedure employed would not affect the magnitude of the effect size. The effect size for convenience-based sampling was negative which is suggestive of physical activity participants reporting lower SPA than the comparison group. However it seems to be somewhat of a trivial finding due to its magnitude (d_{corr} = -.07), the degree of variability (SD_{corr} = .22), and the credibility interval (80% CrI = -.35 to .22) which suggests that this

relationship does not generalize across situations. Also, the SD_{corr} for the convenience group is greater than zero, which suggests that there is an additional moderator affecting these results. The effect size for purposive-based sampling was found to be small in magnitude (d_{corr} = -.27, SD_{corr} = .08). The lower 80% credibility value was greater than zero, and the SD_{corr} was less than .20; therefore one can have some confidence that a relationship generalizes across the situations examined in this study.

Publication type. The final moderator analysis was conducted on the source of the study. It was originally hypothesized that the publication type would influence the magnitude of the effect size such that the effect would be larger for published studies compared to unpublished. For refereed publications, those who were physically active reported lower levels of SPA than the comparison group (d_{corr} = -.16, SD_{corr} = .20). Conversely, for unpublished theses, it was found that those who were physically active reported higher levels of SPA than the comparison group (d_{corr} = .07, SD_{corr} = .12). Caution in interpretation is recommended as for both analyses, the 80% CrI encompassed zero, which suggests the presence of another variable contributing to the effect, and that these results would not generalize to similar situations.

Fail-safe N for Moderator Analyses

Fail-safe *N* values ranged between 0.17 and 5.85, which do not suggest good tolerance to availability bias (see Table 6). That is, 0.17 (university), 0.30 (males), 1.00 (females), and 1.40 (purposive sampling) additional ES's with a d_{corr} of 0.00 would have to be found and included in the analysis to decrease the current d_{corr} values to 0.20, the critical ES that was set based on Cohen's (1988) criterion. For the remaining moderators, 0.30 (athletes), 0.40 (non-experimental design), 1.75 (exercisers), 2.10 (adolescents), 2.25

(quasi- and true-experimental designs), and 5.85 (convenience sampling) additional ES's with a d_{corr} of 0.40 would have to be found and included in the analysis to increase the d_{corr} values to 0.20.

Discussion

Summary

The primary purpose of the present investigation was to examine the influence of the physical activity environment on SPA using meta-analytic procedures. The influence of the physical activity environment on SPA was contrasted to a comparison group. The influence of a number of potential descriptive and study characteristic moderator variables was assessed. Moderator variables considered for inclusion were made *apriori* to the overall analysis and were based on the extant literature and design characteristics.

Computer and manual literature searches were completed to identify studies that recorded the use of the SPAS in various groups and situations. Relevant studies were examined with study characteristics and potential moderators coded. Within a random effects model employed, effect sizes were calculated using standardized mean differences and the magnitude of the effect interpreted. Consideration to the SD_{corr} was afforded in conjunction with the 95% confidence interval to assist with interpretation. Subsequent moderator analyses involved examining differences between d_{corr} values, changes in the SD_{corr} where appropriate, and the credibility interval.

Major Findings

Results of the analysis suggest that, in general, those who were physically active report lower levels of SPA than the comparison group (d_{corr} = -.12). This indicates that, on average, there was a .12 of a SD difference in SPA between those who are physically

active and those who are not. This effect size can be inferred as weak and the magnitude of the SD_{corr} (in contrast to the d_{corr}) is quite large. This research is consistent with other researchers who also found that non-exercisers and non-athletes reported higher levels of SPA than their active counterparts (Berry & Howe, 2004; Hausenblas & Mack, 1999). Concerns over power of the conclusions derived from the aforementioned studies are warranted given reported sample sizes. Interpretation of the confidence interval derived for the present study, which crossed zero, suggests that this effect is not statistically significant. Further, it suggests that the true effect may be zero, although concerns over second-order sampling error based may be raised. Thus support for the original hypothesis that SPA would not differ across physical activity and more general contexts was concluded.

The present study represents the first meta-analytic investigation known on the topic of social physique anxiety. Consequently, generating a link to previous investigations is somewhat difficult. As such, meta-analytic literature in aligned areas was reviewed. Hausenblas and Fallon (2006) investigated the influence of exercise on perceived body image with findings that contrast with those reported in this document. These researchers reported a small effect of exercise on body image for both correlational and intervention studies. For correlational studies, higher body image was associated with lower exercise participation, whereas for intervention-based studies, body image decreased as a result of exercise interventions. However, the above finding cannot be extended with substantial confidence to SPA. Although related to body image, SPA is considered conceptually distinct (Hart et al., 1989; Thompson & Chad, 2002). SPA involves how one perceives others are negatively evaluating their physique, whereas

body image is how one feels about their own body (Hart et al., 1989). Therefore, experiencing a negative body image does not necessarily translate into experiencing elevated levels of SPA. Further, Hausenblas and Fallon examined exercise behaviour only. The present meta-analytic investigation incorporated physical activity participation in varied forms (i.e., sport and exercise).

Hausenblas and Carron (1999) examined differences in various indices of eating disordered behaviour between athletes and non-athletes. Athletes reported more eating disordered symptoms than those in comparison groups (*ES* = .12; *SD* = .22). Furthermore, the magnitude of the ES (although in the opposite direction) and the SD was identical to that reported in the present investigation. Although these results can also be considered small, the magnitude of the effect was significantly different from zero. This may be due to the number of studies included in their meta-analysis ($N = 92$) and the substantially higher number of ES's included in their analysis ($N = 560$) in comparison to those for the present investigation. Further, moderator analyses demonstrated that the physique-salient nature of the sport influenced the magnitude of the effects. For athletes in sports other than aesthetic sports, athletes reported fewer eating disorder symptoms than non-athletes. Again, the magnitude of the relation was classified as small. Various athletic descriptors, such as "physique-salient" sport or "ball" sport participation, were identified as moderators following the review of literature. Given the inclusion criteria, this analysis was not conducted given the small sample size.

Findings from the present investigation may be consistent with research reported by Kowalski et al. (2006) who reported that physical activity was used to cope with SPA by relatively few (i.e., approximately 10% of male and female adolescents) surveyed. The

reason for selecting one coping strategy (i.e., physical activity) over another (i.e., short-term appearance management strategies) is unknown. However, researchers have suggested that ease of strategy implementation may be a factor (Sabiston et al., 2006). In other words, altering physique-related concerns through short-term appearance management strategies, such as clothing choices, have a more immediate effect and require less effort than the commitment associated with altering the physique through physical activity. As such, researchers and practitioners may consider other forms of intervention to help reduce SPA. For example, Kowalski et al. (2006) reported that behavioural/cognitive avoidance and social support were commonly used techniques to deal with physique anxious situations. To date, little is known about the perceived effectiveness of any strategy designed to reduce self-presentational concerns associated with the physique.

The nature of SPA itself and the criteria used to survey those classified as physical activity participants and non-physical activity participants may further be identified to explain the findings of the present investigation. First, consideration of the distributional properties of SPA is necessary. Low to moderate levels of SPA were generally reported by study participants, regardless of physical activity classification. Consequently, for those included in the meta-analysis, anxiety associated with the physique was not, on average, highly endorsed, which could explain the small differences between groups. The mechanism through which participants were classified in the articles included in the meta-analysis may also have influenced results. The comparison group was classified as non-athletes and non-exercisers. However, for some studies, participants were not screened as to their physical activity status. As such, some may

have engaged in physical activity behaviour. For example, Bowden et al. (2005) examined differences in SPA between those enrolled in an athletic class, an exercise class, or more traditional university class (who served as the comparison group in the present investigation). No measure of physical activity participation was taken across any condition. In other words, a proportion of those enrolled in the comparison group may have been active to some extent, and this may have influenced the analyses conducted in this investigation. Lindwall and Lindgren (2005) randomly assigned sedentary female adolescents into either an exercise intervention or a non-exercise comparison. While some confidence can be derived that those in the comparison group were initially sedentary, a post-intervention assessment of physical activity behaviour for the comparison group was never taken.

The small observed effect size could also have been attributed to the small number of studies that were included in the analysis ($n = 13$). The overall effect size, along with a standard deviation greater than .20 and an 80% credibility interval that crossed zero, may suggest that there are other variables that are moderating this effect, and that these results would not generalize. Because the credibility interval is large and contains zero (-.41 to .16), it was appropriate to consider a search for moderators (Whitener, 1990). Variables previously reported to be linked to SPA were originally identified as moderators and were coded and subsequently meta-analyzed.

Moderator Analyses

Moderator analyses were then conducted to determine which variables contributed the most to the overall result. The original coding sheet included several different variables, however, only a portion were used in the analysis. The final analysis

included six moderators: gender, age, type of physical activity, study design, sampling procedure, and publication type. Each moderator was expressed as a dichotomous variable. For 9 of the 12 moderators, negative effect sizes were found, which would indicate support for the overall meta-analytic finding that physically active participants report lower levels of SPA than the comparison group. These effect sizes range from small (-.27) to negligible (-.06), therefore consideration of statistical and practical significance recommended.

Researchers examining perceptions of one's body have typically identified that females report greater body-related concerns compared to males (Hausenblas & Carron, 1999), and the differences in level of SPA reported between genders is no different. Prior research has suggested that SPA differs across gender (Berry & Howe, 2004; Eklund et al., 1997; Frederick & Morrison, 1996; Haase et al., 2002; Hart et al., 1989; Kruisselbrink et al., 2004; Lantz et al., 1997; McAuley et al., 1995; Martin & Mack, 1996; Williams et al., 2002) with females consistently reporting higher levels of SPA compared to males (e.g., Hart et al., 1989; Mack et al., in press; Martin et al., 2003). The findings from the current investigation support the above (males' $M_{SPA} = 2.48$; $SD = .13$) and females' $M_{SPA} = 3.03$; $SD = .12$). As such, the hypothesis that gender would moderate the differences in SPA between physical activity and more general contexts appeared plausible. In the current study, both males and females reported weak, negative effect sizes, which indicate that those who are physically active reported lower levels of SPA than the comparison group. The 80% credibility interval for both genders did not cross zero, which would suggest that there results are relatively stable and would generalize. Previous studies have all considered SPA to be especially salient for females compared to

males, and although this was the case in the current meta-analysis (as noted by the mean SPAS values for males and females), the magnitude of the ES's for both genders was quite similar (d_{corr} = -.24 for females and d_{corr} = -.23 for males). Thus, the hypothesis that a larger effect size for females across physical activity contexts would be found in comparison to males was not supported. In fact, the magnitude of the effect was similar. Consequently, it may be that participation in physical activity may influence males and females similarly. Hausenblas and Fallon (2006) also reported comparable effect sizes in their examination of exercise and body image for males and females. In fact, for non-experimental studies, the effect size was greater for males than females which indicates that the role of exercise on body image was greater for males.

It should be noted that both studies that involved males in the present investigation included participants that typically report increased body image and weight concerns (i.e., weightlifters and bodybuilders; Blouin & Goldfield, 1995; Mangweth, Pope, Kemmler, Ebenbichler, Hausmann, De Col, Kreutner, Kinzl, & Biebl, 2001). Therefore, one reason that males may have reported levels of SPA comparable to females may be due to the physique-salient nature of the physical activity. Also, a more definitive statement may have been made had more studies (especially those involving males) been available. If a particular study included a mix of both males and females, but did not report differences in terms of SPA, then the study could not be used for this analysis.

To investigate the influence of age as a moderator, participants were classified as adolescents and university-aged and older. It was deemed that this classification may help show differences in levels of SPA reported, rather than making the potentially

erroneous assumption that adolescents would report similar levels of SPA as those who are older, when this may not be the case (Ransdell et al., 1998; Reel & Gill, 1996; Thompson & Chad, 2002). Regardless of age classification, those who were physically active reported lower levels of SPA than their comparison group. But, as was mentioned previously, the effect size for adolescents was very small, and the SD_{corr} greater than 0.20, and the 80% credibility interval included zero. This could, once again, be due to the fact that there were a small number of studies that examined participants who were 13-18 years of age ($K = 3$). Perhaps had the data allowed for an examination of a wider age range of participants, the results would have been more definitive in terms of the role of chronological age.

Attention to competitive level and publication type may also clarify the above finding. Reel and Gill (1996) found that high school athletes reported higher levels of SPA than university athletes. Perhaps it was not age that influenced the reporting of SPA, but competitive level. It may be that those who compete at higher levels of competition report less physique-specific anxiety, as they are more familiar with the situation and have less self-presentational concerns about their physiques being on display. Further, two of the three studies used in the classification of the adolescent sample were unpublished dissertations. Research has suggested that published articles may be stronger methodologically and may be more likely to be associated with larger effect sizes (Spence & Blanchard, 2001). The average age of participants in the third study (Hausenblas & Mack, 1999) was 17 with a standard deviation of 1.9 reported. Although the average age was consistent with our definition of an adolescent sample

examination of the standard deviation demonstrates variability in age, such that some were university-aged.

Of particular interest was not only whether being physically active leads to lower levels of SPA, but also whether the type of physical activity in which the participants engage has an effect. Consequently, physical activity participation was dichotomized into sport or exercise, and differences were noted. Athletes reported lower levels of SPA than the comparison group (d_{corr} = -.19, SD_{corr} = .08), whereas exercisers reported higher levels of SPA than the comparison group (d_{corr} = .13, SD_{corr} = .22). The results for athletes may be considered more generalizable, in that even though the effect size was small, the 80% CrI did not cross zero and the SD_{corr} was less than .20. Therefore, one can have some confidence that this relationship would generalize to similar participants in similar situations.

As for the finding that athletes reported lower levels of SPA than their non-athletic counterparts, it is less surprising considering the findings of Schwerin et al. (1996), who found comparisons reported higher levels of SPA than the athletes, and Hausenblas and Mack (1999), who found that physique-salient athletes reported lower levels of SPA compared to non-athletic comparison. Several other researchers also showed that certain athletic participants reported lower levels of SPA than their non-athletic counterparts (Finkenberg, DiNucci, McCune, Chenette, & McCoy, 1998; Haase & Prapavessis, 2001). The current finding could be attributed to many different factors, one of which could include the sample size. Although five studies were included in the exercise subgroup, and six studies in the athlete subgroup, the sample size for the athletes was much larger than that for the exercisers (n = 1412 and n = 551 respectively).

The results involving exercisers was dissimilar to that of Schwerin et al. (1996) who found that the comparisons reported higher levels of SPA than the exercisers. One explanation for these findings could be how an 'exerciser' was defined. More information regarding exercise behaviour would have been beneficial, as they were considered exercisers regardless of what type, how long, or how often they exercised. Although this information was coded for, it could not be used in moderator analyses for this investigation, as this information was not present in sufficient numbers (i.e., $n = 1$) in those studies that were included. The frequency of exercise and exercise behaviour may be important factors in determining why exercisers reported more SPA than comparisons in this investigation. Therefore, if participants exercised one day a week, or 7 days a week, they were all considered 'exercisers'. This could be potentially problematic in that regardless of what level or type of exerciser the participants were, they were all combined and investigated as a single unit.

It has also been suggested that many of the reasons commonly given for participating in exercise reflect self-presentational motives (Crawford & Eklund, 1994; Leary, 1992; Smith, Handley, & Eldredge, 1998). For instance, a major reason why people exercise is to achieve or maintain a desired physical appearance as opposed to a less presentational concern such as health, which does not necessarily translate into higher physical self-presentational anxiety (Smith et al., 1998). Therefore, if socially undesirable physical appearance was among the motives for the adoption of physical activity, SPA may have aversive psychological effects (Hart et al., 1989). Kowalski et al. (2001) suggested that individuals who report higher levels of SPA may be motivated to engage in exercise as remedial behaviours with intentions to improve or maintain their

physical appearances through physical activity participation. With this, if the exercisers in the current sample had been engaging in physical activity for appearance reasons, then high levels of SPA may have been more characteristic of them to begin in comparison to those classified as the comparison group.

However, in terms of athletes, studies have demonstrated that there are many different motives given for sport participation, such as improved physical health, stress and mood management, competition, enjoyment, fun, excitement, personal challenge, sense of achievement, personal satisfaction, and social experience (Cash, Novy, & Grant, 1994; Dwyer, 1992; Flood & Hellstedt, 1991; Frederick & Ryan, 1993; Gill & Overdorf, 1994; Mathes and Battista, 1985; Silberstein, Striegel-Moore, Timko, & Rodin, 1988; Summers, Machin, & Sargent, 1983; Summers, Sargent, Levey, & Murray, 1982). Therefore, it would seem that many factors contribute to one's participation in sport, and perhaps the main reason for engaging in sport may not be for self-presentational reasons.

Although the magnitude of the ES's for both athletes and exercisers was not statistically substantial, the results do offer some potentially interesting practical findings, in that exercisers seem to report SPA to a different degree than athletes. An explanation for this may be due to the group composition of the exercisers, and their potential level of anxiety. There can be little question that there exists a negative, linear relationship between cognitive anxiety and performance (Burton, 1998; Hardy & Parfitt, 1991; Martens, Vealey, & Burton, 1995; Wrisberg, 1994). One extension to the above may be that a sub-sample of those classified as exercisers may have been athletes at one point. For this sub-sample disengagement from sport may have been due to a high level of anxiety. If they experienced high levels of anxiety when competing in sports, they may

potentially also report higher levels of SPA, which would partially account for the exercisers reporting higher levels of SPA in comparison to those who were non-active.

With the athletes reporting low to moderate SPA scores, it also appears that they are comfortable with their physical self-presentation (Martin & Mack, 1996) and have relatively fewer self-presentational concerns regarding their bodies (Hausenblas & Mack, 1999). Thus, even though athletes compete and train in an environment where their physiques are continually on display, they did not seem to report heightened levels of SPA. It is possible that these athletes, especially those competing in physique-salient sports, have become desensitized to self-presentational concerns through repeated exposure of their bodies in training and competition. This may account for some of the disparity in terms of SPA reported between athletes, exercisers, and their respective comparison groups.

The type of experimental design was investigated, with inconsistent findings evidenced. For data derived from non-experimental designs, physical activity participants reported lower levels of SPA than their non-active counterparts (d_{corr} = -.19, SD_{corr} = .17). The opposite was found when quasi- and true-experimental designs were examined (d_{corr} = .11, SD_{corr} = .17). This could also be due to the difference in sample size between non-experimental and quasi-/true-experimental designs (n = 2245 and n = 649 respectively). Given that the effect sizes are based on relatively few primary effects, second-order sampling error may be present (Hunter & Schmidt, 2004). Regardless of design type, the 80% CrI spanned a wide range suggesting that there may be some other variable acting on this relationship. Further, these findings may not generalize across situations. If one were to look at the correlation between study design and the corrected

ES's (see Table 5), one would see that a moderate, negative correlation exists between the two (r = -.68). This would suggest that quasi-/true-experimental designs were associated with larger effect sizes. Also, when looking at the studies that used quasi- and true-experimental designs, all comparisons were made between an exercise group and a comparison group, and, as results illustrated earlier, exercisers were shown to report higher levels of SPA than non-exercisers. This may account for the quasi- and true-experimental designs showing a trend of physically active participants reporting lower levels of SPA than their non-active counterparts.

The sampling procedure was then examined as a potential moderator, and although both resulted in a negative effect size, (indicative of physical activity participants experiencing less SPA than non-active participants), there were some points that were worth noting. When convenience sampling was employed, the 80% CrI crossed zero, which would suggest that this relationship does not generalize to other samples. The large discrepancy in sample sizes for the two groups (n = 2234 for convenience-based group and n = 660 for purposive sampling), as well as concerns raised specific to second-order sampling error resulting from the number of studies included for each group (n = 9 for convenience, and n = 4 for purposive sampling) render caution in interpretation of findings. When looking at the correlation between the corrected ES's and sampling procedure, it shows an r-value of -.22, which indicates that convenience-based sampling was associated with larger effect sizes. However, for the purposive-sampling group, results seemed to be more stable in that the 80% CrI did not included zero, and the magnitude of the ES was larger (d_{corr} = -.27). Therefore, the differences between physical activity participants and the comparison groups, when purposive

sampling techniques were employed, were much more prominent and more generalizable across situations.

Practical Implications

A practical implication of this meta-analysis involves gaining further understanding into the role of physical activity participation to self-reported SPA. Statistically speaking, support was offered for our original hypothesis, in that there would be no difference in levels of SPA reported between physical activity and more general contexts. However, due to the small effect size, the findings still do offer some potentially interesting practical considerations.

The amount of variance an effect accounts for is just one of the many ways to think about its importance (Prentice & Miller, 1992). Small effects may have important implications in a practical context, and may be quite important theoretically (Prentice & Miller, 1992). It has been argued that researchers have dogmatically relied on statistical significance as the only criteria by which the merits of research should be evaluated (Schmidt, 1996; Spence & Blanchard, 2001). Consequently, the message taken from research findings may be distorted. The main goal of research should be to determine how to achieve a meaningful change (i.e., practical significance) in some relevant variable as opposed to merely demonstrating a statistically significant change (Spence & Blanchard, 2001). And even though the current effect size is considered small, and could be considered quantitatively unimpressive according to the conventional statistical standards, it could nevertheless have profound implications in a practical context (Hunter & Schmidt, 2004; Rosnow & Rosenthal, 1989).

For example, in 1988, a major biomedical research study reported that heart attack risk in the population was cut by regular aspirin ingestion (Steering Committee of the Physicians' Health Study Research Group, 1988). This conclusion was based on the results of a five-year study of a sample of 22,071 physicians, approximately half of whom were given an ordinary aspirin tablet every other day, while the remainder were given a placebo. It was thought that the aspirin would work to reduce mortality from myocardial infarction (MI) by aiding with the transport of blood through the arteries. The results showed that 1.3% suffered an MI, and this event occurred more frequently in the placebo condition (1.7%) than in the aspirin condition (0.9%). Therefore, the computed effect size of .034 was so small as to be considered quantitatively unimpressive by methodological convention in their field (Rosnow & Rosenthal, 1989). However, these implications are far from unimpressive when looking at the practical significance. In terms of the clinical significance, it would seem that 3.4% few persons who would probably experience an MI (i.e., given the particular conditions in this investigation), will not experience one if they follow the regimen as prescribed in the aspirin treatment condition. Therefore, by simply taking an aspirin every other day, a meaningful number of lives were saved.

In relating this finding to the current study, it is important to not completely dismiss the practical implications of the meta-analytic findings simply due to the small effect size reported. The results do suggest that there is some relationship between SPA and physical activity due to the differences in effect sizes; however, the direction of this relationship is not known. Findings would suggest that those who are physically active would report lower levels of SPA than those who are not active; however, the current

findings do not offer any further insight as to whether initial lower levels of SPA leads people to be physically active, or if being physically active leads to people reporting lower levels of SPA. What the results do offer is some support for the bi-directionality of the relationship between physical activity and SPA; however, a causal model cannot be proposed based on the findings.

Perhaps another implication that this investigation does offer is more insight into the trait/state debate about the nature of SPA. Although originally conceptualized as a trait, researchers have recently argued that SPA may be more context-specific in nature (Haase & Prapavessis, 2001; Van Raalte et al., 1998). As a result, it was thought that the level of SPA reported may be different from those who engage in physical activity compared to those who do not. Although a difference was noted, the magnitude of the effect was small. Therefore, a conclusive statement regarding the role of physical activity in terms of SPA reported could not be made. Consequently, this finding may offer further support for the trait nature of SPA, as measured by the trait measure that is the SPAS.

Study Limitations

This meta-analysis could potentially add to the literature, however, the small number of ES's does not permit a convincing analysis. A greater number of ES's would improve the validity of the meta-analysis by increasing the accuracy of population estimates and enhance the statistical power of the moderator analyses (Hunter & Schmidt, 2004). This leads to a discussion of the limitations present in this analysis. One limitation could be that the small number of studies hindered the ability to derive robust or generalizable conclusions. Much research has been conducted on social physique

anxiety; however, there are few studies that examine the role of physical activity participation on SPA and included a comparison of physical activity participants to non-physically active samples. For most moderator analyses, the number of ES's was small enough to warrant concern when interpreting the effects due to concerns over second-order sampling error and the inability to comparison for Type 1 error in meta-analyses with 15 or fewer studies (Field, 2001). Therefore, most of the results presented in this analysis should be considered as preliminary findings, and it sanctions the need for much more research on the topic.

The assumption that a meta-analysis represents the final and accurate viewpoint in an area of research is not warranted. Meta-analyses are by no means perfect (Davies & Crombie, 2002). Since a meta-analysis is a summation of studies, it is only as good as the studies that are combined in the meta-analysis. If any of the studies are poorly done, and are included in the meta-analysis, the results may not be representative of the true differences. This is of particular importance in this meta-analysis, as there are very few studies that measure SPA in differing physical activity contexts. With that, if one or more of the studies are not designed or completed in an appropriate fashion, then the results may not be indicative of the sample. This is also an important factor considering study quality, in that more of the included studies were considered 'fair' (i.e., non-experimental) as opposed to 'good' (i.e., quasi- and true-experimental). Therefore, more than half of the included studies utilized a non-experimental design. Spence and Blanchard (2001) stated that practitioners should be aware of the degree to which they can be confident in findings from non-experimental designs, as the results may not be representative of the true relationship between the investigated variables.

Finally, the measurement of SPA may present a limitation to the present investigation. The scale designed to assess SPA has undergone considerable scrutiny. This is evident even from the studies included in the present investigation. The measurement of SPA was operationalized by the original 12-item scale, but also a modified 12-item scale, 9-item, 8-item, and 7-item versions. With concerns over the psychometric properties expressed by numerous researchers (Martin et al., 1999; Motl & Conroy, 2000; Lindwall, 2004), the inclusion/exclusion of scale items may have influenced findings. Unfortunately, this supposition was not able to be tested through moderator analyses.

Future Directions

The results of this investigation speak to the restricted nature of the studies that have been conducted investigating SPA in different physical activity contexts. There is a need for more research. Suggestions for future research are detailed below. Future research should attempt to determine in which situations the overall effect would re-occur, and whether this effect is apparent in other physically active populations. For example, perhaps by conducting a longitudinal study looking at the bi-directionality of causal flow between SPA and physical activity, one can begin to make inferences as to whether physical activity behaviour leads to lower levels of SPA, or if lower levels of SPA leads those to engage in physical activity.

Also, further insight into the type of physical activity in which they engage may help clarify this relationship. The current findings show that athletes report lower levels of SPA than comparisons, but that exercisers report higher levels of SPA. However, this effect does seem to be more stable with the athletes in comparison to the exercisers, as

the 80% credibility interval did include zero for the exercisers, which would suggest th... these results would not generalize. More research involving the type of physical activity may help clarify the relationship between physical activity and SPA. Two variables that may help explain these differences are the exercise behaviour/frequency of the exercisers, and the sport classification/level of the athletes. For the exercisers, it was uncertain as to how long, how often, or what type of exercise they engaged in, and this could have potentially offered insight to the characteristics of these exercisers (i.e., high levels of SPA leading them to exercise, beginner exercisers, or whether exercising for health or appearance reasons). As for the athletes, the level and the type of sport in which they engaged would have potentially lead to more conclusive results (i.e., seasoned athletes or potentially desensitized to the physique-salience of their sport). Many studies that involve SPA in physically active individuals either did not collect this information or did not include it, which could potentially help explain the relationship found in the current meta-analysis.

Future research may want to examine variables that were coded for in the present meta-analysis, but unfortunately, due to a lack of information in the studies that answered the primary research question, led to their removal from the analysis. These subsequent studies should consider research involving males, people of different age groups (i.e., other than university-aged), participants with a BMI level outside of the normal range, participants of different races and ethnicities, SPAS versions other than the 12-item, more true-/quasi-experimental designs, and sampling procedures other than convenience/purposive.

Despite the limitations presented earlier, a meta-analysis based on a theoretical framework can provide useful conclusions, including accurate estimates of the magnitude of an effect and the examination of potential moderator variables, and procedures that overcome problems associated with other approaches to understanding the data, including the traditional narrative review (Reed & Ones, in press). Overall, the results here indicate that those who are physically active do report lower levels of SPA than the comparison group; however, the magnitude of the ES is small. Furthermore, the effects of SPA in physical activity settings seem to be more substantial when the physical activity is introduced through an athletic environment as opposed to an exercise environment. Although most of the moderator analyses should be interpreted with caution, most of the effects reiterate this trend of physical activity participants experiencing less SPA than the respective comparison group.

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*indicates articles that were coded for potential inclusion in the meta-analytic review.

indicates articles that were included in the meta-analysis

Footnotes

[1] Although several moderators were initially identified to influence the relationship between physical activity and SPA, hypotheses were only advanced for moderators numerically able to test.

[2] Nine conference abstracts from Web of Science were retrieved. All conference abstracts did not include SPAS scores or enough information to code.

[3] Study year ranged from 1996 to 2005. BMI was reported in 23.1% (n = 3) of the studies (M = 22.66; SD = 1.14), and only one study reported body fat percentage, with a percentage of 18.59. Race was reported in 21.3% (n = 3) of studies, and in all cases, was reported as 'mixed'. Quality of study was coded, and it was found that 46.2% (n = 6) of the studies were rated as 'good' and 53.8% (n = 7) rated 'fair'. This dichotomous rating was used in conjunction with Cook and Campbell's (1979) threats to validity, in that studies that used true- or quasi-experimental designs were classified as 'good', and studies that used a non-experimental design were classified as 'fair'. The type of physical activity was examined, and 46.2% (n = 6) of the studies compared athletes to comparisons, and the other 53.8% (n = 7) compared exercisers to comparisons. 38.5% (n = 5) of the studies considered competitive levels of the athletes, where 40% (n = 2) were of varied levels, 20% (n = 1) recreational, 20% (n = 1) intercollegiate, and 20% (n = 1) elite. Also, in 38.5% (n = 5) of the studies, sport classification was identified with 20% (n = 1) of the participants competing in a physique-salient sport, and 80% (n = 4) of these studies looking at athletes of differing classifications. In terms of the exercisers, 30.8% (n = 4) of the studies reported the exercise setting in which they were engaged (all public setting), 23.1% (n = 3) reported the gender composition [66.7% (n = 2) same-gendered and 33.3% (n = 1) mixed-gendered], and 30.8% (n = 4) reported the public nature of the setting (all group setting). Only one study (7.7%) reported frequency of exercise in terms of hours per week (M = 1.5 hrs/week), whereas 15.4% (n = 2) reported frequency of exercise in terms of times per week (M = 3.5, SD = 2.12). With regards to the SPAS, 69.2% (n = 9) used the 12-item scale, 15.4% (n = 2) used the 9-item, and 15.4% (n = 2) used a version other than the 12- or 9-item SPAS. Finally, 76.9% (n = 10) of the studies used the original version of the SPAS as identified by Hart et al. (1989), whereas 23.1% (n = 3) used a modified 'trait' version of the SPAS (i.e. translated into a different language, removed item 2). Given the diversity of measurement, the SPAS was dichotomized into the '12-item SPAS' and all 'all other versions', which included all 9-item, 8-item, and modified trait versions. Descriptive statistics show that 69.2% (n = 9) documented the use of the 12-item SPAS, whereas the remaining 30.8% (n = 4) of the studies used a version other than the 12-item.

[4] Four studies did not report the internal consistency of the SPAS, therefore the internal consistency estimate of .90 from the validation study (Hart et al., 1989) was used. Two of these studies used the 12-item version of the SPAS (consistent with the Hart et al. study), and the other two studies used a 9-item version. The authors recognize that number of items is one of the factors which influences estimates of reliability.

Table 1.

Formulas and Procedures for Converting Study Statistics to r.

Statistic to be Converted	Formula for Transformation to r	Notes
t	$r = \sqrt{\frac{t^2}{t^2 + df}}$	Can use with either paired or unpaired t tests
F	$r = \sqrt{\frac{F}{F + df\,(e)}}$	Use only with one way ANOVAS.
Two-Way ANOVA	$r = \sqrt{\frac{(Fa * dfa)}{(Fa * dfa) + (Fb * dfb) + (Fab * dfab) + df\,(e)}}$	Fa = Main Effect of Interest dfa = df for A Fb = Second Main Effect dfb = df for B Fab = Interaction effects dfab = Interaction df df (e) = error df
X 2	$r = \sqrt{\frac{X^2}{N}}$	n = sample size Use only when df = 1
d	$r = \sqrt{\frac{d}{d^2 + \frac{4\,(N-2)}{N}}}$	d = Cohen's d; N = combined sample sizes.
p	1) Convert the 2 tailed p value into a one tailed p (i.e., p/2). 2) Look up the associated Z in a normal probability table.	Can use for either exact p values or when the author reports an approximate p (e.g., $p < .05$).

Table 2.

Formulas and Procedures for Converting Study Statistics to d.

Statistic to be Converted	Formula for Transformation to d	Notes
Means and Standard Deviations	$d = \frac{Xe - Xc}{s_p}$	Xe Experimental Group Mean Xc Control Group Mean Sp Pooled (Within Subjects) Standard Deviation
Pooled Within Subjects Variance	$S_p^2 = \frac{(N_e - 1)\ S_e^2 + (N_c - 1)\ S_c^2}{(N_e + N_c - 2)}$	Ne Experimental Group N Nc Control Group N S2e Experimental Group Variance S2c Control Group Variance
t	$d = \frac{2t}{\sqrt{df}}$	Can use with either paired or unpaired t tests
F	$d = \frac{2\sqrt{F}}{\sqrt{df\ (error)}}$	Use only with one way ANOVAS.
r	$d = \frac{2\ r}{\sqrt{1 - r^2}}$	

Table 3

Studies included in the meta-analysis

Study	Comparison(s) made
Bartlewski, Van Raalte, & Brewer (1996)	Aerobic/comparison
	Aerobic pre/comparison pre
	Aerobic post/comparison post
	Exerciser/non-exerciser
Berry & Howe (2004)	Exerciser/non-exerciser
Cox, Lantz, & Mayhew (1997)	Athlete/non-athlete
Haase & Prapavessis (2001)	Physique-salient/non-athletic comparison
	Weight-restricted/non-athletic comparison
	Non physique-salient *vs.* comparison
Hausenblas & Mack (1999)	Non-physique athlete *vs.* non-athletic
	Physique athlete/non-athletic comparison
Lindwall & Lindgren (2005)	Pre-intervention/pre-comparison
	Post-intervention/post-comparison
Russell (2002)	Weight-trainers/comparison
Schwerin, Corcoran, Fisher et al. (1996)	Sport/comparison
	Exercise/comparison
Williams & Cash (2001)	Weight-lifters/comparison
Finkenberg, DiNucci, McCune, et al. (1998)	Athletes/nonathletic comparison
Bowden, Rust, Dunsmore, & Briggs (2005)	Athletic class/comparison
	Exercise class/comparison
	Baseline exercise/comparison
	Baseline athletic/comparison
	8wks exercise/comparison
	8wks athletic/comparison
	16wks exercise/comparison
	16wks athletic/comparison
Grise (1997)	Active/non-active
Olachnovitch (2001)	Active/non-active

Table 4

Relevant studies not included in the meta-analysis

Study	Reason for exclusion
Amorose & Hollembeak (2005)	No comparison of athletes/exercisers to comparison
Arent, Tuzzolino, et al. (2005)	No comparison of athletes/exercisers to comparison
Bas, Asci, Karabudak, & Kiziltan (2004)	No comparison of athletes/exercisers to comparison
Bas, Karabudak, & Kiziltan (2005)	No comparison of athletes/exercisers to comparison
Beckham (2003)	No comparison of athletes/exercisers to comparison
Belling (1992)	No comparison of athletes/exercisers to comparison
Bindarwish (2000)	No comparison of athletes/exercisers to comparison
Bowden, Lanning, Irons, & Briggs (2002)	Insufficient information (re: group composition)
Brewer, Diehl, Cornelius, et al. (2004).	No comparison of athletes/exercisers to comparison
Brown (unknown year).	No comparison of athletes/exercisers to comparison
Burke, Carron, & Eys, (2006)	No comparison of athletes/exercisers to comparison
Calogero (2004)	No comparison of athletes/exercisers to comparison
Carron & Prapavessis (1997)	Extreme group analyses used for SPAS
Conroy, Motl, & Hall (2000)	No SPAS values reported
Crawford & Eklund (1994)	No comparison of athletes/exercisers to comparison

Table 4 (*continued*)

Study	Reason for exclusion
Crocker, Sabiston, et al. (2003)	No comparison of athletes/exercisers to comparison
Crocker, Sabiston, et al. (2005)	No comparison of athletes/exercisers to comparison
Crocker, Snyder, Kowalski, et al. (2000)	No use of comparison group (athletes vs. athletes)
David & Johnson (1998)	No comparison of athletes/exercisers to comparison
Davison & McCabe (2005)	No comparison of athletes/exercisers to comparison
Davison & McCabe (2006)	No comparison of athletes/exercisers to comparison
Diehl, Brewer, Van Raalte et al. (2001)	No comparison of athletes/exercisers to comparison
Diehl, Johnson, Rogers, & Petrie (1998)	No comparison of athletes/exercisers to comparison
Doughty & Hausenblas (2005)	No comparison of athletes/exercisers to comparison
Duggan & McCreary (2004)	No comparison of athletes/exercisers to comparison
Ebbeck, Watkins, & Levy (in press)	No comparison of athletes/exercisers to comparison
Eklund & Crawford (1994)	No comparison of athletes/exercisers to comparison
Eklund, Kelley, & Wilson (1997)	No comparison of athletes/exercisers to comparison
Eklund, Mack, & Hart (1996)	Insufficient data
Evans, Cotter, & Roy (2005)	No comparison of athletes/exercisers to comparison

Table 4 (*continued*)

Study	Reason for exclusion
Focht & Hausenblas (2001)	No SPAS values reported
Focht & Hausenblas (2003)	Only report SPAS values when >36
Focht & Hausenblas (2004)	Only report scores of participants with high levels of SPA (>36)
Frederick & Morrison (1996)	Only data from exercisers (no comparison)
Frederick & Morrison (1998)	No comparison of athletes/exercisers to comparison
Gammage, Hall, & Martin Ginis (2004)	Only data from exercisers (no comparison)
Gammage, Martin Ginis, & Hall (2004)	Only data from exercisers (no comparison)
Gardner & Hausenblas (2002)	No use of comparison group
Greenleaf (2004)	Only data from athletes (no comparison)
Haase & Prapavessis (1998)	No comparison of athletes/exercisers to comparison
Haase, Prapavessis, & Glynn Owens (2002)	Only data from elite athletes (no comparison)
Harju, Twiddy, Cope, et al. (2003)	Only data from exercisers (no comparison)
Hart, Leary, & Rejeski, (1989)	No comparison of athletes/exercisers to comparison
Hausenblas & Fallon (2002)	Only data from exercisers (no comparison)
Hausenblas & Martin (2000)	Only data from exercisers (no comparison)
Hausenblas, Symons Downs et al. (2002)	No comparison of athletes/exercisers to comparison
Henderson (1995)	No use of comparison group

Table 4 (*continued*)

Study	Reason for exclusion
Hiscock (2005)	No comparison of athletes/exercisers to comparison
Holle (2004)	n values not included
Hurst, Hale, Smith, & Collins (2000)	No use of comparison group
Isogai, Brewer, Cornelius, et al. (2001)	No comparison of athletes/exercisers to comparison
Jordan, Smisson, Burke, et al. (2005)	No comparison of athletes/exercisers to comparison
Katula, McAuley, Mihalko, & Bane (1998)	No comparison of athletes/exercisers to comparison
Kowalski, Crocker, & Kowalski (2001)	No comparison of athletes/exercisers to comparison
Kowalski, Mack, Crocker, et al. (2005)	No comparison of athletes/exercisers to comparison
Kratzer (2004)	No comparison of athletes/exercisers to comparison
Kruisselbrink, Dodge, et al. (2004)	Only data from exercisers (no comparison)
Kyrejto, Mosewich, et al. (submitted 2005)	No comparison of athletes/exercisers to comparison
Lanning, Bowden, & Owens (2004)	No comparison of athletes/exercisers to comparison
Lantz, Hardy, & Ainsworth (1997)	No use of comparison group
Lichtenberger et al. (2003)	No overall SPAS scores
Lindwall (2004)	No overall SPAS scores
Lindwall (2004)	No comparison of athletes/exercisers to comparison
Lox, Osborn, Pellett (1998)	No comparison of athletes/exercisers to comparison

Table 4 (*continued*)

Study	Reason for exclusion
Lundgren, Anderson, & Thompson (2004)	No SPAS values reported
Lundgren et al. (2004)	No SPAS values reported
MacDonald, Spink, & Faulkner (1993)	SPAS scores only reported when <31 and >42
McAuley & Burman (1993)	Only data from athletes (no comparison)
McAuley, Bane, & Mihalko (1995)	No comparison of athletes/exercisers to comparison
McAuley, Bane, Rudolph, & Lox (1995)	No comparison of athletes/exercisers to comparison
McAuley, Marquez, Jerome, et al. (2002)	No comparison of athletes/exercisers to comparison
Mack (1995)	No use of comparison group
Mack, Strong, et al. (in press)	No comparison of athletes/exercisers to comparison
Mack, Strong, Kowalski, & Crocker (in press)	No comparison of athletes/exercisers to comparison
Malone, Czech, Zetterland, & Ruble, (2004)	Only data from exercisers (no comparison)
Mangweth et al. (2001)	No SPAS values reported
Marquez & McAuley (2001)	No SPAS values reported
Martin (1999)	Only data from athletes (no comparison)
Martin, Rejeski, et al. (1997)	Data previously reported
Martin Ginis, Eng, Arbour, et al. (2005)	Only data from exercisers (no comparison)
Martin Ginis, O'Brien, & Watson (2003)	No comparison of athletes/exercisers to comparison
Mayville et al. (2002)	No SPAS values reported
Melbye (2005)	No comparison of athletes/exercisers to comparison

Table 4 (*continued*)

Study	Reason for exclusion
Mirzeoglu, Celebi, Alkurt, & Ahcy (2005)	Number of items used in SPAS not specified
Monro & Huon (2005)	No overall SPAS values
Monsma & Malina (2004)	Only data from athletes (no comparison)
Monsma, Pfeiffer, Harvey, et al. (2005)	Only data from athletes (no comparison)
Mookerjee, Singh, & Cash (2002)	No comparison of athletes/exercisers to comparison
Motl & Conroy (2000)	SPAS values not reported for exercisers vs. comparisons
Motl & Conroy (2001)	Participant data used from previous studies
Motl, Conroy, & Horan (2000)	Data used in previous studies
Murray & Fox (2005)	No comparison of athletes/exercisers to comparison
Nevill, Lane, et al. (2001)	No overall SPAS scores reported
Peiser & Peter (2001)	No SPAS values reported
Ransdell, Wells, Manore, et al. (1998)	No comparison of athletes/exercisers to comparison
Ratusny (1995)	No comparison of athletes/exercisers to comparison
Reel & Gill (1996)	Only data from athletes (no comparison)
Reel & Gill (1998)	Only data from athletes (no comparison)
Reel & Gill (2001)	Only data from athletes (no comparison)
Russell & Cox (2003)	No comparison of athletes/exercisers to comparison
Sabiston, Crocker, et al. (2005)	Only data from exercisers (no comparison)
Sabiston, Sedgwick, et al. (year unknown)	No comparison of athletes/exercisers to comparison

Table 4 (*continued*)

Study	Reason for exclusion
Sands (2000)	No SPAS values reported
Sands, Maschette, & Armatas (2004)	No comparison of athletes/exercisers to comparison
Sands & Wettenhall (2000)	No SPAS values reported
Scott, Burke, Joyner, & Brand (2004)	No comparison of athletes/exercisers to comparison
Sinden, Martin Ginis, Angove (2003)	No comparison of athletes/exercisers to comparison
Smith (2004)	No comparison of athletes/exercisers to comparison
Spink (1992)	No comparison of athletes/exercisers to comparison
Tassell & Flett (2005)	n values not included
Thogersen-Ntoumani & Ntoumanis, (2006)	Only data from exercisers (no comparison)
Thompson & Chad (2000)	No comparison of athletes/exercisers to comparison
Thompson & Chad (2002)	Same dataset as Thompson & Chad (2000)
Thompson, Dinnel, & Dill (2003)	No comparison of athletes/exercisers to comparison
Thornton & Maurice (1997)	No comparison of athletes/exercisers to comparison
Thornton & Maurice (1999)	No comparison of athletes/exercisers to comparison
Treasure, Lox, & Lawton (1998)	No comparison of athletes/exercisers to comparison
Turner (unknown year)	No comparison of athletes/exercisers to comparison

Table 4 (*continued*)

Study	Reason for exclusion
Vandever (2001)	Only data from exercisers (no comparison)
Van Raalte, Cunningham et al. (2004)	No comparison of athletes/exercisers to comparison
Walton & Finkenberg (2002)	Only data from exercisers (no comparison)
Whitehead, Eklund, & Williams (2003)	No SPAS values reported
Williams, Diehl, & Mahoney (2002)	No SPAS values reported
Wilson & Batterham (1999)	No comparison of athletes/exercisers to comparison
Wilson & Rodgers (1999)	No comparison of athletes/exercisers to comparison
Woodgate, Martin Ginis, & Sinden (2003)	No comparison of athletes/exercisers to comparison
Yin (2001)	Only data from exercisers (no comparison)
Yin & Ryska (1999)	Only data from exercisers (no comparison)

Table 5
Overall meta-analysis of the effects of physical activity participation on social physique anxiety

Analysis	*N*	*K*	d_{obs}	95% CI	d_{corr}	SD_{corr}	SD_{res}	$\%Var_e$	80% CrI	d_{fs}
Physical activity vs. comparison	2846	14	-.100	-.510 to .310	**-.123**	.224	.155	32.32	-.411 to .164	5.6

Note: *N*, total sample size; *K*, number of ESs; d_{obs}, mean sample-size weighted observed ES; 95% CI, d_{obs} 95% confidence interval; d_{corr}, mean sample-size weighted corrected ES; SD_{corr}, sample-size weighted corrected standard deviation; SD_{res}, residual standard deviation; $\%Var_e$, percent of d_{obs} variance due to sampling and measurement error; 80% CrI, 80% credibility interval; d_{fs}, d_{corr} fail-safe *N* with $d_{critical} = .20$, $d_{unlocated} = .00$ for d_{corr} values above .20 and $d_{unlocated} = .40$ for d_{corr} values below .20. Boldface entry is the best estimate of the population mean ES.

Table 6
Intercorrelations between moderators and corrected ES's

Moderator	1	2	3	4	5	6	7
1. Gender	—	.108	.205	-.376	-.205	.217	.423
		(12)	(12)	(12)	(12)	(12)	(12)
2. Age		—	.033	.310	-.539	.182	.290
			(13)	(13)	(13)	(13)	(13)
3. Type of PA			—	-.543	-.220	.395	.525
				(13)	(13)	(13)	(13)
4. Study Design				—	-.077	.026	-.684
					(13)	(13)	(13)
5. Sampling Procedure					—	-.337	-.223
						(13)	(13)
6. Publication type						—	.287
							(13)
7. ES corrected (d_{corr})							—

Note: All moderators were correlated as found in coding sheet except for age, which was dichotomized into 1 = adolescence and 2 = university samples. Although numerous sampling procedures were identified, only two (i.e., convenience and purposive) were actually coded. Values in parentheses are sample sizes.

Table 7
Moderator analyses for relevant demographic, study, and measurement characteristics

Analysis	*N*	*K*	d_{obs}	95% CI	d_{corr}	SD_{corr}	SD_{res}	$\%Var_e$	80% CrI	d_{fs}
Gender										
Females	621	5	-.226	-.483 to .031	**-.244**	.139	.194	66.07	-.422 to -.066	1.0
Males	742	2	-.219	-.219 to -.219	**-.232**	0	.110	418.68	-.232 to -.232	0.30
Age										
University-aged	2028	11	-.191	-.330 to -.052	**-.203**	.076	.157	81.10	-.300 to -.106	0.17
Adolescents	814	3	-.015	-.438 to .408	**-.055**	.261	.150	24.86	-.389 to .279	2.1
Type of PA										
Sport	1412	6	-.181	-.334 to -.028	**-.192**	.083	.139	73.62	-.298 to -.085	0.3
Exercise	551	5	.121	-.283 to .525	**.128**	.218	.203	46.32	-.151 to .408	1.75
Study Design										
Non-experimental	2245	8	-.152	-.487 to .183	**-.188**	.173	.133	37.38	-.409 to .033	0.4
Quasi & True	649	5	.107	-.199 to .413	**.113**	.166	.187	55.98	-.099 to .325	2.25
Sampling										
Convenience	2234	9	-.047	-.441 to .347	**-.066**	.220	.142	29.31	-.348 to .215	5.85
Purposive	660	4	-.252	-.399 to -.105	**-.271**	.077	.168	82.54	-.370 to -.172	1.4
Publication Type										
Refereed Publications	2294	12	-.153	-.527 to .221	**-.163**	.202	.154	36.80	-.421 to .096	2.22

Analysis	*N*	*K*	d_{obs}	95% CI	d_{corr}	SD_{corr}	SD_{res}	$\%Var_e$	80% CrI	d_{fs}
Thesis	700	2	.072	-.08 to .227	**.070**	.177	.136	57.02	-.084 to .218	1.3

Note: *N*, total sample size; *K*, number of ESs; d_{obs}, mean sample-size weighted observed ES; 95% CI, d_{obs} 95% confidence interval; d_{corr}, mean sample-size weighted corrected ES; SD_{corr}, sample-size weighted corrected standard deviation; SD_{res}, residual standard deviation; $\%Var_e$, percent of d_{obs} variance due to sampling and measurement error; 80% CrI, 80% credibility interval; d_{fs}, d_{corr} fail-safe *N* with $d_{critical} = .20$, $d_{unlocated} = .00$ for d_{corr} values above .20 and $d_{unlocated} = .40$ for d_{corr} values below .20. Boldface entries are best estimates of the population mean ES.

Table 8

Mean SPAS values for moderator variables

Moderator	Overall SPAS Mean (*SD*)	Physically Active Mean (*SD*)	Comparison group Mean (*SD*)
Gender			
Males	2.48 (.13)	2.43 (.69)	2.63 (.81)
Females	3.03 (.12)	3.04 (.75)	3.11 (.81)
Age			
Adolescents	3.03 (.02)	3.00 (.89)	3.20 (.86)
University	2.87 (.20)	2.94 (.72)	2.91 (.82)
Type of PA			
Sport	2.92 (.22)	2.91 (.71)	3.02 (.83)
Exercise	2.87 (.18)	2.98 (.77)	2.90 (.82)
Study Design			
True- & Quasi-experimental	2.90 (.10)	3.02 (.77)	2.90 (.86)
Non-experimental	2.89 (.30)	2.83 (.69)	3.04 (.79)
Sampling Procedure			
Convenience	2.92 (.15)	3.01 (.70)	2.93 (.81)
Purposive	2.86 (.26)	2.83 (.82)	3.00 (.86)
Publication Type			
Refereed	2.89 (.20)	2.94 (.76)	2.95 (.84)
Thesis	2.98 (.02)	2.98 (.53)	2.98 (.65)

SOCIAL PHYSIQUE ANXIETY: META-ANALYTIC CODING FORM

Column 1: STUDY IDENTIFIER: _____ (Running total on the number of studies. Also listed on document)

Column 2: ARTICLE (APA citation; alphabetic):

Column 3: Publication Venue (source of study)

(1) Refereed Publication	(2) Non-refereed publication	(3) Conference Presentation	(4) Thesis	(5) Dissertation	(6) Unpublished manuscript	(7) Other

SAMPLE CHARACTERISTICS

Column 4: Sample size (N)

(1) Actual value (numerical) (999) Not specified

Column 5: Gender (gender of participants)

(1) Male (2) Female (3) Mixed (999) Not specifiied

Column 6: AgeX (mean age of participants)

(1) Actual value (numerical) (999) Not specified

Column 7: AgeSD (standard deviation of the age of participants)

(1) Actual value (numerical) (999) Not specified

Column 8: Weight (assessment of body weight of participants)

(1) Actual value (lbs) (numerical) (999) Not specified

Column 9: Weight (how obtained)

(1) Objective weight (2) Subjective weight (999) Not specified

Column 10: Height (assessment of body height of participants)

(1) Actual value (numerical) (999) Not specified

Column 11: Height (how obtained)

(1) Objective height (2) Subjective height (999) Not specified

Column 12: BMI (assessment of BMI of participants)

(1) Actual value (numerical) (999) Not Specified

Column 13: BMI (how obtained)

(1) Objective BMI (2) Subjective BMI (999) Not specified

Column 14: Body Fat Percentage

(1) Actual value (%) (999) Not reported

Column 15: Race (race of participants

(1) Caucasian	(2) African American/Canadian	(3) Asian	(4) Hispanic	(5) Aboriginal	(6) Mixed	(999) Not reported

STUDY CHARACTERISTICS

Column 16: Quality (Study Quality; based on Cook & Campbell (1979) validity threats)

(1) Good (2) Fair

Column 17: Manip (did the study involve a manipulation?)

(1) Yes (2) No

Column 18: If YES: Describe manipulation (alphabetical)

Column 19: Design (Study Design)

(1) True Experimental (2) Quasi-experimental (3) Non-experimental

Column 20: Sampling (protocol for selection of participants; based on Trochim's definitions)

(1) Simple random sample
(2) Stratified
(3) Systematic
(4) Cluster
(5) Multi-stage
(6) Convenience
(7) Purposive
(8) Modal Instance
(9) Expert
(10) Quota
(11) Heterogeneity
(12) Snowball

Column 21: Setting (Independent variable physical activity setting)

(1) Sport (2) Exercise (3) Varied (4) Non PA (999) Not reported

MODERATORS

Column 22: Levels: (different competitive level)

(11) Varied	(12) Recreational	(13) High school	(14) Intercollegiate	(999) Not reported

Column 23: Class (sport classification)

(21)Physique-salient	(22) Non-physique salient	(23) Weight restricted	(24) Athletic comparison	(25) Non-athletic comparison	(999) Not reported

Column 24: SettingEX (exercise setting)

(31) Public setting	(32) Private setting	(999) Not reported

Column 25: GenderEX (gender of exercise setting)

(33) Same gendered	(34) Mixed gendered	(999) Not reported

Column 26: GroupEX (individual vs. group exercise setting)

(35) Individual	(36) Group	(999) Not reported

Column 27: FreqEX (frequency of exercise behaviour) – hours per week

(41) Actual Number (hours per week)	(999) Not reported

Column 28: FreqEX (frequency of exercise behaviour) – times per week

(41) Actual Number (frequency per week)	(999) Not reported

Column 29: SPAS (actual value)

(41) Actual Number	(999) Not reported

Column 30: SPAS (measurement of SPAS)

(51) 12 item	(52) 9-item	(53) 7-item	(54) Other

Column 31: SPAS (version)

(61) Original SPAS	(62) Modified "state" version

Calculation of Effect Sizes

Column 32: Definitions (variables as defined in the study.; alphabetic)

If using r: Correlation Definition (variables as defined in the study)

If using d: Contrast definition (general description of the cells in the design used to calculate ES and Dependent measure)

(1) M;SD	(2) T or 1 df F statistic	(3) Correlation Coefficient	(4) Proportions	(5) Chi-square	(6) p-value	(7) regression	(8) Assumed ES = 0 from reported null effect	(999) Not calculated

NOTE: Separate SPSS files will be created for data that is correlational, means, and percentages (as necessary).

Column 33:

Correlation file	Means file	Percentage file
totN (number of participants measures to calculate correlation)	MGroup1 (mean of Group 1)	NGroup1 (number of subjects in group 1)

Column 34:

Correlation file	Means file	Percentage file
rCOR (actual r value)	SDGroup1 (standard deviation of Group 1)	PerGroup1 (percentage for the Group 1)

Column 35:

Correlation file	Means file	Percentage file
	NGroup1 (number of participants in Group 1)	NGroup2 (number of subjects in group 2)

Column 36:

Correlation file	Means file	Percentage file
	MGroup2 (mean of Group 2)	PerGroup2 (percentage for Group 2)

Column 37:

Correlation file	Means file	Percentage file
	SDGroup2 (standard deviation of Group 2)	

Column 38:

Correlation file	Means file	Percentage file
	NGroup2 (number of participants in group 2)	

Column 39: Source of Means

(1) Directly reported	(2) Average of reported	(3) Obtained from graph	(4) Other

Column 40: Source of Standard Deviations

(1) Directly reported	(2) Directly reported MSE	(3) Calculated from means and SDs from subgroups	(4) Calculated from related t or d statistic	(5) Calculated from F statistic	(6) Calculated from p-value	(999) SD not used

Column 41: Effect Size (d)

(1) Effect Size (d)