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Social comparison processes as contributors to consistent physical activity.

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SOCIAL COMPARISON PROCESSES AS CONTRIBUTORS TO CONSISTENT PHYSICAL ACTIVITY

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PHYSICAL ACTIVITY

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"Sometimes our light goes out but is blown into flame by another human being. Each of us owes deepest thanks to those who have rekindled this light."

- Albert Schweitzer

I would like to give my sincerest thanks to all of the individuals who have kept my academic flame alight.

ABSTRACT

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The present study examined the impact that attention to social comparison (SC) information may have on consistency in physical activity (PA) behaviors across genders. SC factors, including SC frequency, SC direction and trait tendency to compare (SCO) were assessed within the Dynamic Relapse Model (DRM) as markers of PA consistency within men and women. Participants were *N*=200 individuals engaging in physical activity at YMCA gym facilities. Data collection utilized cross-sectional methods including anthropomorphic data collection at the point of recruitment and online self-report measures post-recruitment. High adherence to regular physical activity was observed, with participants reporting infrequent slips in PA (modal PA slips was 0). Participants reported engaging in upward and lateral SC most frequently, with downward SC being infrequently reported. Overall reported engagement in SC was intermittent; the modal frequency of SC engagement was "sometimes." Specific hypotheses were developed to explore the relationships between SC direction, SCO, gender and PA consistency outcomes. SC direction and frequency were not related to PA consistency. Gender differences were not observed in the frequency of SC constructs or PA

consistency, however, a significant interaction was observed between gender and SCO; women's PA consistency was impacted by SCO to a greater extent than their male counterparts'. A decrease in PA consistency was observed at high levels of SCO in women, but not in men. Study findings suggest that SCO may be most impactful on women's PA behaviors, regardless of SC direction and frequency. Results identify possible clinical intervention points for the promotion of PA consistency, particularly focusing on women who demonstrate a high tendency to compare themselves (SCO). The study provides support for the contribution of social comparison processes to PA consistency and demonstrates that social cognitions warrant greater exploration within models of health behavior.

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INTRODUCTION

Physical activity (PA) plays an integral role in copious medical conditions including obesity, type 2 diabetes, cardiovascular disease and hypertension (Kesaniemi et al., 2001) with each respective disease contributing significantly to both morbidity and mortality rates in the U.S (Guh et al., 2009). The consequences of insufficient PA are apparent: two-thirds of American adults are considered overweight or obese (Ogden, Carroll, McDowell, & Flegal, 2007) and 90% will experience hypertension within their lifetime (Vasan et al., 2002). Alarmingly, cardiovascular disease remains the primary cause of death within the U.S. (Foot, Lewis, Pearson, & Beller, 2000) in spite of evidence suggesting that increases in PA may prevent or delay its development (Thompson & Lim, 2003). Further, individuals who engage in consistent PA report fewer days in which they suffer poor mental and physical health (Brown et al., 2003). Indeed, the psychological benefits associated with PA are well established for anxiety, depressive symptoms and stress (Dishman & Buckworth, 1997).

Despite an understanding of the health benefits attributable to regular PA engagement, levels of adult PA and sedentarism within the US have not changed significantly over the past decade and 23% of deaths from chronic diseases remain attributable to sedentary lifestyles (Hahn, Teuesch, & Rosenberg, 1986; USHHS., 2002; National Center for Health Statistics, 2014). While biological predispositions to these health conditions are not alterable through lifestyle changes, the adoption and maintenance of appropriate PA behaviors may reduce the prevalence of these diseases

(Halpin, Morales-Suarez-Varela, & Martin-Moreno, 2010). Consequently, identification of strategies to augment and maintain engagement in PA has emerged as a focal point of behavioral intervention research using health behavior models (USHHS, 2002).

Consistency in Physical Activity

Existing models within the PA and exercise literature have primarily focused on the prediction of intention to be active, while minimizing the focus on PA maintenance. However, it is reported that 50% of people who initiate PA will discontinue regular activity within the first 6 months, thus losing the health benefits associated with continuous PA (Dishman & Buckworth, 1997). As a result, investigation of factors that promote and impede PA adherence has become a necessary area of interest in health research and may contribute to the identification of individual differences between those who adhere to PA and those who do not (Rhodes & Smith, 2006).

Despite a paucity of longitudinal studies assessing exercise maintenance, it is suggested that a large proportion of individuals who participate in exercise do so intermittently (Bock, Marcus, & Pinto, 2001). Stetson et al. (2005) assessed exercise consistency in adults recruited from an urban YMCA; their findings indicated that 38.2% of participants perceived themselves to be "intermittent" exercisers (Stetson et al., 2005). In another community sample of YMCA exercisers, 81% of participants reported missing a week of exercise over a one-year period (Marcus et al., 2000). Linke et al. (2011) reported exercise attrition rates of 7% to 57% of all community exercise programs, noting that statistically higher attrition rates have been observed in intermittent exercisers above those engaging in long-term exercise programs (Linke, Gallo, & Norman, 2011)

Furthermore, studies assessing longitudinal habits and historical patterns of PA suggest that intermittent PA is experienced by a large proportion of U.S. adult exercisers. In a longitudinal study of undergraduate exercisers meeting CDC/ACSM guidelines, only 35% of participants endorsed maintaining these PA recommendations at a one-month follow-up (Irwin, 2007). Stetson et al. (2004) assessed prospective PA patterns in a sample of community exercisers, finding that 63.4% of participants endorsed missing at least one week of exercise while 15.2% missed three weeks or more over a six-month period. At a 12-month follow-up, almost 30% of participants were no longer exercising regularly (Stetson, Beacham, Dubbert, Ulmer, & Meyer, 2004). Additionally, Sallis and colleagues (1990) investigated past exercise drop-out rates in randomly selected California residents. In this sample, 40.9% of participants reported one or more episodes of dropping out of exercise, while 21% endorsed 3 or more episodes of exercise drop-out (Sallis et al., 1990). Given the health benefits associated with PA consistency, these findings highlight the importance of identifying factors that predict PA adherence and maintenance.

Gender Differences in Physical Activity Consistency

Gender differences have been observed in both PA initiation and adherence (Troiano et al., 2008). Troiano and colleagues (2008) assessed broad PA adherence using objective accelerometer data within a representative sample of the U.S. population. Data drawn from the National Health and Nutritional Examination Survey (NHANES) demonstrated significant gender differences in PA engagement and adherence to CDC/ACSM recommendations across all age groups, from childhood to older adulthood (Troiano et al., 2008). Further, only 3.8% of adult males and 3.2% of adult females met

CDC/ACSM PA recommendations. Significant gender differences have also been observed in longitudinal leisure-time energy expenditure, including the duration, frequency and overall engagement in PA sessions (Pivarnik, Rafferty, & Reeves, 2002). Additionally, it has been identified that ethnicity impacts the aforementioned gender differences in PA. African-American men and women report significantly less leisure activity than other ethnicities (Centers for Disease Control and Prevention, 2013), with African-American women reporting the least amount of leisure PA across genders and ethnicities (Hawkins et al., 2009). Given the apparent differences in PA engagement and adherence between genders, exploration of the contributors to this gender gap is warranted. Investigation of the contribution of ethnicity to PA consistency deserves further empirical attention.

Defining Physical Activity

The terms "physical activity" and "exercise" are frequently interchanged in the literature. However, physical activity comprises varied lifestyle and workplace activities, whereas exercise is often operationalized as a purposeful regimen of physical activity (Marcus, Bock, & Pinto, 1997). The specific assessment of exercise behaviors, while a valid area of study, may miss the variety of PA forms that the general population engages in. The Centers for Disease Control and Prevention (CDC) and the American College of Sports Medicine (ACSM) recommend that adults engage in either 30 minutes of moderate PA on most, if not all days per week, for a total of 150 minutes per week or 75 minutes of vigorous PA per week (CDC/ACSM, 1995). The CDC/ACSM guidelines also assert that adults should engage in muscle building exercises twice per week (CDC/ACSM, 1995). Given the use of global PA as a criterion for adequate activity

levels in the U.S. population, this study will address broad, PA engagement as a benchmark for adequate activity levels.

Research has begun to focus on the factors that contribute to successful PA adherence and failure to adhere, with PA adherence frequently defined as having met the CDC/ACSM recommendations for PA (CDC/ACSM, 1995; Crain, Martinson, Sherwood, & O'Connor, 2010; Marcus et al., 2000). Adherence to PA may be viewed within the context of prevention of relapse to sedentary behavior, thus non-adherence may be conceptualized as lapses in planned PA. One model of behavior relapse, the Dynamic Relapse Model (DRM) describes relapse as a process precipitated by a series of cognitive, affective and behavioral factors (Witkiewitz & Marlatt, 2004). Specifically, relapses are preceded by behavioral markers known as “slips” and “lapses.” Conceptualizing lapses from regular PA as a form of behavioral relapse has been posited (Stetson et al., 2005) and application of the DRM to PA behaviors has received empirical support. Previous research suggests that a slip in behavior may be considered as an absence of behavior on a single occasion (Marlatt, 1996; Stetson et al., 2005). Consistent with this definition, a slip in PA will be considered as an isolated omission of a planned PA session. Stetson et al. (2004) further assessed female exercisers’ reported patterns of lapse and relapse behavior as predictors of maintained exercise behavior. Within this sample, participants perceived an exercise lapse as a period of two weeks of missed exercise sessions and considered a relapse in exercise as a period of three months without exercise (Stetson et al., 2004). This definition is consistent with a widely supported description of relapse behavior: a three month period without exercise after having completed six months of consistent exercise prior to relapse (Sallis et al., 1990). In

accordance with the PA and exercise literature, a PA lapse will be defined as two weeks of missed PA sessions while a relapse will be operationalized as a period of three months of missed PA. The DRM will be the chosen modality to reflect PA consistency, with intermittent PA being determined by the frequency of PA slips. Lapses and relapses in planned PA will be assessed for future data analysis.

Determinants of Physical Activity Consistency

Empirical research bodies have identified biopsychosocial factors that influence the initiation and maintenance of health behaviors, including PA, in the general population, as well as in individuals with chronic illnesses. Although influential demographic variables remain non-agentic (i.e. gender, age, ethnicity), factors that display vicissitude are typically targeted through empirical research and interventions (Schwarzer, 2008). These factors fall into two categories; psychological variables and environmental variables (Marcus et al., 1997). Psychological variables associated with PA include PA-specific self-efficacy, motivation status, health perceptions and PA enjoyment (Trost, Owen, Bauman, Sallis, & Brown, 2002). Social/environmental factors impacting PA adherence include social support, access to facilities, cost and physical intensity of the PA programs offered (Trost et al., 2002). Furthermore, barriers to PA maintenance have been identified, and include feelings of fatigue, inclement weather, fear of injury and lack of activity partners (Trost et al., 2002).

Approaches to Physical Activity Consistency

The identification of psychological and environmental influences in the initiation and maintenance of PA behaviors has received much attention, with strong support for the predictive validity of social and cognitive factors in behavior change (Schwarzer, 2008). Research into PA behaviors focuses primarily on the processes by which change

occurs and the factors that allow some individuals to maintain PA when others do not. However, theories that identify the mechanisms of action behind behavior change may better enable the explanation and prediction of continuous health behavior engagement and may inform treatment and education programs (Schwarzer, 2008).

Extant research has combined predictive models of behavior with the measurement of social-cognitive factors when conceptualizing health behavior engagement (Bandura, 2004; Maes & Karoly, 2005; Hagger & Chatzisarantis, 2006; Hagger, Chatzisarantis, & Biddle, 2002; Hankonen, Vollmann, Renner, & Absetz, 2010). One well-developed and widely supported social-cognitive theory that may provide a conceptual framework for investigating how individuals develop and maintain their behaviors is *social comparison theory* (Festinger, 1954). Despite garnering strong empirical support for behavior change, the social comparative construct has yet to be considered within the context of PA consistency specifically.

Social Comparison Literature

Social comparison (SC) is defined as an objective, cognitive-evaluative process with both affective and behavioral outcomes (Festinger, 1954). SC provides valuable self-knowledge and precipitates behavioral self-evaluation (Mussweiler & Ruter, 2003). It is proposed that SC occurs as a result of cognitive hypothesis testing to determine similarity with a target. Perceptual knowledge of the target triggers the evaluative comparison process, which in turn relates the target traits to specific features of comparison within the self (Mussweiler, 2003). Subsequently, target-related information is incorporated into self-knowledge arising from an integrated self-evaluation through assimilation or contrast (Mussweiler, 2003). The aforementioned integrative process is

central to the cognitive judgment literature which suggests that accrued target information is utilized as a basis for successive behavior judgments.

Social Comparison Theory. Festinger (1954) provided the first systematic theory of SC processes, positing that people have a desire to know whether their opinions and perceptions of their abilities are concurrent with reality. When an individual is unable to test these pragmatically, Festinger (1954) asserted that individuals evaluate their opinions and abilities by comparing themselves to similar others. Through observation of similar others, individuals can ascertain whether their opinions are in accordance with those of others and whether there is dissonance between their perceived and actual abilities (Festinger, 1954). Schachter and Singer (1962) identified the utility of SC as a conveyor of affective cues and suggested that this may shape an individual's affective and behavioral response to ambiguous situations. In this landmark study, the researchers gave subjects a dose of epinephrine without disclosure of the physiological arousal associated with the chemical. A confederate proceeded to display a variety of emotional and physiological behaviors, causing the participants to label their ambiguous physiological arousal in concordance with that of the confederate's presentation (Schachter & Singer, 1962). Affective and informational responses to SC have been demonstrated within the literature, with research suggesting that ambiguous and stress-inducing states induce both problem-solving needs (e.g. information to overcome the stressor) and emotional needs (e.g. fear). Within the presented literature a common theme underpins each social comparative process; comparisons result from ambiguous or stress-inducing contextual factors (Tennen, McKee-Eberhardt, & Affleck, 2000). Access to internal states is oftentimes indirect as many internal cues are themselves ambiguous (Festinger, 1954). As

such, individuals may use situational processes, including SC, to guide how they identify, interpret and label internal states (Festinger, 1954). This is particularly relevant for individuals attempting to alter health behaviors in which internal symptoms may not be readily identifiable and may lead to comparisons with others completing the same behavior.

Relevant Components of Social Comparison Theory

Several aspects of social comparisons may contribute to the affective and behavioral responses that occur after comparing oneself. First, the *dimension* of SC refers to the specific attribute that is being compared, such as athletic ability or musical proficiency. Comparisons made on dimensions that are important to the individual are more likely to elicit affective, cognitive and behavioral responses than are irrelevant dimensions (Arigo, Suls, & Smyth, 2012).

Second is the *direction* of SC. Comparison "targets," or the individuals against whom the comparisons are made, may be perceived to be better off than the self (upward SC), worse off (downward SC), or the same as the self (lateral SC) on a given dimension. Perceptions of the self as performing better or worse relative to another individual can have distinct effects on affective and behavioral responses. Wills (1981) proposed an implicit directionality component within the comparison process, suggesting that individuals in threatening and stress-inducing environments are more inclined to compare themselves to less-fortunate others: a *downward comparison* (Wills, 1981). Support for the use of directionality as a central tenet in social comparative processes arises through research with chronically ill individuals. Research asserts that ill individuals will use downward comparisons with less-fortunate others to reduce emotional distress associated

with the illness (Gibbons & Gerrard, 1991). Taylor and Lobel (1989) posit that downward SC aids emotion regulation by allowing an individual to feel better than the comparison target, conversely upward comparisons augment problem-solving efforts by providing information on the comparison domain (e.g. coping behaviors; Taylor & Lobel, 1989). It is further asserted that individuals derive comfort from downward comparisons and coping information from upward comparisons, particularly in conditions in which improvement is likely (Buunk & van Yperen, 1989).

Finally, it has been proposed that *social comparison orientation* (SCO), or an individual's dispositional tendency to engage in comparisons, may exert a strong influence in the prediction of behavior intention above and beyond the direction of comparison (Gibbons & Buunk, 1999). It is suggested that individuals who attend more frequently to comparison information report stronger responses in affect, behaviors and quality of life in the direction of the comparison (Buunk et al., 2012). The SCO construct may be particularly useful in the assessment of individual differences in populations in which an ambiguous or stress-inducing behavior encourages frequent SC (Gibbons & Buunk, 1999).

Indeed, the high frequency and wide range of potentially ambiguous contexts in which individuals must make health-related decisions may render the SCO construct amenable to PA prediction. Luszczynska and colleagues (2004) assessed SCO patterns amongst adolescents in the U.S., Turkey, Poland and Hungary. The authors demonstrated that adolescents high in SCO were more likely to engage in physical activity and healthy diet behaviors as a result of an increased tendency to perceive peers' healthful behaviors (Luszczynska, Gibbons, Piko, & Tekozel, 2004). While the authors did not address the

specific direction of comparisons, it is posited that a strong drive to compare oneself is associated with behavioral outcomes. Moreover, SCO has been demonstrated to play a significant role in the adoption of other health-promoting behaviors, including HIV preventative behaviors (Misovich, Fisher, & Fisher, 1997), and has been linked to engagement in health-compromising behaviors (Gibbons & Gerrard, 1997)

Furthermore, a strong desire to engage in SC is associated with general depressive symptoms, psychological distress and lower-self-efficacy (Bennenbroek, Buunk, van der Zee, & Grol, 2002; Morse & Gergen, 1970), each of which may impact PA consistency. Buunk et al. (2001) examined affective consequences related to professional burnout and social comparison orientation to other professionals. Individuals high in SCO engaged primarily in upward comparisons, regardless of their level of burnout. When comparing downwards, individuals high in SCO exhibited greater levels of negative affect and higher levels of professional burnout (Buunk, Ybema, Gibbons, & Ipenburg, 2001). Thus far, SCO has been assessed in relation to life satisfaction (Schneider & Schupp, 2014), quality of life in cancer patients (Brakel, Dijkstra, & Buunk, 2012), and health perceptions following spinal cord injuries (Buunk, Zurriaga, Gonzalez, Terol, & Roig, 2006). The reported literature demonstrates significant associations between SCO and affective and behavioral outcomes. However, the effects of SCO vary across comparison dimensions and populations as SCO interacts with comparison direction and other cognitive variables. The findings demonstrate the need for greater exploration of this construct as a precipitant of PA consistency.

Social Comparison as a Determinant of Physical Activity Consistency

While the construct of SC has yet to be directly assessed in terms of PA consistency, parallels may be drawn from research on PA engagement and other health behaviors. For example, it has been asserted that comparative factors including SC cognitions and internalized sociocultural pressures impact the development of subjective body image disturbance and compensatory dietary habits, while controlling for both self-esteem and obesity (Corning, Krumm, & Smitham, 2006; Stormer & Thompson, 1996). Indeed, research suggests that comparative processes afford information with which to develop appearance beliefs (Fitzsimmons-Craft, Harney, Brownstone, Higgins, & Bardone-Cone, 2012). Exposure to momentary upward appearance comparisons induced increased body dissatisfaction beliefs and thoughts of weight-loss in a female sample. Moreover, compensatory dieting behaviors were observed post-comparison in individuals reporting eating disorder pathology (Leahey, Crowther, & Ciesla, 2011). Schachter (1971) further identified that obese individuals pay greater attention to general environmental cues and demonstrate increased sensitivity to food-related comparisons (Schachter, 1971). These findings suggest that SC processes may engender the translation of environmental cues into affective and behavioral responding in both dietary and appearance-oriented domains.

A breadth of social comparative literature has focused on the development of illness beliefs (Tennen et al., 2000). After receiving a cancer diagnosis, individuals may compare themselves to others possessing emotional and behavioral stability and positive coping strategies in order to garner information about performing well in these domains (Buunk, Collins, Taylor, Van Yperen, & Dakof, 1990). Therefore, the development of beliefs about illness and behavioral management strategies may be derived from

observations of others. In PA terms, individuals may identify others that they perceive are performing PA behaviors 'well' to enable the development, assimilation and perhaps re-evaluation of their own PA beliefs and performance.

It has been suggested that SC plays a prominent role in self-evaluations throughout situations in which objective measures of behavioral performance are also available (Klein, 1997). Klein (1997) provided an undergraduate sample with false comparative feedback about performance on a simple cognitive task. Each participant attained false scores of either 40% or 60% on the task and received information that the attained score was above or below average (Klein, 1997). Subsequent performance on the cognitive task reflected attention to comparison information rather than a dependency on objective task ability (Klein, 1997). Specifically, research suggests that SC direction may play a pivotal role in the maintenance of PA and dietary behaviors. Mahler, Kulik and Tarazi (1999) assessed prospective low-fat diet and exercise engagement in a sample undergoing coronary artery bypass surgery. Videos of upward, downward and control comparisons were shown prior to hospital release. The results demonstrate that relative to controls, individuals who received upward and downward comparison information reported significantly lower dietary fat intake one-month post-surgery (Mahler, Kulik, & Tarazi, 1999). Further, individuals who received downward comparison information reported more frequent exercise engagement at one- and three-months post-surgery (Mahler et al., 1999). These findings demonstrate that SC may impact current and future behavior performance; specifically, downward comparisons may elicit more frequent engagement in PA behaviors across time.

While there is strong support for the relationship between SC processes and health behavior engagement, this relationship is likely impacted by other cognitive correlates. The next section discusses these cognitive factors in order to inform hypotheses about additional domains that may impact PA consistency.

Interaction between Motivation and Direction of Social Comparison

Research demonstrates links between cognitive predictors of behavior adherence and lapses in behavior, including self-efficacy and motivation. For example, it is suggested that the directionality of comparisons is frequently determined by the individual's motivation to engage in the health behavior. In a sample of individuals with type 1 and type 2 diabetes, participants who were motivated to promote positive health outcomes responded favorably to upward SC targets while those motivated to prevent negative outcomes responded strongly to downward comparisons (Schokker et al., 2010). In its simplest form, motivation means to be *moved or activated* to meet an end goal (Ryan & Deci, 2000). Motivation may be further broken down into *level* (i.e. how much) and *orientation* (i.e. what type) of motivation. Globally, motivation to complete a task may be have *intrinsic* and *extrinsic* determinants (Ryan & Deci, 2000), both of which have been addressed within the SC literature.

Breadths of studies have suggested that the impact of SC on behavior intention may predict global health behaviors, given the strong links between comparison motivation and behavioral action (Arigo et al., 2012; Falomir-Pichastor, Berent, & Pereira, 2013). Bailis and Segall (2004) assessed prospective wellness-center membership with the goal of addressing the interaction between motivational factors and SC cognitions. Self-report data demonstrated that internally-derived motivation predicted

longevity of membership and reduced the impact of negative upward comparisons on self-efficacy. Respondents aspiring to improve health behavior engagement were less inclined to engage in esteem maintenance and self-evaluative SC, while a broad trend to engage in self-improvement comparisons was observed (Bailis & Segall, 2004). The authors assert that upward SC to an individual who performs better than oneself tends to lower one's self-efficacy and will inevitably become a barrier to the maintenance of health behaviors (Bailis & Segall, 2004). This study illustrates the importance of the motivational context in which comparisons occur.

Nascent literature exploring behavioral self-evaluations has focused on qualitative assessments of social comparative processes. One such study aimed to uncover the function that SC serves in self-management behaviors among older adults with type 2 diabetes. Utilizing a predominantly African-American sample, semi-structured interviews were administered at a single time point (Gorawara-Bhat, Huang, & Chin, 2008). Individuals who described "external motivations" for SC (i.e. using similar others to gauge health goals and to gain knowledge) reported monitoring their blood-glucose, following a diet and engaging in PA more frequently than "internally motivated" (i.e. setting self-enhancement goals without comparison to similar others) individuals. The majority of externally motivated participants reported using downward SC to evaluate their self-management skills, while upward comparisons were rarely invoked (Gorawara-Bhat et al., 2008).

The impact of motivation on PA has been well-studied in a variety of populations. Importantly, intrinsic, or autonomous, motivation has been used to predict PA and exercise maintenance in normative adult (Marcus et al., 2000), older adult (Sabin, 2005),

and chronically-ill populations (Sweet et al., 2009). Associations between motivation to regulate PA behavior and socially-oriented cognitions have been observed, including the drive for social recognition and motivation to promote outward physical appearances to others (Ingledew, 2009). Given the relationship between SC and motivation, and the significant impact of motivation on PA consistency, this interaction warrants investigation.

Interaction between Self-efficacy and Social Comparison

Self-efficacy is defined as the extent to which an individual feels confident and capable of performing a given behavior within a specific context (Bandura, 1977), and has been connected to SC processes. Wood, Taylor and Lichtman (1985) demonstrated that breast cancer sufferers will compare themselves to hypothetical individuals that they perceive to be coping poorly with their diagnosis. The authors assert that SC may act as a mechanism to improve self-efficacy about illness-coping when comparative targets are lacking (Wood, Taylor, & Lichtman, 1985). Further, it is posited that individuals suffering from chronic illnesses, such as rheumatoid arthritis, may look to others they perceive to be 'worse-off' than themselves to bolster self-efficacy about their illness symptoms and coping skills (Arigo et al., 2012). The authors suggest that the level of perceived controllability of illness trajectory impacts the direction of SC individuals engage in and illness-specific self-efficacy. Additionally, Datta and Kulik (2012) assessed female college exercisers use of exercise machines across three comparison conditions: fit peer, un-fit peer, no peer. The authors identified that participants exposed to an un-fit (or downward) comparison took less time to approach each exercise machine,

suggesting that comparisons may cause a fluctuation in exercise self-efficacy as a correlate of the comparison direction (Datta & Kulik, 2012).

Self-efficacy has been identified as the most significant psychosocial predictor of PA maintenance (Crain et al., 2010; Nigg, Borrelli, Maddock, & Dishman, 2008). Low levels of PA self-efficacy are found to be strongly associated with inconsistency in PA in normative (Sallis et al., 1990; Sullum, Clark, & King, 2000) and chronically-ill samples (Bock et al., 1997). Further, self-efficacy has shown significant predictive utility for the initiation and maintenance of PA, and is the most consistent correlate of PA outcomes (Trost et al., 2002). The mechanism by which self-efficacy influences PA outcomes and comparative tendencies requires further distinction.

Interaction between Affect and Social Comparison

The contribution of an individual's affective state to health behavior engagement via SC processes is worth noting, although it will not be the primary focus of this study. Petersen and Ritz (2010) compared implicit response times between individuals with and without asthma and indicated that negative affective evaluation of asthma occurs in the presence of SC. Negative affective evaluation of asthma occurs when individuals utilize lateral SC and when individuals do not have implicit access to salient SC information (Petersen & Ritz, 2010). Furthermore, in the presence of downward SC, assessment of affective responses to asthma resulted in a positive bias in the attitude of asthma sufferers toward their symptoms. The authors concluded that context cues, such as SC, impact illness attitudes and affective responses (Petersen & Ritz, 2010).

Buunk et al. (2012) assessed longitudinal quality of life after exposure to an affect-provoking video and an informative coping video in individuals with a recent

cancer diagnosis. Notably, increasing inclination to socially compare oneself to others led to higher quality of life post-comparison condition and decreased quality of life post-emotion condition at a three-month follow up (Buunk et al., 2012). Moreover, it was identified that coping information, but not emotional comparison information, may impact quality of life over a prolonged period of time, depending on the SC inclination of the patient (Buunk et al., 2012). It is believed that affective responses to SC information may impact quality of life and attitudes toward given behaviors (such as PA) post-comparison.

Gender and Social Comparison

A further avenue for exploration is the investigation of SC influences on PA behaviors by gender. Thus far, gender differences have been observed in both engagement in SC and in general PA patterns (Bailis & Segall, 2004). It has been suggested that women engage more frequently in SC, particularly in appearance and eating habit domains (Heinberg & Thompson, 1992). While differences in SCO have not been observed, a sex difference has emerged in the frequency of negative health outcomes after SC: women report three times the rates of negative outcomes post-comparison than men (Bailis & Segall, 2004). It may therefore be possible to determine whether gender differences occur in PA behaviors as a result of distinct social comparative processes between men and women.

Summary of the Literature

The aforementioned applications of SC theory indicate that comparisons can elicit meaningful behavioral consequences. Further, the consequence of a given comparison may be impacted by multiple factors, including: (1) SC dimension (i.e. comparing oneself

to others in a specific domain), (2) SC direction (i.e. upward, downward, lateral), (3) SC orientation (i.e. trait drive to compare oneself) and (4) additional cognitive factors (i.e. self-efficacy and motivation). Relationships between these factors have been demonstrated within a broad range of health behaviors, including PA and exercise. However, the relationship between these variables and PA consistency has yet to be addressed.

Many questions remain unanswered by the extant literature. It has yet to be identified how frequently individuals compare themselves to others while engaging in PA, and in what direction the majority of SC occurs across PA types. SC direction and SCO have yet to be addressed in regard to consistency of PA, specifically when accounting for gender differences in PA and SC engagement.

Purpose of the Present Study

Escalating rates of obesity and chronic-illness are believed to coincide with rising rates of physical inactivity within the U.S. Research demonstrates that it is important to maintain consistency in PA in order to attain the positive health effects associated with PA behaviors (Brown et al., 2003; Haskell et al., 2007; Warburton, Nicol, & Bredin, 2006). However, studies have identified that intermittent PA is often the rule rather than the exception for community members (Linke et al., 2011). Extending our knowledge of SC processes to understand factors that underlie PA consistency may contribute to the improvement of interventions targeting PA maintenance. An important next step in the investigation of these relationships is to conduct a study that captures each SC variable and explores the previously described interactions within a population attempting to maintain consistent PA. Thus, the current study attempts to achieve this goal by

following procedures outlined in a PA-based study by Bailis et al. (2004). Specifically, both SCO and SC direction will be addressed as contributors to PA consistency within a population of community wellness-center members. Further, this study examines whether PA-specific self-efficacy and motivation to complete PA interact with SC direction and SCO in regard to PA consistency outcomes. This is the first known study to assess both SCO and SC direction within a health behavior domain.

Research Questions and Hypotheses

Drawing from unexplained areas within the literature, the present study attempts to answer the following research questions:

1. How often do people compare themselves to others engaging in PA?

Hypothesis 1: Thus far, frequency of PA-based comparisons has been addressed using Likert scales ranging from 'Never' to 'Always.' Using this Likert scale range, 'often' is frequently identified as the modal response (Bailis & Segall, 2004). However, the specific quantity of comparisons has yet to be assessed. Based on the aforementioned Likert ratings, it is believed that individuals will endorse engaging in comparisons at least one time per PA period.

2. In what direction does SC most frequently occur and how does the direction of SC relate to consistency of PA?

Hypothesis 2: Based on previous research, it is believed that upward and lateral comparisons will be most commonly evoked, with fewer participants endorsing engagement in downward comparisons (Bailis & Segall, 2004). However, it is believed that downward comparisons may exhibit a stronger association with engagement in consistent PA (i.e. fewer PA slips; Mahler et al., 1999).

3. How does SCO relate to PA consistency?

Hypothesis 3: Within the SCO literature, it has been identified that individuals endorsing high SCO tend to experience greater negative affective and behavioral outcomes following the comparisons (Gibbons & Buunk, 1999). Thus, it is posited that individuals with high SCO will demonstrate less consistent PA, or more frequent slips in PA.

4. Are there identifiable gender differences in the rates of comparison, SC direction and SCO? If so, how do these differences relate to PA consistency?

Hypothesis 4: It is hypothesized that gender differences will emerge in the rates and direction of SC, with women using upward comparisons more frequently than their male counterparts. It is also believed that gender differences may emerge in the impact of SCO and SC frequency on PA consistency. It is posited that SCO and comparison frequency may have a greater impact on PA consistency in women.

5. How do gender, SCO and SC direction interact in association with PA consistency, after controlling for PA self-efficacy and PA motivation?

Hypothesis 5: The interaction between SC direction and SCO has yet to receive empirical attention in regard to PA consistency. As a result, it is unclear how these constructs will interact, although it is believed that individuals endorsing low SCO will demonstrate the most consistent activity patterns regardless of comparison direction. Conversely, it is believed that individuals exhibiting high SCO will demonstrate less PA consistency depending on the direction of comparison they frequently engage in. For example, individuals reporting high SCO who frequently engage in upward comparisons may demonstrate the most inconsistent patterns of PA while individuals high in SCO who

engage in downward comparisons may exhibit greater consistency in PA. It is further hypothesized that gender may alter the relationship between SC and PA consistency, with men displaying greater PA consistency regardless of SCO and SC direction. Additionally, it is believed that PA consistency differences between SC direction groups will remain significant even after controlling for the covariates PA self-efficacy and PA motivation.

6. What variables have the strongest unique predictive value on PA consistency?

Hypothesis 6: The variables to be examined include SC direction, frequency of SC, SCO, PA self-efficacy and PA motivation. It is hypothesized that PA self-efficacy will emerge as the strongest predictor of PA consistency for both genders; however it is believed that the SC constructs will contribute significantly to this predictive model.

METHOD

Participants. Participants were adult exercisers recruited from one of four community YMCA facilities in Louisville, Kentucky. Inclusion criteria were as follows: Participants must be 21 years old or older, able to independently provide full written informed consent, have adequate English proficiency, and must be using the exercise facility for the purpose of PA. Exclusionary criteria include: a cardiac event or myocardial infarction within the past six months, a significant upper or lower body surgery causing inability to engage in PA for greater than one week within the past six months, and significant illness, mental or physical disability/impairment preventing engagement in PA and completion of self-report measures.

Procedure. Participants were approached as they were entering or leaving the YMCA facility and were asked to participate in an online research study assessing PA behaviors. An overview of the study was provided and individuals were screened for eligibility. Informed consent was obtained from all eligible participants. Anthropomorphic data was collected including the participants' height and weight after the consent process had occurred. Following this, all participants were asked to provide an email address to which an email would be sent containing a link to the online questionnaires. Participants were notified that they would be given an individual identification number so that the information they provided through the online portal would be anonymous. Participants were further notified that completion of the online

questionnaires would allow them entrance into a random lottery drawing, and the chosen participant (as matched to the subject number) would receive a $150 gift card.

Measures. The selected measures were used to assess the cross-sectional relationships between SC direction, SCO and the PA consistency. PA-specific measures of the cognitive variables (i.e. self-efficacy, motivation) were also administered.

General Background/Demographic Measure. Participants completed a brief demographic questionnaire assessing age, gender, ethnicity, years of education, income level, occupation, and relationship status.

Body Mass Index. Anthropomorphic measures were assessed using height (in inches) and weight (in pounds) measurements in order to calculate body mass index (BMI) using the Imperial BMI formula. The BMI outcomes were characterized using the World Health Organization's obesity classifications (World Health Organization, 2000): Class I (BMI 30.00 to 34.99),

Class II (BMI 35.00 to 39.99), and Class III (BMI $\geq$ 40). Additional classifications include Overweight or Pre-Obese (BMI 25.00 to 29.99), and Normal range (BMI 18.50 to 24.99).

Physical Activity Status. Based on the CDC guidelines (i.e. moderate intensity activity for 150 minutes per week; CDC/ACSM, 1995), PA status was determined using a categorical variable to classify participants into those who adhere to the recommendations and those who do not (nonadherence). This PA status variable was assessed using the Rapid Assessment Physical Activity Scale (RAPA; University of Washington, 2014). The scale consists of nine dichotomous yes/no items assessing a wide range of PA engagement, including sedentary to vigorous activity, strength and flexibility training. Participants answer each item in correspondence with their perceived activity

level to obtain a cumulative total score. A score of less than 6 is considered to be suboptimal PA engagement (nonadherence), and while a score greater than 6 meets criteria for adherence to CDC/ACSM PA guidelines (adherence; University of Washington, 2014).

The scale was developed for use in primary care settings as a rapid assessment of PA engagement, and has been demonstrated to compare well to longer measures of PA. Glasgow and colleagues (2005) conducted an extensive literature review and expert panel discussion regarding the utility of widely used PA assessment measures. They concluded that the RAPA provided strong empirical validity and reliability, change sensitivity and was particularly practical for practice-based research in adult populations (Glasgow, 2005). Further, the RAPA outperformed two widely used measures of PA engagement in predictive value and discriminant analyses (Topolski et al., 2006).

Physical Activity Consistency. Consistent with previous research (Stetson et al., 2005), two items were used to determine slips in PA: participants were asked to report how frequently they had *planned* to engage in PA over the *past two weeks* and how many of the planned PA sessions they had *completed.* To account for unplanned PA, a separate item asked participants to recall how frequently they had engaged in *unplanned PA.* Within the study, the frequency of slips was identified by calculating the difference between the self-reported number of planned PA sessions per week over the past month and the self-reported number of sessions completed. Thus, a continuous PA omission score was obtained.

Previous Physical Activity Consistency. Self-reported current and historical patterns of PA consistency were assessed using individual items based on Sallis and

colleagues' (1990) widely supported description of relapse behavior. Based on these definitions, a relapse was identified as a three month period without PA after having completed 12 months of consistent exercise prior to relapse (Sallis et al., 1990). Additionally, a lapse in PA was defined as two weeks of missed PA sessions within a three month period (Sallis et al., 1990).

Psychosocial Measures

Physical Activity self-efficacy. PA self-efficacy was assessed using the Exercise Confidence Scale (ECS), which has established strong construct validity (Sallis, Pinski, Grossman, Patterson, & Nader, 1988). Items are rated for the degree of confidence individuals have that they can engage in PA in a variety of situations, using a one to five point Likert scale, ranging from "not at all" to "extremely confident." The survey assesses self-efficacy to overcome barriers to exercise/PA completion, and reflects a two-factor structure including PA maintenance and time management for PA (Calfas, Sallis, Oldenburg, & French, 1997). Within a population of undergraduate and community participants, the measure demonstrated good internal consistency (Cronbach's alpha = 0.85) and adequate test-retest reliability (Factor = 0.68; Sallis et al., 1988). A continuous outcome score summing Likert ratings was used as a measure of relative PA self-efficacy.

Motivation for Physical Activity. Assessment of motivation specific to PA was conducted using the Exercise Motivation Scale (EMS; Li, 1999). This 31-item assessment tool was developed to measure the motives behind engagement in PA and exercise and comprises eight health-related subscales. The subscales include items related to a range of motives for PA, for example PA enjoyment, social recognition, health

pressures and weight management. The scale uses Likert rating items to assess whether the respondent "agrees" with each statement; ranging from 1 (strongly disagree) through 6 (strongly agree). The EMS has demonstrated adequate support for the eight-factor structure, acceptable test-retest reliability and nomological validity (Li, 1999).

Social Comparison construct measures

Social Comparison Orientation. SCO was assessed using an 11-item validated measure titled the Iowa-Netherlands Comparison Orientation Measure (INCOM; Gibbons & Buunk, 1999). The INCOM has been frequently used to assess the SCO construct and provides an ecological assessment of subjective preference toward comparative evaluations (Gibbons & Buunk, 1999). Factor analyses in samples within both the U.S and the Netherlands identified a two-factor structure incorporating performance-related comparison and opinion-related comparison. The measure has demonstrated adequate internal consistency and reliability (Cronbach's $\alpha = .83$), while adequate construct and discriminant validity have been reported (Gibbons & Buunk, 1999). The INCOM has been incorporated into the measurement of relationships between SCO and life satisfaction (Schneider & Schupp, 2014), quality of life in cancer patients (Brakel et al., 2012), and health perceptions following spinal cord injuries (Buunk et al., 2006). Furthermore, the INCOM has been successfully used to identify links between SCO and health behaviors including dietary habits and physical activity (Luszczynska et al., 2004) and eating disordered behaviors (Fitzsimmons-Craft et al., 2012).

Social Comparison Direction. SC *direction* was assessed in accordance with the method utilized by Bailis and Segall. (2004). In their study, the authors defined SC as the act of "noticing others who are engaged in a similar pursuit and thinking about your own performance in relation to those others." To address SC *direction*, respondents were

asked with whom they typically compare themselves: comparison to someone who appears to be "doing better", "worse" or "about the same" as they are. *Frequency* of the reported comparisons was assessed in two ways: first, a single Likert item asking how often the respondent makes this kind of comparison was presented, with the following response options: 1 (all or nearly all the time), 2 (often), 3 (sometimes), 4 (rarely), and 5 (never). Second, respondents were also asked to report the frequency that they engage in SC during each PA session; ranging from "never" to "more than five times per session." This allowed for the assessment of broad tendencies of comparison and specific comparison frequencies (e.g. numerical frequency).

Despite strong support for the utility of social comparative constructs in behavior construal, a primary critique of the application of SC to health behaviors is the predominant use of static, forced-choice SC information (e.g. behavioral vignettes with pre-determined comparison directions). It has been suggested that these findings may not provide adequate ecological validity (Arigo et al., 2012; Bandura & Jourden, 1991). Empirical support for self-selection of comparison targets is sparse, with limited exploration of the means by which individual differences contribute to target selection and comparison information intake (Arigo et al., 2012). Given the novel application of the SC construct to the measurement of PA consistency, exploration of SC direction was assessed through the aforementioned self-selection items to overcome the limitations inherent to forced-choice directions.

Statistical Approach

Statistical Analyses for Description and Comparison

In order to characterize the sample, a number of descriptive and univariate

analyses were conducted using SPSS software version 22 (IBM Corp, 2014). Descriptive statistics (e.g. mean, median, mode, standard deviation, frequency, etc.) were used to analyze (1) demographic characteristics, (2) SC characteristics (e.g. frequency of direction, SCO mean), (3) BMI and PA characteristics, (4) psychosocial characteristics (e.g. mean PA self-efficacy score), and to check for outliers, implausible means and standard deviations, and out of range variables. Outliers were not detected once data input had been cleaned, meaning that all data were retained to the greatest extent possible. Binomial tests, such as Chi-square, were utilized to explore relationships between multiple discrete variables. Analyses of Variance (ANOVAs) and independent sample t-tests were used to compare means of continuous variables across grouped or dichotomized variables (such as PA slips by gender). Additionally, parametric correlation statistics (Pearson's correlations) were used to assess associations between continuous variables. Test statistics with an associated alpha level of .05 or less were regarded as statistically significant.

Statistical Analyses for Hypothesis Testing

The primary aim of this study was exploratory in nature: to examine direct relationships between SC constructs, gender and PA consistency, as defined by the frequency of PA slips individuals report experiencing. Further, descriptive analyses assessing basal frequency of PA slips, engagement in specific SC directions and trait tendency to compare (SCO) were explored given the novel application of the Social Comparison Theory to PA consistency.

Hypothesis 1 (H1): It is believed that the majority of individuals will endorse engaging in comparisons at least one time per PA period.

Comparison frequency is reported as an averaged descriptive variable and assessed using the aforementioned Likert items.

Hypothesis 2 (H2): It is hypothesized that upward and lateral comparisons will be most commonly endorsed. However, it is hypothesized that downward comparisons will demonstrate a stronger association with consistency of PA (i.e. fewer PA slips).

Frequency of each SC direction is reported as a descriptive variable, while an Analysis of Variance (ANOVA) was used to examine the relationships between the direction of comparison and slips in PA behaviors.

Hypothesis 3 (H3): It is hypothesized that individuals with high SCO will demonstrate less consistent PA, or more frequent slips in PA.

A mean split was used to categorize individuals into high and low SC orientations, a method that is suggested by the developers of the INCOM (Gibbons & Buunk, 1999). Pearson's correlations were used to examine the relationship between continuous SCO scores and slips in PA behaviors while an independent samples t-test was used to assess the impact of high and low tendency to compare oneself (SCO) on PA slips.

Hypothesis 4 (H4): It is hypothesized that gender differences will emerge in the rates and direction of SC, with women using upward comparisons more frequently than their male counterparts. Gender differences are also expected in the frequency of SC and SCO scores.

Independent t-tests and chi-square analyses were conducted to identify gender differences in the frequency of comparisons, SC direction and SCO (categorized into high and low groupings).

Hypothesis 5 (H5): Individuals exhibiting high SCO will demonstrate less PA consistency depending on the direction of comparison; individuals reporting high SCO who engage in upward comparisons will demonstrate the most inconsistent PA patterns. It is further hypothesized that men will display greater PA consistency regardless of SCO or SC direction.

An Analysis of Covariance (ANCOVA) was used to examine differences in PA consistency (assessed as the frequency of PA slips) within a 2x2x2 design: gender x SC direction (upward and lateral) x SCO. Participants were categorized into SC direction groups based on the SC direction they reported engaging in most frequently. Levene's test demonstrated that equality of variance between groups was not assumed when all three SC directions were entered into the analysis. However, removal of the individuals who self-selected the downward comparison group (n = 5) allowed for the equality of variances assumption to be met between the lateral and upward SC groups. Frequency of PA, PA self-efficacy and PA motivation entered into the ANCOVA as covariates. Upon inspection, both PA self-efficacy and PA motivation scores were significantly skewed; therefore these variables were transformed to achieve normality within the distributions prior to use within the analysis. All other statistical assumptions were met. To further explore group differences, estimated means contrasts are reported, according to the method outlined by Field (2013).

Hypothesis 6 (H6): PA self-efficacy will emerge as the strongest predictor of PA consistency across genders, although it is believed that SC direction and SCO will contribute significantly to the regression model.

A hierarchical regression analysis was used to test which variables are unique and significant predictors of PA slips. Based on their associations with SC constructs or relevant PA variables, age and gender were entered into the first block of the regression model. Frequency of PA, PA self-efficacy, and PA motivation were entered as a second block within the regression model (after transformation to improve distribution normality) in order to control for the effect of these predictors on PA slips. The predictor variables SCO, SC frequency and SC direction (as a dummy coded variable) were entered into the third block of the regression model. As recommended by Aiken and West (1991), continuous predictor and control variables were centered (standardized) for use in the regression analyses (Aiken & West, 1991). Although more variables could have been entered into the regression analyses as predictors, in order to avoid Type I error rate, a smaller subset (the eight named above) of variables were chosen as likely predictors and control variables.

Power Analyses

Based upon the power tables constructed by Cohen (1992) and use of G*Power statistical software (Faul et al., 2009), a minimum of 128 subjects would be needed to provide 80% power for the detection of a medium effect size (0.25) at a significance level of .05, using an ANCOVA with a total of 3 independent variables (2x2x2 design including 3 covariates). Fewer participants were required to perform the regression analysis, t-test and correlation associations at the aforementioned power level and effect size. The number of participants providing valid data exceeded 128 for all analyses. Therefore, the study was adequately powered (.83) to detect a medium effect size with 95% confidence.

RESULTS

The following section describes study participants, response rates and descriptive analyses. The results of the outlined statistical plan for the study's six hypotheses will be discussed with emphasis on hypotheses that required adjusted statistical plans.

Participant Characteristics

This section presents participant characteristics ($N = 200$) including demographic data and response/completion rates for measures.

Response Rates. Of the 279 individuals recruited, 200 completed the measures partially or fully for a response rate of 71.7%. Table 2 reflects response rates for individual sites; 80.4% ($n = 41$) for the Southwest YMCA, 75.4% ($n = 49$) for the Northeast YMCA, 69.0% ($n = 98$) for the Downtown YMCA and 57.1% ($n = 12$) for the Norton Commons YMCA. Table 1 reports overall recruitment by site.

Completion Rates for Social Comparison, Physical Activity and Psychosocial Measures. Table 2 is a summary of response rates to the measures employed in the study. Participants' completion rates for self-report measures ranged from 79.5 to 91.0%. Response rates did not differ by gender, ethnicity or by site. Completion of the single item assessing SC direction yielded a response rate of 82.5%. Response rates to specific measures along with measure reliability (Cronbach's alpha) may be found in Table 2.

Sample Demographics. Participant demographic characteristics are reported by site in Table 3. Participants differed across sites by age ($F(3, 187) = 5.30$, $p < .05$), although significant differences were not observed across other demographic

characteristics. All study analyses were conducted on data pooled from all recruitment sites. Table 4 summarizes the demographic characteristics of the sample. Participants were predominantly white (82.4%), middle-aged (41-65 years; 46.8%), employed full-time (71.7%), highly educated (some college through graduate degree: 95.8%) and had household incomes above $60,000 (60.9%).

Gender Differences. Gender differences were observed across descriptive and physical activity variables. Women were more likely to be younger ($t(161) = 2.60$, $p = .012$) and to have been engaged in consistent PA for less time ($t(160) = 2.07$, $p = .039$) than their male counterparts. Significant gender differences were not observed across other demographic or independent variables (see Tables 9 and 16).

Ethnicity Differences. Given the limited ethnic diversity within the sample, and the community as a whole, differences between African-American and White American participants were assessed. Relative to their White counterparts, African-Americans had significantly higher BMI's ($t(168) = 2.917$, $p < .01$) and reported fewer planned PA sessions per two-week period ($t(171) = -2.53$, $p = .01$). White American and African-American individuals did not differ on other demographic, PA or SC-related outcomes.

Body Mass Index Differences. Participants were categorized into BMI groupings according to the World Health Organization's (WHO) ascribed BMI groups (World Health Organization, 2000). Between-group comparisons revealed significant differences in the frequency of PA engagement ($F(5, 167) = 2.49$, $p = .045$) and length of time spent as a consistent exerciser ($F(5, 172) = 12.14$, $p < .01$; see Table 13 for ANOVA results). Other demographic factors, frequency of PA slips and SC variables did not differ by BMI group.

Socioeconomic Status Differences. Descriptive and PA differences based upon income and education level were assessed within the sample. In comparison to participants with a lower income level, participants with combined household incomes of greater than 60,000 were more likely to be older ($t(171) = 2.721$, $p < .05$) and to have spent longer in education ($t(171) = 2.354$, $p = .02$). Although it did not reach statistical significance, differences were also noted in BMI scores across groups; individuals receiving greater incomes demonstrated a trend toward lower BMI scores ($t(171) = -1.640$, $p = .10$). Participants with greater than 13 years of education endorsed more frequent planned PA in a two-week period ($t(178) = 2.535$, $p = .01$) and more frequent engagement in PA ($t(178) = 2.203$, $p = .03$). Additional SC and PA variables did not differ by income or education level.

Health Status. Table 7 summarizes the health characteristics present in the study sample. Participants were primarily non-smokers (95.1%) and overweight (*M* BMI= 27.61, *SD* = 6.06), with 22.1% of the present sample falling within the obese (BMI obese I through III) weight range. Table 7 also presents data for the frequency of chronic health conditions among participants. A significant proportion of participants endorsed experiencing some form of chronic health condition (37.6%), with 5.3% of the sample reporting two or more chronic illnesses. While significant chronic health conditions can interfere with physical activity consistency, the present study aimed to obtain a heterogeneous sample that would be representative of community exercisers' attempts to maintain consistent physical activity. Therefore, variability within the sample is considered reflective of the population at large.

Endorsement of specific chronic health conditions was apparently lower than rates of chronic illness within Kentucky. Sample descriptives deviated from population-based norms by obesity (22.1% sample vs. 31.3% regionally), diabetes (4.2% sample vs. 10.7% regionally), and coronary heart disease (3.0% sample vs. 6.1% regionally) dimensions. Further, 29.7% of Kentuckians report limited participation in any form of PA, with level of physical inactivity increasing by age, lower SES, income and education levels (KDPH & CDC, 2012). It is believed that these results are reflective of general health awareness and the physical activity status of this sample relative to general Kentucky norms.

Primary Study Variables

Physical Activity Characteristics

Physical Activity Descriptors. Participants' physical activity descriptors are presented in Table 8. Drawing from self-reported physical activity scores on the RAPA, 87.0% of participants met CDC/ACSM physical activity guidelines. Participants generally reported that they regularly engage in PA (98.9%) and had maintained consistent PA over the past 5 years (61%). Overall, participants reported experiencing lapses (23.7%) and relapses (20.8%) infrequently. Relative to regional samples of community individuals, participants in this sample demonstrated greater adherence to PA guidelines and reported more frequent engagement in PA sessions (KDPH & CDC, 2012).

Physical Activity Slips. On average, participants reported experiencing PA slips (planned minus completed PA sessions) approximately once over the two-weeks prior to questionnaire completion (M = 1.16, SD = 2.75) and planned to participate in nine PA sessions over the two-week period (M = 9.17, SD = 3.43). The modal number of

endorsed PA slips was 0 (n = 56, 31.3%). Valid data points ranged from -9 to 14 slips, signifying that some individuals engaged in more frequent PA than they had originally planned. All data points were utilized in the study analyses to accurately depict PA consistency within the sample. Correlational analyses did not reveal significant associations between PA slips and continuous demographic, SC or PA variables.

Covariate Variable Characteristics

Physical Activity Self-Efficacy. PA self-efficacy was assessed using total scores on the Exercise Confidence Scale (ECS; Sallis et al., 1988). The present sample reported an average PA self-efficacy score (M = 54.12, SD = 7.14) that is somewhat higher than previously reported norms (M = 43.2, SD = 6.7; Sallis et al., 1988). Significant differences in PA self-efficacy were not observed between genders, ethnicities, BMI groups or by SC direction. However, a significant difference was observed between individuals with high and low trait tendencies to compare oneself (high/low SCO, see Table 11). Specifically, independent sample t-tests revealed that individuals with a strong tendency to compare themselves (high SCO) reported significantly lower PA self-efficacy (M =52.53, SD = 7.39) than individuals with a low tendency to compare themselves (M =56.38, SD = 6.07; $t(167)$ =13.10, $p < .01$).

Physical Activity Motivation. Motivation to engage in PA was assessed using total scores on the Exercise Motivation Scale (EMS; Li, 1999). Significant differences in PA motivation were not observed between genders, ethnicities, BMI groups or by SC direction. However, a significant difference was observed between individuals with high and low trait tendencies to compare oneself (high/low SCO, see Table 11). Independent sample t-tests revealed that individuals with a strong tendency to compare themselves

(high SCO) reported significantly higher motivation to engage in PA (M =130.47, SD = 14.71) than individuals with a low tendency to compare themselves (M = 124.37, SD = 15.15; $t(149) = 6.14$, $p = .01$).

Social Comparison Variables

Social Comparison Direction. In order to understand the composition of upward (n = 96), lateral (n = 64) and downward (n = 5) SC direction groups, demographic and activity characteristics of individuals within these groups were compared. Chi-square and ANOVA analyses did not reveal significant differences by ethnicity, gender, education level, employment status, smoker status or activity history. Further, statistical differences between direction groups were not observed for SC and PA-related variables. The majority of individuals within the upward comparison group (n = 96) considered themselves to be regular exercisers (98.8%) and had maintained consistent PA for over five years (60%). Of the individuals within the lateral SC group (n = 64), 98.4% considered themselves to be regular exercisers, with the majority having maintained consistent PA for over five years (57.8%). Individuals within the downward SC group (n = 5) were primarily consistent exercisers (PA > 5 years; 60.0%), with 100% considering themselves to be regular exercisers. Information regarding the demographic and PA characteristics of each direction group can be found within Tables 5 and 10.

Social Comparison Orientation Descriptives. The demographic and activity characteristics of individuals endorsing high levels of trait comparison (high SCO; n = 96) and low levels of trait comparison (low SCO; n = 73) were explored. Chi-square, Fisher's Exact Tests (for analyses containing cells < 5) and t-test analyses did not reveal significant differences by ethnicity, gender, education level, employment status, smoker status or activity history. As previously noted, significant differences were observed

between high and low trait tendency to compare on both PA self-efficacy and PA motivation measures. Individuals within the high SCO group were primarily consistent exercisers (PA > 5 years; 61.1%), with 97.9% considering themselves to be regular exercisers. Of the individuals within the low SCO group, 100% considered themselves to be regular exercisers, with the majority having maintained consistent PA for over five years (59.5%). The demographic and activity characteristics of both groups (high/low) can be found in Tables 6 and 11.

Hypothesis Testing

Primary study variables were examined for their ranges, medians, modes, means, standard deviations, and item/measure response distribution. Variables were examined for missing data, outliers and distribution normality.

Hypothesis 1

Hypothesis 1 (H1): It is believed that the majority of individuals will endorse engaging in comparisons at least one time per PA period.

Frequency of reported comparisons was assessed in two ways: first, a single Likert item was presented asking how often the respondent makes this kind of comparison, with options ranging from 1 (all or nearly all the time) to 5 (never). A modal response of "sometimes" (n = 61, 35.7%) was obtained, with 28.1% of participants reporting engaging in SC "often" (n = 48). Second, respondents were also asked to report the frequency that they engage in SC during each PA session using Likert ratings ranging from "never" to "more than five times per session." A modal response of "I rarely compare myself" was obtained (n = 36, 20.9%) while 16.3% of participants reported that they "never" engage in SC (n = 28). The majority of individuals reported engaging in SC

less than one time per session (n = 90; 52.3%). Of those who do engage in SC, frequency groups were collapsed to distinguish between those who do not compare at least once per PA session and those who do. Results demonstrated that the majority of participants who engage in SC do so at least one time per PA session (n = 82, 56.9%), providing partial support for H1 (see Table 14).

Hypothesis 2

Hypothesis 2 (H2): It is hypothesized that upward and lateral comparisons will be most commonly endorsed. However, it is hypothesized that downward comparisons will demonstrate a stronger association with consistency of PA (i.e. fewer PA slips).

As previously reported, upward and lateral comparisons were most frequently endorsed, with a small minority of participants reporting engagement in downward comparisons (see Table 2). One-way ANOVA analysis revealed no significant differences in PA consistency between SC direction groups (see Table 15 for ANOVA results; $p > .05$). Thus, H2 is partially supported.

Hypothesis 3

Hypothesis 3 (H3): It is hypothesized that individuals with high SCO will demonstrate less consistent PA, or more frequent slips in PA.

Initial correlation analyses did not reveal a significant relationship between SCO (as assessed using total score on the INCOM; Gibbons & Buunk, 1999) and PA slips ($p >$ .05). To further investigate potential differences in PA consistency and SCO, participants were grouped into high and low comparers using a mean split cut-point, as suggested by the authors of the INCOM (Gibbons & Buunk, 1999). Independent t-test analyses confirmed that H3 was not supported: significant differences in PA consistency were not

observed between individuals who exhibit high (M = 1.20, SD = 2.34) and low (M = .94, SD = 3.25) inclinations to compare themselves ($p > .05$, see Table 11).

Hypothesis 4

Hypothesis 4 (H4): It is hypothesized that gender differences will emerge in the rates and direction of SC, with women using upward comparisons more frequently than their male counterparts. Gender differences are also expected in the frequency of SC and SCO scores.

Chi-square analyses were used to assess gender differences across SC constructs, with SC frequency values grouped categorically in accordance with the method outlined by Bailis and Segall (2004). The percent of participants endorsing each SC direction and SC frequency did not differ by gender ($p > .05$, see Table 16). Further, gender differences in trait engagement in SC (SCO) were assessed using independent samples t-tests. However, significant gender differences in SCO were not revealed ($p > .05$, see Table 9 for gender differences in SCO). H4 was not supported.

Hypothesis 5

Hypothesis 5 (H5): Individuals exhibiting high SCO will demonstrate less PA consistency depending on the direction of comparison; individuals reporting high SCO who engage in upward comparisons will demonstrate the most inconsistent PA patterns. It is further hypothesized that men will display greater PA consistency regardless of SCO or SC direction.

Participants providing complete data across SC and PA measures (N = 143) was significantly lower than the study sample size, but surpassed the sample size required for adequately powered analyses. As previously mentioned, a disproportionate percent of

participants reported engaging in both upward and lateral comparisons (n = 83 and n = 55 respectively), while few individuals endorsed engaging in downward comparisons (n = 5). Given the limited cell size for downward SC, and the aforementioned non-normality of variance, individuals who compare downward (n = 5) were not included in the following analyses. Power analyses demonstrated that this adjusted sample size reached adequate power (.83) to detect a medium effect size of 0.25. Within the updated model, PA frequency, self-efficacy and motivation were controlled for given the strong associations noted between these constructs and PA frequency within the literature. A 2 (SC direction) x 2 (SCO High/Low) x 2 (Gender) analysis of covariance (ANCOVA) assessing frequency of slips in PA yielded a model that approached statistical significance ($F(9, 137) = 1.67$, $p = .10$). Significant main effects for each of the independent variables were not identified ($p > .05$) however, a significant interaction effect emerged between high and low SCO groups and gender ($F(1, 137) = 3.87$, $p = .05$). As can be seen in Tables 17-18 and Figure 3, women exhibited a greater discrepancy in the frequency of PA slips than men, dependent on their trait level of SC (SCO High/Low). Specifically, women with a low tendency to compare themselves to others (INCOM low) demonstrated lower levels of PA slips ($M = .14$, $SE = .54$), below that of men ($M = 1.15$, $SE = .45$). However, at high levels of trait SC tendency (SCO high), women demonstrated more frequent PA slips ($M = 1.74$, $SE = .42$), above that of men ($M = .98$, $SE = .41$). Additionally, men demonstrated slightly fewer PA slips with a stronger tendency to compare (SCO high). No other significant interactions were revealed, thus H5 was only partially supported.

Hypothesis 6

Hypothesis 6 (H6): PA self-efficacy will emerge as the strongest predictor of PA consistency across genders, although it is believed that SC direction and SCO will contribute significantly to the regression model.

Hypothesis 6 was tested using a hierarchical regression model controlling for age and gender within the first block of the model, and frequency of PA, PA self-efficacy and PA motivation in the second block. SC direction, frequency and SCO were added to the final block of the model. PA slips were entered as the outcome variable. All relevant assumptions for use of hierarchical regression analyses were tested prior to utilizing this statistic. Firstly, a sample size of 141 was deemed to provide adequate power given the eight independent variables included within the model (G*Power; Faul et al., 2009; Cohen & Cohen, 1975). Examination of the correlations between regression predictors revealed that with the exception of PA self-efficacy, PA motivation and frequency of PA ($p < .05$), independent variables were not highly correlated with one another. Despite these correlations, collinearity statstics (i.e., Tolerance and VIF) were all within acceptable limits and the multicollinearity assumption was deemed to have been met (Everitt & Dunn, 2001). Residual and scatter plots indicated the assumptions of normality, linearity and homoscedasticity were satisfied (Everitt & Dunn, 2001).

Within the model, PA self-efficacy emerged as a significant predictor of PA slips ($p < .05$), providing support for the initial portion of H6. However, SC direction and SCO did not significantly contribute to the final predictive model ($p > .05$). The full regression model did not explain a significant proportion of variance in PA slips. See Table 19 for a summary of the regression results.

DISCUSSION

In this study, relationships between constructs of SC and consistency of PA were explored using cross-sectional, self-report indices within a Dynamic Relapse Model (DRM; Witkiewitz & Marlatt, 2004) framework of PA behavior. Broadly, it was predicted that the majority of participants would engage in upward and lateral directions of SC, and that direction of SC would significantly impact PA consistency (as measured by slips in PA; consistent with the DRM). Further, trait tendency to engage in SC (SCO) and the direction of comparison were predicted to interact and explain differential rates of PA consistency. Significant relationships were predicted to emerge between PA slips and SC direction, depending on an individual's trait tendency to compare themselves and their gender. Specifically, it was hypothesized that, relative to men, women would be more susceptible to PA slips at high levels of SCO and whilst engaging in upward comparisons.

This study utilized a convenience sample of community exercisers recruited from four YMCA facilities within the metropolitan area of a mid-size Midwestern city. Participants were adults (21 years or older) using the YMCA facilities to engage in PA, and were predominantly White-American (82.4%), of higher socioeconomic status (78.3%), adherent to CDC/ACSM PA guidelines (87.0%) and reported engaging in regular PA (98.9%).

Hypothesis Testing

Hypothesis 1 (H1): It is believed that the majority of individuals will endorse engaging in comparisons at least one time per PA period.

Hypothesis 1. Assessment of modal responses to Likert items indicated that Hypothesis 1 was partially supported, depending on the item used for data collection. When presented with item 1 (a 5-point Likert measure assessing SC frequency ranging from "all the time" to "never"), participants modal response demonstrated engagement in SC "sometimes." Literature assessing frequency of SC across a variety of health behaviors and other behavioral domains frequently utilizes the aforementioned Likert item and indicates that individuals report engaging in SC "often" or "sometimes" while completing behaviors or tasks (Arigo et al., 2012). Respondents within the present study were also asked to select a numerical frequency reflecting the rate that they engage in SC during PA, using an 8-point Likert scale ranging from "never" to "more than five times per session" (item 2). Results from item 2 reveal a modal response of "I rarely compare myself". This finding is somewhat surprising given the reported level of comparison present in the majority of health behaviors (Arigo et al., 2012; Luszczynska et al., 2004; Dibb & Yardley, 2006). However, it is possible that the broad definition of PA used in the present study allowed participants to recall their own comparative processes within PA activities that do not often elicit comparison. For example, it is likely that individuals will less frequently engage in SC when completing household chores than when completing a fitness class at a gym facility. As such, SC frequency values may be highly dependent on the form of PA the individual is engaging in and elects to report on in response to the SC questionnaire items.

Interestingly, discrepancies between the two measures of SC were noted. First, while overall item response rates were comparable between the two items, 8.8% of participants reported "never" engaging in SC on the first item (5-point Likert measure assessing SC frequency ranging from "all the time" to "never"), however, 16.3% of participants endorsed "never" engaging in SC on the second item. Further, the additional Likert scale points in item 2 (8-point Likert scale ranging from "never" to "more than five times per session") allowed for a significant break down of the "sometimes" and "often" categories present in item 1, dispersing participants into additional groups. The addition of extra Likert scale points could have accounted for the differences in modal responses for each item, with fewer participants selecting each individual category in item 2. Of the responders who reported engaging in SC on item 2 (i.e. excluding individuals endorsing "never" engaging in SC), the majority endorsed doing so more than once per PA session. This demonstrates that, while comparisons may not be as frequent as expected within the sample, individuals who do compare themselves to others may do so at a high rate. It has been demonstrated that frequent engagement in comparisons may have behavioral consequences, impacting both intention to complete behaviors and behavioral follow-through across a range of health behaviors (Luszczynska et al., 2004; Yun & Silk, 2011). Future research should attempt to delineate the relationship between overall frequency of SC and the ability of individuals to maintain consistent health behaviors.

The present study's inclusion of both SC items (items 1 and 2) allows for consideration of the most efficacious approach to assessing SC in PA. Use of item 2 has been less frequent within the general SC literature, although it has emerged as a

significant assessment tool for SC within chronic illness populations (Schokker et al., 2010). Although the initial item is the most commonly used assessment item for SC frequency measurement, item 2 may allow for a more thorough examination of SC frequency by providing specific numerical categories. It has been suggested that numerical and temporal groupings on Likert items may allow for ease of responding and may offer greater face validity than non-numerical Likert ranges (i.e. "never" to "always"; Carifio & Perla, 2007). This may explain the discrepancy between modal responses; participants' may be readily able to quantify their engagement in SC frequency rather than to categorize their general comparison tendencies in an abstract way (i.e. "often" and "sometimes").

Hypothesis 2 (H2): It is hypothesized that upward and lateral comparisons will be most commonly endorsed. However, it is hypothesized that downward comparisons will demonstrate a stronger association with consistency of PA (i.e. fewer PA slips).

Hypothesis 2. The first step in Hypothesis 2, that upward and lateral comparison will be most frequently endorsed, was supported. Within the sample, 58.2% of participants reported engaging in upward SC, 38.8% reported engaging in lateral SC while only 3.0% reporting engagement in downward SC. This finding within PA behaviors is comparable to that of SC direction endorsement among other health behaviors (Arigo et al., 2012; Bailis & Segall, 2004).

However, engagement in *downward* SC was not associated with greater consistency of PA, thus Hypothesis 2 is only partially supported. It is believed that two factors may contribute to this outcome. First, a marginal percent of this sample endorsed engagement in downward comparisons, reducing the variability associated with this

group and thus the likelihood that significant differences would be detected. Furthermore, exploration of the relationships between SC direction and behavioral outcomes in the current literature often utilizes forced choice comparison conditions to detect significant differences between groups. While it has been observed that those comparing downward tend to exhibit more frequent and sustained health behavior engagement, this result is often obtained without consideration for ecological validity (Mahler et al., 1999, Arigo et al., 2012). Use of a self-selected comparison grouping within the present study allows for greater ecological validity and examination of community exercisers SC tendencies. However, this approach may not have allowed for the inclusion of an adequate number of downward comparers to conduct meaningful statistical analyses with appropriate power.

Further, it is possible that SC direction is heavily determined by the activity an individual is engaging in and the level of adaptation an individual demonstrates during an activity. For example, the present study relied on a sample of current exercisers. As a result, it is possible that there is something specific to this sample that has enabled the majority of the sample to maintain regular PA for over five years. Specifically, it has been observed that individuals engage in downward comparisons as a means of bolstering self-efficacy, while upward and lateral comparisons are typically evoked to infer information about an activity (Arigo et al., 2012; Datta & Kulik, 2012). Given that the present sample demonstrated high levels of PA self-efficacy (above previous study findings) it is possible that downward comparisons were not evoked for this reason. It is possible that individuals who are attempting to initiate PA may demonstrate lower levels of PA self-efficacy and may therefore engage in downward comparisons at higher frequencies. Future studies should assess directionality in individuals within a PA activity

continuum, ensuring that data is collected from individuals who infrequently engage in PA and who are attempting to increase their PA levels.

Hypothesis 3 (H3): It is hypothesized that individuals with high SCO will demonstrate less consistent PA, or more frequent slips in PA.

Hypothesis 3. To investigate potential differences in PA consistency and SCO, participants were grouped into high and low comparers using a mean split cut-point, as suggested by the authors of the INCOM (Gibbons & Buunk, 1999). However, significant differences in PA consistency were not observed between individuals who exhibit high and low tendencies to compare themselves, thus Hypothesis 3 was not supported.

While there is significant support for the use of the INCOM, it has not been previously used to assess comparison orientation within community exercisers. Thus, the hypothesis for the present study was based on prior research in other health populations that has consistently reported associations between trait tendency to compare oneself and frequency of health behaviors. For example, a high tendency to compare oneself has been linked to engagement in PA in adolescents and engagement in health-promoting behaviors such as skin cancer and HIV prevention in adults (Misovich, Fisher, & Fisher, 1997; Luszczynska et al., 2004). However, given the novel application of the measure to this population, it is possible that the relationship between SCO and PA consistency was not captured sufficiently by the assessment tool or other predictive variables used within the linear model. Specifically, a significant relationship has been demonstrated between SCO and affective responses to behaviors, which may in turn contribute to behavioral engagement. Given that this study design did not allow for the assessment of affect post-

PA, it is possible that the complex nature of this relationship was not fully realized within the specific hypotheses and statistical analyses.

In addition, the authors of the INCOM recommend use of a mean split analysis to categorize participants into high and low trait comparison groups (Gibbons & Buunk, 1999). However, there is considerable discrepancy within the field in regard to the utility of this form of analysis. Field (2013) has reported that mean or median splits may mask detectable differences between high and low responders given that Likert scale scores tend to centralize around mid-point values, and may not demonstrate normal distribution patterns. Other recommendations for categorical groupings of high and low responders include use of quartile splits, such that individuals within the top and bottom quartiles are used in the analyses (Field, 2013). A similar mechanism for grouping participants relies on the standard deviation around the mean score, so that individuals greater than one standard deviation above and less than one standard deviation below the mean are included in the analyses (Field, 2013). While these methods of data grouping are frequently used in social science literature, it is recognized that this form of categorization may significantly reduce the number of participants within each group, thus reducing the power associated with the analyses. To assess whether quartile or standard deviation split analyses may reveal significant differences between high and low SCO responders, additional analyses were completed. Two additional ANCOVA analyses were run utilizing data from participants in the highest and lowest quartiles and participants one standard deviation above and below the mean. Significant differences between these new groupings were not detected for PA slips ($p > .05$). It is therefore possible that significant differences in PA consistency are not related to one's tendency to

compare oneself or that a confounding variable masked significant differences in the outcome variables.

Hypothesis 4 (H4): It is hypothesized that gender differences will emerge in the rates and direction of SC, with women using upward comparisons more frequently than their male counterparts. Gender differences are also expected in the frequency of SC and SCO scores.

Hypothesis 4. Steps one and two within Hypothesis 4, assessing gender differences in SC frequency, direction and SCO, were not supported. Given that there is relatively limited exploration of gender differences in SC as a construct, particularly gender differences in SC within health behaviors, this hypothesis was based upon literature presented in other social science domains. For example, gender differences emerge in global reactions to comparison tendencies, with women significantly more likely to experience negative outcomes (cognitive and affective responses) with a high trait tendency to compare oneself (Bailis & Segall, 2004).

Since gender differences among the SC domains were not identified, despite an even gender distribution within the sample, it is possible that the variability of responses within each gender was restricted given that the sample was relatively homogeneous. Specifically, the majority of both men and women reported living in households with high incomes, were employed full-time and had few chronic illnesses, factors which may contribute significantly to overall PA engagement and consistency. It is therefore possible that the limited variability in and overall high socioeconomic and health status of the sample may have contributed to the limited gender differences in PA and SC constructs.

Furthermore, a statistically significant age difference was noted between the genders, with men tending to be older than their female counterparts. However, it is unclear if this reflects a meaningful difference (42 vs. 47 years of age). It is also unclear how and at what threshold age might impact SC, particularly when considering gender differences. A single study has assessed the impact of age on SC and health outcomes, finding a significant interaction between age and SC direction. Specifically, engagement in downward comparisons produced larger gains in self-rated general health status in older adults than in younger adults (Cheng, Fung & Chan, 2007). However, increasing counts of physical ailments over time was also associated with more frequent comparison to others and worsening of one's self-rated health status (Cheng et al. 2007). Thus, it appears that age and age-related health comorbidities may add complexity to the relationship between SC and PA consistency, and may have acted as a confounding factor within the analyses.

Additionally, an interesting conceptual model has been posited linking gender self-construal to social comparison tendencies in both men and women. Guimond and colleagues (2006) identified that, within Western cultures, women tend to develop interdependent or relational self-construal whereas men are more likely to construe themselves as independent or agentic. However, gender differences in self-construal (interdependent vs. independent) appear to be altered after engagement in social comparison related to self-construal: within-gender comparisons decreased gender differences in self-construal, while between-genders comparisons increased gender differences in both relational interdependence and independence/agency (Guimond et al. 2006). This conceptual framework may be applicable to self-construal within PA

behaviors. It is possible that predominant use of within-gender comparisons may decrease gender differences in self-construal of one's PA engagement, while between-genders comparisons may demonstrate the converse effect. Although self-construal of PA behaviors was not assessed within the present study, it is plausible that self-construal is altered by comparison target selection (within or between genders), which in turn impacts PA consistency. Further, it could be hypothesized that the selected comparison target is of greater importance to cognitive and behavioral outcomes than the direction of comparison within or between genders. Given that gender differences in SC direction and PA slips were not identified within the present study, it would be interesting to consider both PA self-construal and comparison target (within or between genders) as constructs for future examination in PA behaviors.

Finally, it is important to note that women were more likely to decline study participation at the point of recruitment. It is unclear whether this is reflective of female participation in community activities at large or whether it is a result of the specific study recruitment processes. It is possible that there are differences between individuals, particularly women, who chose to participate and those who declined, and therefore findings, including those reflecting gender differences may not generalize to community exercisers as a whole.

Hypothesis 5 (H5): Individuals exhibiting high SCO will demonstrate less PA consistency depending on the direction of comparison; individuals reporting high SCO who engage in upward comparisons will demonstrate the most inconsistent PA patterns. It is further hypothesized that men will display greater PA consistency regardless of SCO or SC direction.

Hypothesis 5. The first step in Hypothesis 5 assessing the interaction between SC direction and SCO was not supported. This is the first study of its kind to assess both SCO and SC direction concurrently with health behavior outcomes, thus it was unclear whether orientation and direction would impact each other in a significant manner. It is important to note that individuals within the downward comparison group (n = 5) were removed from this set of analyses given the small cell size. Consequently, the full spectrum of comparison directions was not represented within the results. Interestingly, while it is reported that upward and lateral comparisons are most commonly evoked in health behaviors, the impact of lateral comparisons on health outcomes is uncertain. Dibb and Yardley (2006) assessed perceived quality of life among chronically-ill individuals as a factor of SC direction. The authors identified that upward and lateral comparisons were the most frequently reported dimensions of SC among the chronically-ill however, only upward and downward comparisons significantly contributed to perceived quality of life (Dibb & Yardley, 2006). It appears that individuals engage in lateral comparisons frequently, but may not ascribe the same affective or behavioral weight as they might to upward or downward comparisons. In terms of PA consistency, it is possible that significant main effects or interactions for SC direction were not observed because upward comparisons and lateral comparisons elicit a similar behavioral response, regardless of SCO or gender. However, it is also possible that lateral comparisons do not impact PA outcomes, rather these comparisons may be used to derive information about PA, such as best practice for equipment use. This may mean that deviations in PA consistency among individuals who predominantly engage in lateral SC are in fact influenced solely by extraneous factors (not assessed within this study), which may

simulate the impact of upward SC on PA consistency. Further exploration of the behavioral impact of each SC direction on PA is warranted to investigate the complexity of this relationship.

The second part of Hypothesis 5, that gender may interact with SCO to impact PA consistency, was supported. Consistency of PA was not impacted by SCO in men, whereas women demonstrated fluctuations in their PA consistency dependent on SCO grouping. Women with high levels of trait SCO demonstrated greater inconsistency in their PA than women with low trait levels of SCO. The results demonstrate that trait tendency to compare oneself may impact PA consistency to a greater extent in women than men. This finding is particularly interesting given the discrepancy in rates of PA consistency between men and women, with women being less likely to initiate and maintain PA overall. It is plausible that a trait tendency to compare oneself to others contributes to this discrepancy. Interestingly, average SCO, as assessed through mean scores on the INCOM, did not differ by gender. Given that the INCOM scores were normally distributed within each gender, this suggests that the interaction effect is not attributable to discrepancies in inherent tendencies for one sex to compare to a greater extent than the other.

Overall, this result corroborates previous findings that women experience more frequent negative outcomes at high levels of trait SC (Bailis & Segall, 2004; Bennenbroek, Buunk, van der Zee, & Grol, 2002; Morse & Gergen, 1970). Gender differences in additional SC domains have also been observed within the literature. It has been suggested that women engage more frequently in appearance-related comparisons than men, with these comparisons eliciting subsequent decreases in affect and body

satisfaction (Heinberg & Thompson, 1992; Tiggeman & Polivy, 2010). It is possible that gender differences in comparison domains may explain the interaction between SCO, gender and PA consistency. For example, if women with high SCO typically compare themselves to others in terms of their appearance while engaging in PA, they may experience decreased self-efficacy and may potentially engage in less consistent PA. However, men with high SCO may compare along domains that do not elicit negative affective or behavioral responses (e.g. for information gathering). Future studies should assess the domains within which individuals compare themselves as a means of explicating the interaction between gender and SCO.

Hypothesis 6 (H6): PA self-efficacy will emerge as the strongest predictor of PA consistency across genders, although it is believed that SC direction and SCO will contribute significantly to the regression model.

Hypothesis 6. Step one of Hypothesis 6, that PA self-efficacy would emerge as the strongest predictor of PA consistency, was supported. PA self-efficacy explained a significant proportion of the variance in PA consistency in both step 2 and step 3 of the hierarchical regression model. Extensive literature suggests strong associations between PA self-efficacy and the initiation and maintenance of PA behaviors, therefore it was important to replicate this finding in a sample of community exercisers attempting to maintain PA consistently.

However, SC direction and SCO did not emerge as significant contributors within the regression model, thus step 2 of Hypothesis 6 was not supported. Interestingly, the data suggest that SC direction may not impact PA behaviors as heavily as initially

projected, while SCO may only contribute to PA consistency when considering the intersection between SC and gender.

Support for Social Comparison Theory within a Model of Health Behavior Consistency

Although Social Comparison Theory (Festinger, 1954) has received extensive attention within decision-making and performance assessment domains, there has been limited application of the theory to health behavior outcomes, specifically PA behaviors. Further, no known studies have explored the applicability of social comparative principles within a Dynamic Relapse Model of PA behavior. To date, SC literature has examined comparative processes through two distinct lenses: (1) direction of comparison and (2) trait drive to compare oneself. However, this study proposed a combinatorial approach to the study of social comparison, specifically assessing the intersection between direction, trait drive to compare and gender discrepancies. To achieve this, the present study sought to draw from the literature in both distinct areas and to incorporate socio-cognitive principles as they relate to PA behavior. Planned analyses to test the intersection between SC direction, trait drive to compare and gender revealed mixed findings. A significant interaction between direction and trait tendency to compare was not identified however, gender and trait comparison tendency demonstrated a significant interaction effect. As such, the results suggest that PA consistency in women is impacted by trait tendency to compare while direction of comparison may not influence PA behavior as heavily as originally projected.

The findings provide support for the contribution of SC constructs to our understanding of health behavior *consistency*. Specifically, gender differences in the

initiation and consistency of health behaviors have been frequently noted within the literature. While a multitude of factors may contribute to this finding, it is believed that social comparison factors may provide a noteworthy step toward explanation of the observed gender differences in *PA consistency*. Furthermore, the present study provides support for the consideration of socially-oriented cognitions within health behavior frameworks, particularly given the aforementioned interaction. Of note, trait-based social-cognitions may influence behavioral consistency, particularly in women. Trait-based factors are often overlooked within health behavior models, with the literature demonstrating a general propensity to focus on transient or malleable factors (Schwarzer, 2008). While exploration of factors that may be amenable to change is a highly valid endeavor, given the potential ability to improve PA consistency through these mechanisms, it also appears that trait-based factors warrant greater recognition within health models. Specifically, the present findings demonstrate that a stable, trait-based propensity to engage in social-cognitions may significantly impact PA consistency in women. Thus, it is believed that inherent trait or personality factors, such as tendency to compare oneself, require consideration when attempting to identify and explain gender differences in PA and, quite probably, other health behaviors. Future research should attempt to uncover specific differences in trait tendency to compare oneself within each gender. For example it is possible that underlying personality differences, general affect or global self-efficacy may be significantly linked to the impact of trait comparisons on PA behaviors.

Use of the Dynamic Relapse Model as a Framework for Physical Activity Consistency

Previous literature has suggested that the Dynamic Relapse Model (DRM) may provide a fruitful conceptual framework to guide the study of PA consistency (Stetson et al., 2005). Within the DRM, Witkiewitz and Marlatt (2004) define "slips" as the frequency of behavioral omissions within a two-week period, calculated by subtraction of the total number of completed behaviors from the number of planned behaviors. The present study utilized the aforementioned definition to conceptualize PA consistency as the frequency of PA slips within the two-weeks prior to assessment, a method used in previous adaptations of the DRM to PA behavior (Stetson et al., 2004). Within this item, a wide range of reported PA slips emerged (range -9 to 14 slips), reflecting individual engagement in planned and unplanned PA. To fully represent PA consistency as an outcome within the sample, all data points were included in the analyses. The modal number of reported slips in PA was 0, demonstrating that a large proportion of individuals were able to maintain consistent PA over the two-weeks prior to questionnaire completion. However, the majority of participants endorsed experiencing one or more slips in their planned PA over the course of two-weeks (n = 103, 57.54%). This is in accordance with the findings from other samples of community exercisers, demonstrating that most individuals report engaging in PA "on and off" over a two-week period (Stetson et al., 2004).

It is believed that the present study provides support for the use of the DRM as a valid framework to conceptualize PA consistency in a number of ways. First, the model bridges the gap between behavioral intention and actual behavior completion. While a

multitude of health behavior frameworks have aimed to assess and predict PA engagement and consistency, a large proportion of these frameworks utilize behavioral intention as a proxy for actual behavior completion (Schwarzer, 2008). The present study highlights discrepancies between planned behavior and behavioral completion, suggesting that intention proxies may not fully capture one's ability to engage in a behavior with consistency. Thus, the model provides a means to assess functional outcomes within the context of other frameworks, as is demonstrated within the present study. The use of discrepancy scores to depict PA behaviors longitudinally (over a two-week period) and the measurement of actual behavioral completion are significant strengths of the model in relation to other conceptual frameworks of PA consistency.

Further, the DRM provides a framework within which to clinically conceptualize PA consistency as the discrepancy between an individuals behavioral planning and behavioral completion. Clinical interventions may benefit from the incorporation of this conceptual ideology to target individuals who consistently demonstrate significant discrepancy between their plans to engage in PA and their actual PA level. Rather than focusing solely on PA intention, initiation or behavior alone, the model may allow for the assessment of barriers that preclude movement between behavior planning and completion. Further investigation of the factors preventing individuals with high levels of behavioral planning from completion of PA behaviors may elucidate the mechanisms that drive this discrepancy and may allow for the development of clinical interventions targeting these mechanisms.

It is worth noting that a significant percent of individuals (n = 76, 40.4%) reported engaging in PA that was unplanned (i.e. reported fewer planned PA sessions than

completed PA sessions). It is believed that there are two potential contributors to this finding. First, it is possible that self-report error played a predominant role in this finding (e.g. some individuals reported engaging in nine unplanned PA sessions per two-week period). This may signify that the wording of the individual item ("How many times within the past two weeks did you plan to participate in PA?") was not fully transparent or comprehendible for responders. Conversely, it is also possible that certain individuals do not plan to incorporate PA into their daily routines, but are nonetheless still engaging in PA. It is possible that individuals may engage in multiple bouts of activity within a day (e.g. participate in a YMCA class in the morning and walk at home in the evening), with each of these individual bouts being planned or unplanned. This would increase the number of potential omissions, excesses or deficits.

This finding could relate to the definition of PA within a broad sense, such that a wide variety of activities are incorporated within the operational definition. It is conceivable that individuals are less likely to plan certain lifestyle activities (such as mowing the grass) that do not comprise time-delimited factors (as may been seen within a specific exercise group at a gym facility). Therefore, individuals may be engaging in activities that they do not consider to be planned PA, but are ultimately counting these activities within their weekly PA. While a broad definition of PA allows for greater inclusion of the range of activities an individual may complete, it may also be reflected in the negative discrepancy between planned and completed behaviors. It is further possible that the inclusion of individuals with negative discrepancies (lower frequency of planned behavior than completed behavior) may have masked the impact of the independent variables on overall PA consistency. Future studies should consider this possibility.

Additionally, it is important to consider the use of PA omissions within a two-week period as a marker of PA consistency. Although this approach has been used within other studies as a valid PA measure, it is possible that PA omissions did not adequately capture broad trends for consistency, but rather depicted follow-through of PA plans within a finite period. Future studies may consider use of similar constructs that assess omissions or slips over prolonged periods (i.e., three or six months) to allow for further measurement of the temporal fluctuations in PA omissions as a marker of consistency. Consideration may also be given to the utility of lapse and relapse measures as depicters of longitudinal PA consistency.

Finally, it is possible that the study characteristics and data collection processes influenced the range of individuals within the sample, in turn impacting the observed findings. These factors are discussed below.

Study characteristics influencing participation

The format of data collection may have impacted the individuals approached and consented within the study. Individuals were approached upon entering and leaving each YMCA at varied times throughout the day. However, there were times during the day in which it appeared that individuals were less likely to engage with the research staff. For example, when recruitment occurred after typical weekday work hours, individuals were less likely to interact with the recruiters and frequently stated that they did not have adequate time to complete the study consent process. Conversely, when individuals were recruited during the weekend period, receptivity to research staff appeared to increase. In an attempt to elicit diverse recruitment, the research staff varied the times, days and sites from which they recruited on a weekly basis. Further, the point of recruitment (i.e. the

YMCA lobby) may have also impacted the ability to consent a range of individuals. For example, as part of the YMCA mission statement, parents may bring their children to the YMCA while they exercise, utilizing the free childcare provided at each facility. However, when approached in the lobby, parents were typically accompanied by their children making it difficult for research staff to recruit these individuals. For this reason, parents with young children were perhaps an under-represented group within the data set.

It is also possible that the online nature of the questionnaire was a deterrent for individuals without consistent internet access. Specifically, it appeared that older adults often did not have consistent access to the internet or to an email account, thus did not feel comfortable completing the online survey. This may have restricted the age range present within the sample. However, the majority of approached individuals reported having internet access.

Additionally, recruitment was limited to four YMCA sites across the metropolitan area. While additional sites were approached with the study proposal, only the four listed recruitment sites consented to allow data collection. This limited the breadth of metropolitan areas and demographics represented within the sample. Further, these sites were typically in relatively affluent regions within the greater Louisville area, which may have inherently selected sample characteristics.

Completion rates were slightly higher than expected, with approximately 64% of consented participants completing the online questionnaire. Of those who completed questionnaires, the rates of missing data varied by measure, with a range between 9 and 21.5%. The rates of missing data were slightly less than predicted, suggesting that individuals felt comfortable completing all measures and were able to comprehend the

questions within each questionnaire. Further, the added lottery incentive may have impacted completion rates.

Participant characteristics with potential influence on outcomes

Homogeneity of sample characteristics. Significant relationships were not identified in PA slips or SC variables across demographic categories. This may be explained in part by the relatively homogeneity of the sample demographics. Specifically, this sample was predominantly White and demonstrated aggregate high socioeconomic status, income and low chronic illness endorsement, factors that may all significantly contribute to frequency and consistency of PA. It is possible that the data only reflects SC outcomes within a proportion of the population who are relatively healthy and economically stable. Thus, the findings may not generalize to other samples of community exercisers.

Reliance on YMCA users to represent community physical activity engagement. Data was collected using a convenience sample of YMCA exercisers across the metropolitan area. Reliance on YMCA-users for questionnaire completion may have limited access to individuals engaging in a wide range of activities. It is possible that individuals attending YMCA's demonstrate differing characteristics to other community exercisers. For example, the study methodology relied on individuals utilizing a gym facility to engage in PA however, there are many individuals who engage in PA without attending a gym. It is possible that individuals who do not attend gyms but engage in regular PA outside of gym settings may demonstrate different levels of SC and general PA consistency. Further, while the YMCA aims to promote open access to PA for the community, the membership fees associated with the facility may have prevented access for individuals who are unable to afford the fees, thereby reducing the range of SES and

income levels present within the sample.

Physical activity self-efficacy. PA self-efficacy emerged as a significant predictor of PA consistency, a finding that is well-supported within the literature. Of interest, the present sample reported an average PA self-efficacy score (M = 54.12, SD = 7.14) that is somewhat higher than previously reported norms (M = 43.2, SD = 6.7; Sallis et al., 1988). However, studies that have used this measure of self-efficacy are often attempting to assess self-efficacy in individuals initiating changes to their PA habits (Lloyd & Little, 2010). It is therefore possible that individuals within this sample demonstrated greater levels of self-efficacy toward PA given that the majority of the sample is currently engaged in regular PA, above that of individuals who are attempting to initiate greater PA.

It is also worth noting that individuals who demonstrate a higher tendency to compare themselves to others also exhibit lower self-efficacy than individuals who demonstrate a low tendency to compare. The extant literature has demonstrated strong associations between self-efficacy and comparison direction, with upward comparisons eliciting reduced self-efficacy across a variety of populations (Arigo et al., 2012; Bailis & Segall, 2004; Datta & Kulik, 2012). Therefore, it is possible that individuals who are engaging in frequent upward comparisons may experience decreased PA self-efficacy. This relationship warrants further exploration given the strong links between self-efficacy and PA maintenance.

Physical activity motivation. Within the present sample, individuals with a higher tendency to compare themselves to others also exhibited greater motivation to engage in PA than individuals who demonstrated a low tendency to compare. Research has

explored the relationship between SC processes and motivation, finding that the type of motivation an individual utilizes may significantly impact SC constructs. Specifically, use of intrinsic motivation may mediate the negative impact of upward comparisons on self-efficacy (Bailis & Segall, 2004) while improving overall PA maintenance (Marcus et al., 2000). It is also interesting to consider the intersection between gender and motivation to engage in PA within the context of the aforementioned findings. Specifically, gender differences have been demonstrated in motivational focus within PA behaviors, with men tending to be motivated by intrinsic factors (e.g. strength, competition and challenge) while women are typically motivated by extrinsic factors (e.g. weight management and appearance; Egli et al., 2011). Comparative processes within PA may be inherently linked to these motivational foci, although it is unclear how these factors intersect. It is possible that comparisons may be used to increase PA motivation, conversely, individuals with high motivation levels may have a greater impetus to compare themselves to others. Future research should attempt to delineate this relationship.

Strengths and Limitations

Strengths of the Present Study

Contribution to limited literature. The present study significantly contributes to the extant literature on social comparative processes within the context of health behavior maintenance. There has been limited exploration of comparative factors within health behavior models, and this is the only known study to assess SC constructs as contributors to PA consistency. This is despite considerable research suggesting that social comparative factors elicit significant cognitive and behavioral outcomes. Elucidating

factors that influence PA initiation and consistency is paramount given the alarming rates of obesity and highly sedentary lifestyles within the general population. Without an understanding of the mechanisms that impact PA consistency, empirically-grounded interventions will be limited.

Within the social comparison literature, the interaction between SC direction and SC orientation has been explicitly overlooked. The present study represents a significant contribution to the literature given its consideration of both approaches to the assessment of SC as a means of understanding potential interactions between these two domains. Furthermore, the present study assesses the utility of the DRM as a framework within which to address the relationship between PA consistency and SC processes, a novel concept unto itself.

The sample is currently engaged in self-selected physical activity. Prior research has often assessed PA engagement within samples recruited to complete PA routines designated to meet a research protocol. For example, individuals may be recruited to complete a 12-week exercise regimen created by the research staff. While this study design may allow for greater control of PA-related variables that predict or contribute to PA maintenance, this prescriptive activity format may not allow for the ecological validity present within the current study. Specifically, by allowing respondents to describe their most frequent form of PA, an accurate representation of normative SC processes may be obtained given that this self-selected form of PA may yield greater meaning for the individual. Further, use of broadly defined PA allowed for greater access to the wide range of activities individuals may complete.

Online data collection. Use of an online data collection tool allowed for ease of

data collection and provided an accessible and convenient means of completing questionnaires, particularly given the higher socioeconomic status of the present sample. However, this form of data collection may not be convenient for use with low socioeconomic status individuals or for older adults.

Limitations of the Present Study

Cross-sectional design. A primary limitation of the present study is its reliance on a cross-sectional study design. The present study utilizes cross-sectional self-report data as a proxy for PA consistency; a construct that is arguably best assessed using a longitudinal study design (Schwarzer, 2008). Further, data collection relied on respondents' recall of their PA engagement over the two weeks prior to questionnaire completion. Inherent self-report biases may potentially impact respondents' memory of and ability to recall their planned PA and actual PA engagement. Additionally, measurement of the SC constructs relied on respondents' ability to recollect the average frequency with which they engage in SC while being active. This form of data collection requires individuals to be acutely aware of their engagement in SC. Furthermore, it may be difficult for individuals to recall their engagement in comparisons given that PA is physically and cognitively taxing in and of itself, thus reducing one's capacity for recall of extraneous factors post-activity (Tomporowski, 2003).

A means to remedy these limitations may involve the use of a longitudinal study design that follows PA engagement over time. This would allow for the comparison of PA intention and actual PA completion at differing time points, providing detailed data on the fluctuation of PA slips over time. In addition, to avoid the biases inherent to self-reported SC recall, post-comparison responses could be assessed using in-vivo data

collection after completion of PA. This would enable the immediate assessment of affective and cognitive responses to SC, while reducing the likelihood that individuals misremember their engagement in SC processes.

Homogenous sample. An additional limitation of this study is the relative homogeneity within the sample. All study participants reported utilizing a gym facility setting for PA purposes, limiting not only ethnic and socioeconomic status within the sample but also the breadth of activities that individuals engage in. To date, few studies have addressed the impact that ethnicity may have on engagement in SC, although it has been suggested that individuals within ethnic minority groups demonstrate a tendency toward in-group comparisons (Smith & Leach, 2004). Within the data, significant differences in SC processes were not identified between ethnicities, which may result from the limited demographic variability within the sample. In addition, comparison target (i.e. the object of comparison) was not assessed within the present study. By asking individuals to report with whom they often compare themselves by gender and ethnicity, informative qualitative data reflecting the intersection between SC and ethnicity may be collected.

As previously mentioned, differing forms of activity may elicit different types, directions and frequency of comparisons, a factor that may contribute to the sample's overall report of limited SC engagement. It is also possible that a sample utilizing gym facilities may engage in different SC processes than non-gym users, given that PA will likely occur in the presence of others. Thus far, the impact of environment or activity setting on SC processes has yet to be addressed within the literature and would be a worthwhile avenue for exploration. Future studies may specifically control for the

environment in which PA is occurring and the type of PA engaged in.

Finally, 87.0% of participants met CDC/ACSM guidelines for PA, thus the majority of this sample is highly active. Given the limited proportion of the sample that did not meet PA guidelines for regular PA, discrepancies between regular and non-regular exercisers were not noted. This was expected since recruitment was limited to individuals who currently engage in PA at a gym facility. Interestingly, the preponderance of individuals within the sample considered themselves to be regular exercisers (98.9%), while only 87.0% of individuals met the CDC/ACSM criteria. This discrepancy may occur because there is likely a broad range of social definitions for "regular physical activity". Providing individuals with the CDC/ACSM guidelines for regular PA may improve accuracy of participant report for this item.

Measurement items. A significant limitation of the present study is the use of self-report recall of PA behaviors. Within the literature, accelerometer use is generally considered to be the gold-standard approach to the direct measurement of PA, while PA diaries or logs of longitudinal PA engagement demonstrate strong self-report reliability and validity (Bauman et al., 2006; Prince et al., 2008). As with all self-report data, implicit biases are often present, with both men and women tending to over-report their engagement in PA when compared to direct measures of PA (Prince et al., 2008). However, given constraints on data collection (i.e. a single contact with research staff) within a fast-paced gym setting, use of direct PA measures and PA self-report diaries was impractical. As a result, data collection relied on respondents' ability to accurately recall both intention to complete PA and actual PA engagement at a single time point, and may have over-represented sample PA engagement. Future use of PA diaries would not only

improve respondent recall and accuracy, but would also provide qualitative data, while corroboration of self-report data with direct PA measures may provide enhanced accuracy of PA consistency measurement.

Additionally, the study relied on comparison frequency data collected using a single Likert item. There has been significant debate about the utility of Likert items as measures of overall behavioral frequency and their use within statistical analyses (Field, 2013; Norman, 2010). However, to date this is the only form of frequency measurement for SC processes that has been utilized and validated within the literature. While currently lacking validation, open-ended or value-recall measurement of SC frequency may allow for assessment of this construct in a continuous fashion, giving greater ranges in responses and therefore greater variability for use in analyses.

Implications and Recommendations

Clinical implications and recommendations

The present study reflects an important step toward understanding factors that impact PA consistency. Further research is needed to explore the main effects of SC processes on PA consistency, particularly in women, prior to drawing definitive clinical implications. However, some of the patterns observed within this exploratory study may be used to help guide future intervention development and clinical research. The present findings demonstrate that a significant interaction between trait tendency to compare and gender occurs, though the driving mechanisms behind this interaction remain unclear given that significant main effects for each variable were not identified. This finding has implications for interventions targeting PA consistency across both genders, with the recognition that trait-based comparison tendencies may impact women to a greater extent

than men. PA self-efficacy was also found to differ by SCO level, with individuals endorsing high trait levels of comparison experiencing lower self-efficacy. This finding may provide a useful target for clinical intervention. Given the strong associations between PA self-efficacy and PA maintenance, it is possible that interventions targeting self-efficacy in individuals with a high tendency to compare may facilitate improved PA consistency. However, future studies should attempt to address whether trait tendency to compare oneself leads to reduced self-efficacy or whether this relationship is reversed.

It is clear that tendency to compare oneself is impactful, particularly in women. Further, it appears that individuals typically engage in upward or lateral comparison directions when engaging in PA. Potential interventions may attempt to combine this information to provide comparison targets with which individuals may compare themselves. For example, it is possible that gym facilities could initiate a "peer" system for individuals who are attempting to maintain PA consistency. Within this system, individuals could be paired with a gym-user who is performing at a level equal to or above the individual, depending on the individual's most frequent comparison direction, with peers taking a role model approach to PA. This may enable individuals to glean helpful input and support from their peers through upward or lateral comparative feedback. Alternatively, if future studies identify that a specific direction of comparison negatively impacts PA consistency, gym-users could attend PA groups according to perceived performance level, with the goal of reducing overall engagement in comparison to others. Future studies should address the clinical applicability of the present findings to other groups of community exercisers.

Research Implications and Recommendations

Alternative measures. The measures used within the present study reflected those used most frequently within the current literature. However, it is recognized that each construct may be differentially represented using other measures. For example, both self-efficacy and motivation were assessed within the context of PA (i.e. PA specific self-efficacy and motivation). It is possible, however, that general self-efficacy and motivation may also impact PA consistency, although these global constructs were not assessed. In addition, trait tendency to compare oneself has primarily been assessed using the INCOM (Gibbons & Buunk, 1999). However, this measure focuses on overall tendency to compare given that it is a trait-based measure. It is unclear whether SCO may differ by the activity one engages in, with some individuals demonstrating a weak global tendency to compare themselves despite frequent engagement in SC while completing PA. The development of a measure designed to assess both state and trait comparative tendencies during engagement in health behaviors may be a further step toward specifying how SC impacts PA and other health behaviors.

Alternative methods and statistical analyses. The methods utilized in the present study were primarily exploratory and were grounded in the data collection procedures outlined by Bailis and Segall (2004). However, future studies may choose to use different methodology as a means of exploring specific main effects for the SC constructs. Within the current study, self-selected comparison direction was used to explore general engagement in SC processes. However, comparison direction may be controlled for experimentally by providing forced-choice comparison groups. For example, participants may receive prompts requiring engagement in a specific comparison direction prior to engagement in controlled PA. This would allow for greater comparison of between-group

differences and would ensure that a subset of the sample engages in downward comparison. Further, post-comparison responses could be readily assessed using this methodology.

In addition, an alternative statistical approach may be taken to further elucidate the relationship between SC variables and PA slips. Within the present study, SC constructs were assessed as predictors of and contributors to PA consistency. However, it is possible that SC direction and trait tendency to compare (SCO) may demonstrate both mediation and moderation functions within PA consistency. Further analyses should be conducted to assess the function of SC constructs in moderation or mediation roles.

Sample. As previously mentioned, the present study utilized a relatively homogeneous sample drawn from specific gym locations. Future studies should consider use of expanded recruitment techniques so that individuals from a wide range of potential PA locations may be included. Further, examining the observed relationships between SC, gender and PA within a less homogenous sample with greater representation of ethnicities, socioeconomic statuses and stages of PA engagement (i.e. individuals who are not yet regular exercisers) may elucidate contributors to and nuances within these associations.

Additional construct exploration. Although it was beyond the scope of the present study, multiple avenues for further exploration were identified. First, it is apparent that SC intersects with PA differentially between genders. When considering that women report different rationale behind their engagement in PA (Molanorouzi, Khoo & Morris, 2015), it is clear that exploration of the reasons underpinning PA completion should extend beyond overall motivation level, as assessed within this study using the Exercise

Motivation Scale (EMS). For example, two individuals may both demonstrate high levels of motivation to engage in PA but may do so for differing reasons, and may therefore engage in SC processes differentially. The rationale for engagement in PA may significantly contribute to SC direction, frequency and targets, and as a result is a worthwhile area to explore.

As previously mentioned, strong associations have been noted between comparative processes and affective reactions. Given the cross-sectional design of the study, PA bout-specific post-comparison data was not collected. However, post-comparison affect may play an important role in the observed gender by SC orientation interaction. Although a gender difference in trait tendency to compare has not been observed in the literature, women endorse experiencing three-times the rates of negative affect post-comparison (Bailis & Segall, 2004). It is plausible that post-comparison affect may in part explain the tendency for women's PA consistency to be more heavily impacted by trait drive to compare than their male counterparts'. Additionally, a breadth of literature illustrates the impact that state and trait affect may have on PA behaviors, particularly in women (Biddle & Mutrie, 2001). Further exploration of the relationship between affect and SC constructs may therefore reveal significant associations with PA consistency. Future research should attempt to capture affective responses post-comparison while engaging in PA.

Additionally, it may worthwhile to explore whether individuals endorse awareness of engaging in SC. It is possible that comparative processes occur at an implicit level, meaning that individuals are unaware that they are comparing themselves. A contrast between implicit and explicit comparisons may help to explain why individuals may

endorse “never” engaging in comparative processes. Indeed, it is possible that individuals select comparison targets and engage in explicit SC to promote a specific response, i.e. improved self-efficacy or positive affect. A study that attempts to assess both implicit and explicit comparisons may allow for a contrast between the responses individuals experience following each form of comparison, and the effect of these responses on PA.

Summary of conclusions

The present study examined SC processes as contributors to PA consistency. Findings suggest that individuals are more likely to engage in upward and lateral comparisons while exercising, and that inherent trait tendency to compare may play an important role in PA consistency in women. To date, there are no known studies that assess both SC direction and orientation within a sample of community exercisers, with special consideration given to the role of gender within this process. Although the study was exploratory and relied on cross-sectional self-report data, the observed results demonstrate that SC processes may contribute to PA consistency and may provide a strong grounding for future research on the application of comparative processes to health behavior frameworks.

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APPENDICES

Table 1

Individuals Recruited by Data Collection Site

Site	*N*
Northeast YMCA	65
Southwest YMCA	51
Downtown YMCA	142
Norton Commons YMCA	21

Table 2

Total Response Rates for Measure Completion

Measure	*n*	% of total	Number of items in scale	*M* (range)	*SD*	*Cronbach's alpha*
Rapid Assessment of Physical Activity Scale (RAPA)	164	82.0	7	11.49 (8 - 14)	1.32	N/A
Exercise Confidence Scale (ECS)	178	89.0	12	54.12 (26 - 68)	7.14	.812
Exercise Motivation Scale (EMS)	159	79.5	31	127.45 (86 - 159)	15.12	.873
Iowa-Netherlands Comparison Orientation Measure (INCOM)	170	85.0	11	33.59 (10 - 47)	5.61	.800
Frequency of Social Comparison (single Likert item)[a]	172	86.0	1	4.08 (1 - 8)	2.32	N/A
Social Comparison Direction (single Likert item)[b]	165	82.5	1	1.45 (1 - 3)	.557	N/A
	n	% of total				
Comparison Direction						
Upward	96	58.2				
Downward	5	3.0				
Lateral	64	38.8				
INCOM (trait SCO)						
High	80	58.0				

Low	58	42.0

Note: [a] "When participating in your most frequent form of physical activity, how often do you compare yourself to other people completing a similar activity?"

[b] "When participating in your most frequent form of physical activity, do you usually compare yourself to other people who seem to be doing *better than you/the same as you/worse than you*"

Table 3

Distribution of Age, Gender and Ethnicity for Completers by Data Collection Site

Site	*N*	Age		Gender		Ethnicity		
				Male	Female	Caucasian	African-American	Other
		M	*SD*	%			%	
Northeast YMCA	49	51.57[a]	14.93	57.1	42.9	89.8	8.2	2.0
Southwest YMCA	41	48.51	13.35	41.5	58.5	93.5	7.5	0
Downtown YMCA	98	42.34[a]	13.89	49.0	51.0	74.5	19.4	6.1
Norton Commons YMCA	12	50.17	11.66	66.7	33.3	100.0	0	0

Note: Significant difference observed between Northeast and Downtown YMCA facilities at [a] $p < .5$

Table 4

Descriptive Information for Demographic Characteristics of Sample

Characteristic	*n*	%	*M* (range)	*SD*
Age (years)	188	94.0	46.08 (21 - 84)	14.56
21-30	31	16.5		
31-40	48	25.5		
41-50	35	18.6		
51-65	53	28.2		
66-90	21	11.2		
Gender	188	94.0		
Male	93	49.5		
Female	95	50.5		
Ethnicity	187			
White-American	154	82.4		
African-American	26	13.9		
Hispanic	3	1.6		
Asian-American	1	0.5		
Native American/Pacific Islander	1	0.5		
Multiracial	2	1.1		
Marital Status	187	93.0		
Married	91	48.9		
Widowed	18	9.7		
In Relationship/Living Together	53	28.5		

In Relationship/Not Living Together	16	8.6
Single	8	4.3
Education	187	93.5
Partial High School	1	.5
High School Graduate	7	3.7
Partial College	29	15.5
Associate's Degree	19	10.2
Bachelor's Degree	57	30.5
Graduate Degree	74	39.6
Employment Status	187	93.5
Full time at job	134	71.7
Part time at job	16	8.6
Homemaker	1	0.5
Unemployed	4	2.1
Disabled	2	1.1
Student	6	3.2
Retired	24	12.8
Household Income	161	80.5
Less than $10,000	7	4.3
$10,000 - $19,000	4	2.5
$20,000 - $39,000	24	14.9
$40,000 - $59,000	28	17.4
$60,000 - $100,000	43	26.7
Greater than $100,000	55	34.2

Table 5

Demographic Characteristics of Social Comparison Direction Groups

	Comparison Direction					
	Upward		Lateral		Downward	
Characteristic	*n*	%	*n*	%	*n*	%
Age (years)	90		62		5	
21-30	18	20.0	9	14.5	1	20.0
31-40	25	27.8	17	27.4	1	20.0
41-50	17	18.9	12	19.4	1	20.0
51-65	25	27.8	17	27.4	2	40.0
66-90	5	5.6	7	11.3	0	0.0
Gender	96		64		5	
Male	48	50.0	35	54.7	3	60.0
Female	48	50.0	29	45.3	2	40.0
Ethnicity	96		63		5	
White-American	81	84.4	52	82.5	4	80.0
African-American	13	13.5	9	14.1	0	0.0
Hispanic	1	1.0	1	1.6	0	0.0
Multiracial	1	1.0	1	1.6	1	20.0
Marital Status	96		63		5	
Married	45	46.9	35	55.6	2	40.0
Widowed	11	11.5	6	9.5	1	20.0
In Relationship/Living Together	27	28.1	16	25.4	2	40.0

In Relationship/Not Living Together	8	8.3	5	7.9	0	0.0
Single	5	5.2	1	1.6	0	0.0
Education	96		63		5	
Partial High School	1	1.0	0	0	0	0.0
High School Graduate	1	1.0	5	7.9	0	0.0
Partial College	14	14.6	12	19.0	0	0.0
Associate's Degree	7	7.3	9	14.3	0	0.0
Bachelor's Degree	29	30.2	16	25.4	4	80.0
Graduate Degree	44	45.8	21	33.3	1	20.0
Employment Status	96		63		5	
Full time at job	68	70.8	48	76.2	4	80.0
Part time at job	11	11.5	4	6.3	1	20.0
Unemployed	3	3.1	1	1.6	0	0.0
Disabled	2	2.1	1	1.6	0	0.0
Student	3	3.1	1	1.6	0	0.0
Retired	9	9.4	8	12.7	0	0.0
Household Income	96		63		5	
Less than $10,000	3	3.2	4	6.3	0	0.0
$10,000 - $19,000	3	3.2	1	1.6	0	0.0
$20,000 - $39,000	12	12.9	10	15.9	2	40.0
$40,000 - $59,000	18	19.4	10	15.9	0	0.0
$60,000 - $100,000	23	24.7	17	27.0	3	60.0
Greater than $100,000	34	36.6	21	33.3	0	0.0

Table 6

Demographic Characteristics by Social Comparison Orientation Group (High and Low SCO)

	Comparison Orientation Group			
	High SCO		Low SCO	
Characteristic	*n*	%	*n*	%
Age (years)	96		74	
21-30	24	25.0	3	4.2
31-40	26	27.1	17	23.0
41-50	16	16.7	16	21.6
51-65	25	26.0	25	33.8
66-90	5	5.2	13	17.6
Gender	96		74	
Male	48	50.0	39	52.7
Female	48	50.0	35	47.3
Ethnicity	96		74	
White-American	87	90.6	56	76.7
African-American	6	6.3	15	20.5
Hispanic	1	1.0	0	0.0
Pacific Islander			1	1.4
Multiracial	2	2.1	1	1.4
Marital Status	96		73	
Married	46	47.9	39	53.4
Widowed	14	14.6	4	5.5
In Relationship/Living Together	24	25.0	20	27.4
In Relationship/Not	11	11.5	4	5.5

Living Together				
Single	1	1.0	6	8.2
Education	96		73	
Partial High School	0	0.0	1	1.4
High School Graduate	1	1.0	5	6.8
Partial College	10	10.4	17	23.3
Associate's Degree	9	9.4	8	11.0
Bachelor's Degree	36	37.5	15	20.5
Graduate Degree	40	41.7	27	37.0
Employment Status	96		73	
Full time at job	74	77.1	48	65.8
Part time at job	9	9.4	7	9.6
Homemaker	0	0.0	1	1.4
Unemployed	2	2.1	1	1.4
Disabled	1	1.0	1	1.4
Student	2	2.1	3	4.2
Retired	8	8.3	12	16.4
Household Income	95		72	
Less than $10,000	4	4.2	4	5.6
$10,000 - $19,000	1	1.1	3	4.2
$20,000 - $39,000	14	14.7	10	13.9
$40,000 - $59,000	15	15.8	14	19.4
$60,000 - $100,000	29	30.5	15	20.8
Greater than $100,000	32	33.7	26	36.1

Table 7

Health Characteristics of Participants

Characteristic	*N(n)*	% of sample	*M*	*SD*
Body Mass Index	177		27.61	6.06
Body Mass Index Group (BMI range)				
Underweight (BMI <18.5)	1	.6		
Normal Weight (BMI 18.5 – 24.9)	64	36.2		
Overweight (BMI 25.0 – 29.9)	73	41.2		
Obese I (BMI 30.0 – 34.9)	21	11.9		
Obese II (BMI 35.0 – 39.9)	11	6.2		
Obese III (BMI > 40.0)	7	4.0		
Body Mass Index by Gender				
Male	90		27.62	5.02
Female	87		27.60	7.00
Smoking Status				
Smoker	8	4.9		
Non-Smoker	156	95.1		
Chronic Health Condition				
None	103	62.4		
Asthma	7	4.2		
High Blood Pressure	3	1.8		
Heart Disease	5	3.0		
Hyperlipidemia	22	13.3		
Diabetes	7	4.2		
Arthritis	6	3.6		
Physical Disability	7	4.2		
Other Health Condition	13	7.9		
≥ 1 Chronic Health Condition	10	5.3		

Table 8

Physical Activity Characteristics of Participants

Characteristic	*n*	% (range)	*M*	*SD*
Physical Activity Status (RAPA)	182			
Suboptimal PA levels	24	13.0		
Optimal PA levels	158	87.0		
Self-reported PA status	182			
Regular Exerciser	180	98.9		
Non-regular Exerciser	2	1.1		
Length of time as regular exerciser	182	(<1week to >5years)		
< 1 week	0	0		
< 1 month	5	2.7		
1 – 6 months	20	11.0		
6 months – 1 year	10	5.5		
1 – 2 years	18	9.9		
2 – 5 years	18	9.9		
> 5 years	111	61.0		
Frequency of PA (single Likert item)	182	(score 1 - 8)	5.96	1.54
Number of planned PA sessions over past 2 weeks	182	(0 to 24 sessions)	9.17	3.43
Number of completed PA sessions over past 2 weeks	179	(0 to 21 sessions)	8.05	3.78
PA Omissions or "slips" (retrospective report of planned days minus actual days of PA over the past 2 weeks)	179	-9 to 14 slips	1.16	2.75
No	76	42.5		

1 slip	24	13.4
2 – 5 slips	73	40.8
> 5 slips	6	3.3
PA lapses (2 week absences in PA sessions over past 3 months)	177	
No	135	76.3
Yes	42	23.7
PA relapse (3 month absences in PA sessions over past 12 months)	178	
No	141	79.2
Yes	37	20.8
Historical PA relapse (3 month absences in PA sessions over past 5 years)	175	
No	113	64.6
Yes	62	35.4

Table 9

Mean Differences in Social Comparison and Physical Activity Constructs by Gender

	Male	Female		
Measure	*M (SD)*	*M (SD)*	*N*	*t*
Rapid Assessment of Physical Activity (RAPA)	11.60 (1.47)	11.37 (1.15)	164	1.27
Exercise Confidence Survey (ECS)	54.67 (6.85)	53.57 (7.41)	178	1.06
Exercise Motivation Scale (EMS)	126.59 (14.54)	128.38 (15.76)	159	.555
Length of time as regular exerciser	6.22 (1.34)	5.70 (1.69)	182	5.26*
PA Slips (retrospective report of planned days minus actual days of PA)	1.14 (2.52)	1.17 (2.99)	179	.004
Iowa-Netherlands Comparison Orientation Measure (INCOM)	33.72 (4.55)	33.44 (6.56)	170	.104
Comparison frequency during most frequent form of PA	4.38 (2.30)	3.75 (2.31)	172	3.26

Note: Independent samples t-test used to determine mean differences by gender; *$p < .05$

Table 10

Mean Differences in Social Comparison Orientation and Physical Activity Constructs by Self-Reported Comparison Direction

	Comparison Direction				
	Upward	Lateral	Downward		
Measure	*M (SD)*	*M (SD)*	*M (SD)*	*N*	*F*
Rapid Assessment of Physical Activity (RAPA)	11.57 (1.36)	11.32 (1.30)	11.33 (1.15)	146	.617
Exercise Confidence Survey (ECS)	53.63 (7.15)	54.75 (6.87)	51.00 (6.56)	164	.950
Exercise Motivation Scale (EMS)	128.31 (14.02)	127.47 (16.56)	139.25 (4.57)	147	1.16
Length of time as regular exerciser	6.00 (1.46)	5.75 (1.70)	6.80 (.447)	164	1.33
PA Slips (retrospective report of planned days minus actual days of PA)	.852 (2.51)	1.48 (3.06)	.200 (1.79)	163	1.26
Iowa-Netherlands Comparison Orientation Measure (INCOM)	34.34 (5.32)	32.98 (5.47)	37.20 (2.49)	163	2.21
Comparison frequency during most frequent form of PA	4.58 (2.22)	3.69 (2.31)	3.00 (2.00)	165	3.75*

Note: One-Way Analysis of Variance (ANOVA) was used to assess mean differences in measures by direction; *$p < .05$

Table 11

Mean Differences in Social Comparison and Physical Activity Constructs by Iowa-Netherlands Comparison Orientation Scale Score (Mean Split into High and Low Comparison Orientation)

	INCOM Orientation			
	High	Low		
Measure	*M (SD)*	*M (SD)*	*N*	*t*
Rapid Assessment of Physical Activity (RAPA)	11.42 (1.33)	11.63 (1.26)	150	.945
Exercise Confidence Survey (ECS)	52.53 (7.39)	56.38 (6.07)	168	13.10**
Exercise Motivation Scale (EMS)	130.47 (14.71)	124.37 (15.15)	150	6.14*
Length of time as regular exerciser	6.03 (1.48)	5.81 (1.64)	169	.846
PA Slips (retrospective report of planned days minus actual days of PA)	1.20 (2.34)	.944 (3.25)	167	.349
Comparison frequency during most frequent form of PA	4.95 (2.10)	3.00 (2.11)	169	35.38
Social Comparison Direction	*n (%)*	*n (%)*		
Upward	57 (60.0%)	38 (55.9%)		
Lateral	33 (34.7%)	30 (44.1%)		
Downward	5 (5.3%)	0 (0.0%)		

Note: Independent samples t-tests used to assess differences in outcome measures by SCO group; Chi square analyses were used to assess SCO differences by comparison direction; $^{**}p < .01$; $^{*}p < .05$

Table 12

Mean Differences in Social Comparison and Physical Activity Constructs by Recruitment Site

	Recruitment Site					
	Northeast	Southwest	Downtown	Norton Commons		
Measure	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*		*F*
N						
Rapid Assessment of Physical Activity (RAPA)	11.76 (1.36)	11.25 (1.07)	11.40 (1.34)	11.67 (1.50)	164	1.02
Exercise Confidence Survey (ECS)	54.25 (8.65)	54.96 (7.25)	53.94 (6.20)	53.25 (8.28)	178	.207
Exercise Motivation Scale (EMS)	126.46 (17.50)	129.54 (15.13)	126.93 (14.44)	131.75 (8.88)	159	.456
Length of time as regular exerciser	6.11 (1.48)	6.14 (1.48)	5.98 (1.53)	4.73 (1.48)	182	2.71*
PA Slips (retrospective report of planned days minus actual days of PA over a two-week period)	1.02 (2.12)	1.51 (4.31)	1.17 (2.39)	.750 (3.36)	179	.275
Iowa-Netherlands Comparison Orientation Measure (INCOM)	32.64 (6.58)	34.20 (5.74)	33.98 (5.20)	32.92 (4.36)	170	.719
Comparison frequency during	3.56 (2.44)	3.32 (1.89)	4.63 (2.29)	3.42 (2.02)	172	3.88

Table 13

Comparisons of Physical Activity Variables Across Body Mass Index Categories

Variable	Normal Weight		Overweight		Obese I		Obese II		Obese III		MS	*F*	*p*
	M	SD	M	SD	M	SD	M	SD	M	SD			
Number of PA sessions in past 2-weeks	8.68	4.02	8.03	3.44	6.95	3.59	5.27	2.57	8.43	4.47	33.63	2.49	.045*
Length of time as a regular exerciser	6.40	1.19	6.08	1.37	5.25	1.83	5.91	1.98	2.86	.69	22.69	12.14	.000**

Note: One-way Analysis of Variance (ANOVA) was used to calculate differences by BMI group; $N = 171$; $*p < .05$, $**p < .01$

Table 14

Frequency of Social Comparison for Testing of Hypothesis 1.

Response	*N*	*n*	%
When Participating in PA, how often you notice others who are also participating in the same activity?	171		
Never		15	8.8
Rarely		31	18.1
Sometimes		61	35.7
Often		48	28.1
All of the time		16	9.4
Per PA period, how frequently do you compare yourself to others participating in the same activity?	172		
Never		28	16.3
I very rarely compare myself to others		36	20.9
1 time per month		14	8.1
1 time per week		12	7.0
1 time per session		25	14.5
2 to 5 times per session		32	18.6
> 5 times per session		6	3.5
I compare all the time		19	11.0

Table 15

Differences in Physical Activity Consistency across Social Comparison Directions for Hypothesis 2.

Source	Upward SC		Downward SC		Lateral SC		df	SS	MS	*F*	*p*
	M	SD	M	SD	M	SD					
Between Groups	.85	2.51	.20	1.79	1.48	3.06	2	18.67	9.33	1.26	.287
Within Groups							160	1188.45	7.42		
Total							162	1207.12			

Note: One-Way Analysis of Variance (ANOVA) used to testing differences by comparison direction; $N = 162$

Table 16

Gender Comparisons between Comparison Direction, Frequency and Orientation for Hypothesis 4

Variable	Gender		χ^2	*p*
	Male	Female		
Social Comparison Direction			.454	.79
Upward	48 (55.8%)	48 (60.8%)		
Lateral	35 (40.7%)	29 (36.7)		
Downward	3 (3.5%)	2 (2.5%)		
Social Comparison Frequency (Item 1)			2.47	.65
Never	9 (10.1%)	6 (7.3%)		
Rarely	13 (14.6%)	18 (22.0%)		
Sometimes	31 (34.8%)	30 (36.6%)		
Often	26 (29.2%)	22 (26.8%)		
All the time	10 (11.2%)	6 (7.3%)		
Social Comparison Frequency (Item 2)			7.32	.40
Never	11 (13.1%)	10 (12.7%)		
Rarely	13 (15.5%)	23 (29.1%)		
1 time per month	6 (7.1%)	8 (10.1%)		
1 time per week	5 (6.0%)	6 (7.6%)		
1 time per session	16 (19.0%)	8 (10.1%)		
2 to 5 times per session	19 (22.6%)	13 (16.5%)		
> 5 times per session	3 (3.6%)	3 (3.8%)		
All the time	11 (13.1%)	8 (10.1%)		

Note: Chi-square analysis used to test differences in comparison direction and comparison frequency by gender; percent of SC direction within each gender appear in parentheses beside the group frequencies

Table 17

Associations between Social Comparison Direction, Orientation, Gender and Physical Activity Slips for Hypothesis 5.

Variable	df	MS	*F*	*p*
Covariates				
PA self-efficacy	1	23.76	3.77	.06
PA motivation	1	7.97	1.27	.26
PA frequency	1	3.30	.56	.46
Independent Variables				
SCO high/low	1	14.47	2.30	.13
SC direction (upward/lateral)	1	4.10	.65	.42
Gender	1	.50	.08	.78
Interactions				
SCO*SC direction	1	.30	.05	.83
SCO*Gender	1	24.36	3.87	.05*
SC direction*Gender	1	.30	.05	.83
SC direction*SCO*Gender	1	.32	.05	.82
Error (within groups)	128	6.29		

Note: Analysis of Covariance (ANCOVA) used to assess main and interaction effects within the model; $N = 138$; $*p \leq .05$; $F(10, 137) = 1.67$, $p = .10$ for full model

Table 18

Mean Frequency of Physical Activity Slips by Gender and Social Comparison Orientation for Hypothesis 5.

INCOM group	Gender	*M*	*SE*
High	Men	0.98	0.41
	Women	1.74	0.42
Low	Men	1.15	0.45
	Women	0.14	0.54

Note: Mean frequency of PA slips per two-week period

Table 19

Multivariate Associations of Social Comparison Variables with Physical Activity Slips, Controlling for Demographic and Cognitive Variables

Variable	β	t / F value	sr	R	R^2	ΔR^2	df	Model Sig (p)
Step 1		.233		.058	.003	.003	2, 138	.792
Gender	-.037	-.421	-.036					.674
Age	-.055	-.625	-.053					.533
Step 2		1.756		.247	.061	.058	5, 135	.126
Gender	-.041	-.470	-.039					.639
Age	.020	.216	.018					.829
PA self-efficacy*	-.201	-2.31	-.192					.023*
PA motivation	-.029	-.320	-.027					.749
Frequency of PA	-.097	-1.01	-.084					.314
Step 3		1.202		.261	.068	.007	8, 132	.303
Gender	-.031	-.335	-.028					.738
Age	.011	.109	.009					.914
PA self-efficacy*	-.224	-2.345	-.197					.021*
PA motivation	-.026	-.273	-.023					.785
Frequency of PA	-.096	-.984	-.083					.327

SC direction	.057	.662	.056	.509
SCO (INCOM total)	-.077	-.716	-.060	.475
SC frequency	.060	.615	.052	.540

Note: Hierarchical linear regression used to test contribution of variables to predictive model; $N = 141$, $^{*}p < .05$

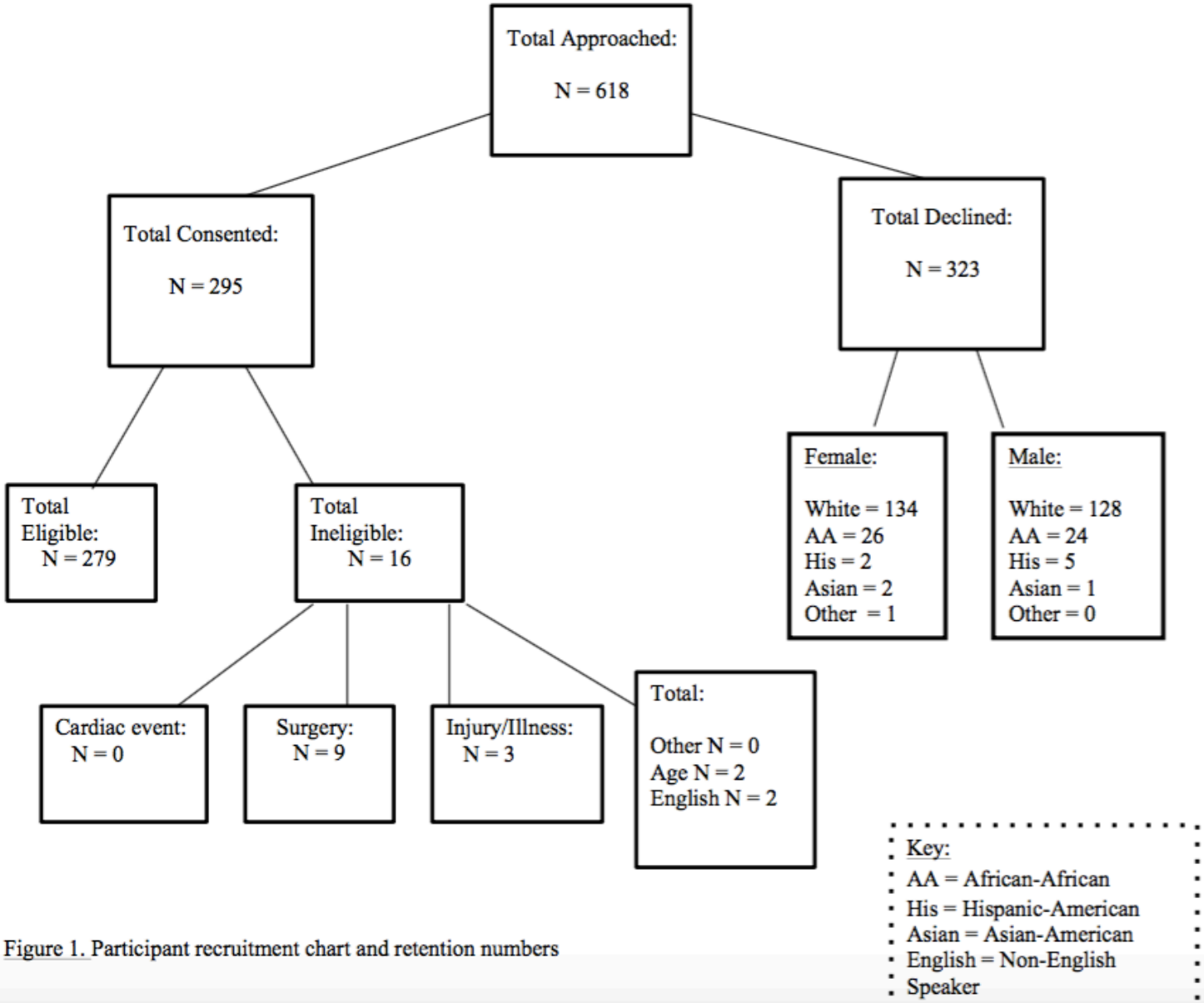

Figure 1. Participant recruitment chart and retention numbers

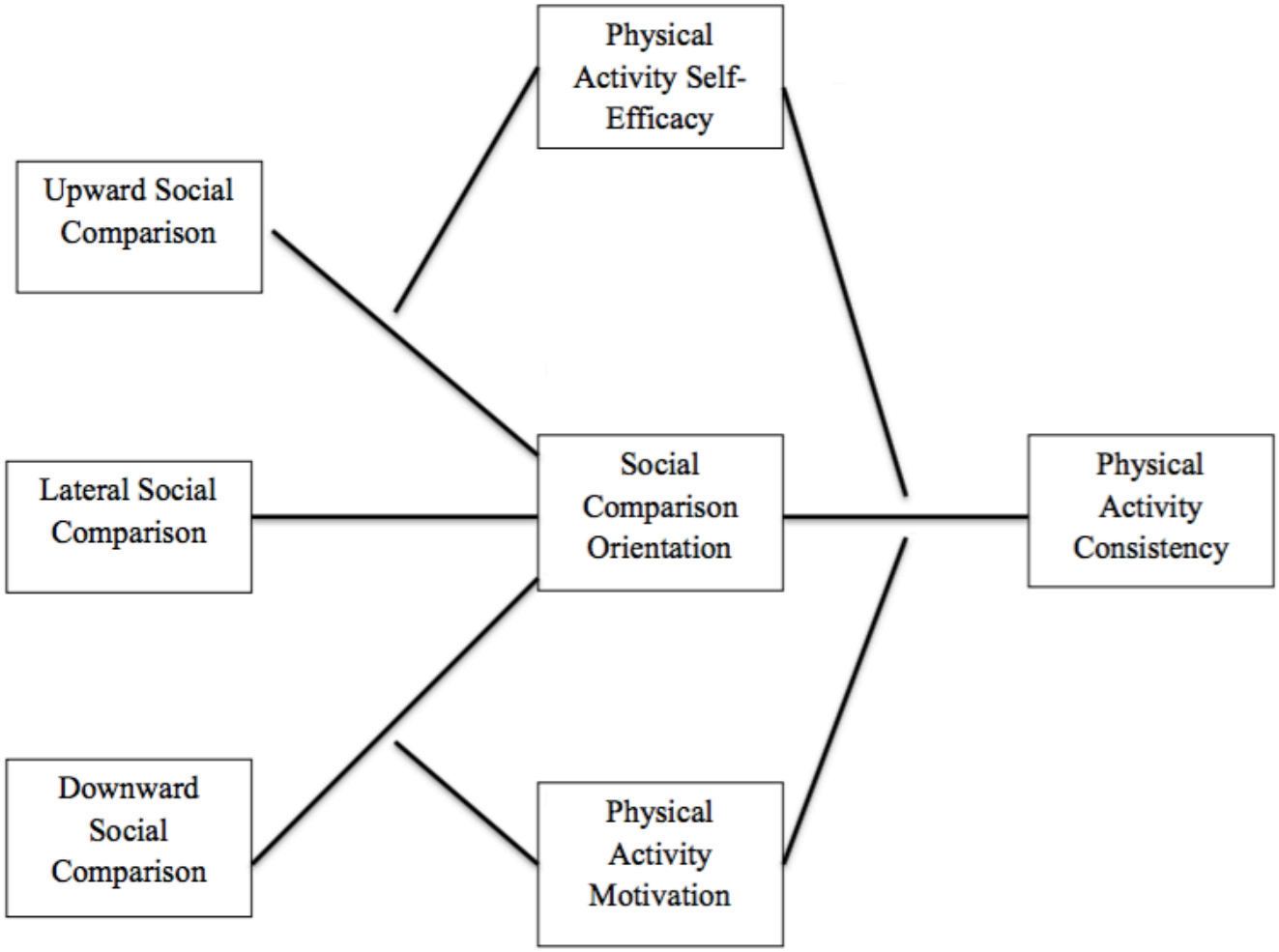

Figure 2. Proposed Social Comparison Processes within a Physical Activity Consistency Model

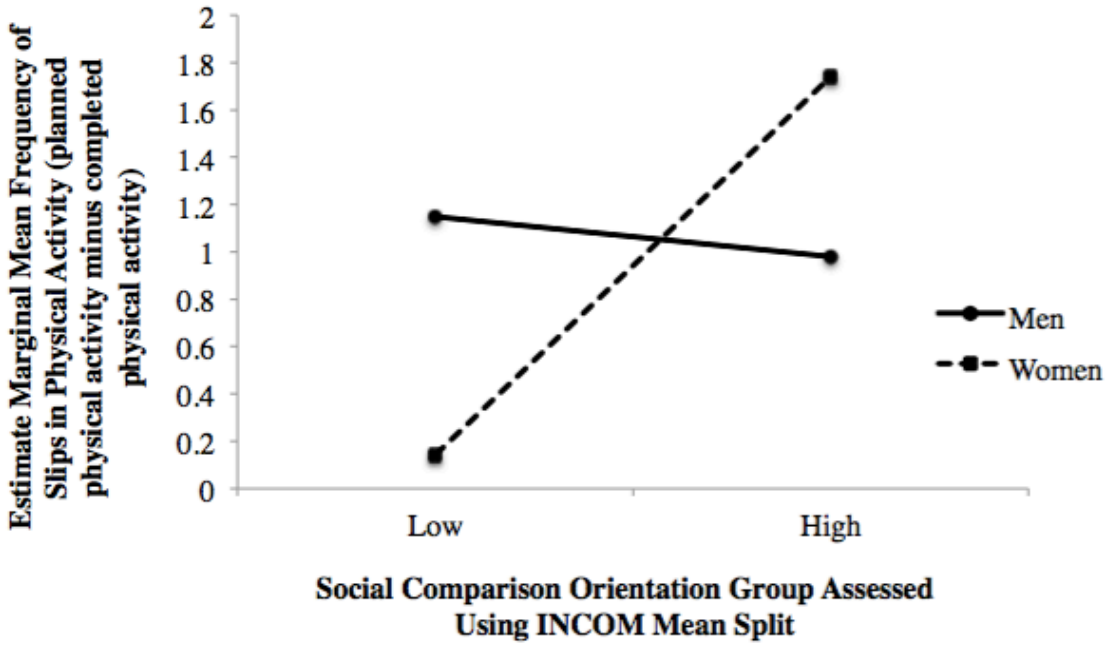

Figure 3. Mean physical activity slips by gender and social comparison orientation group. This figure represents the interaction between gender and social comparison orientation identified using a multivariate analysis in Hypothesis 5.

CURRICULUM VITAE

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EDUCATION

2016 (expected)	Ph.D.	University of Louisville (Louisville, KY) **Clinical Psychology** *Faculty mentor:* Barbara Stetson, Ph.D.
2013	M.A.	University of Louisville (Louisville, KY) **Clinical Psychology** *Faculty mentor:* Barbara Stetson, Ph.D.
2010	B.A.	Auburn University (Auburn, AL) **Psychology**, Human Development *Summa Cum Laude*

DISSERTATION TOPIC

"Social Comparison Processes as Contributors to Consistent Physical Activity"

RESEARCH INTERESTS

Behavioral medicine and health behavior change with regard to chronic disease. Interests include health promotion, self-care behaviors and dietary, exercise and weight loss factors in overweight/obese populations with Type 2 Diabetes Mellitus and Metabolic Diseases. Specific foci include physical activity relapse prevention through socio-cognitive factors within a biopsychosocial model. Additional interests include perceptions of health change in underserved populations and multicultural sensitivity in empirical work.

2012 – Present Graduate Research Assistant, **Health Behavior Change Research Program**, Department of Psychological and Brain Sciences, University of Louisville
Role: Lab Manager (2013 – Present)
Supervisor: Barbara Stetson, Ph.D.

Study cognitive, behavioral and motivational domains of health-related change within a biopsychosocial model of risk prevention and health promotion. Research approaches include initial, secondary and tertiary prevention of chronic diseases to reduce illness burden in at-risk populations and improving psychosocial functioning for those already living with disease. Emphasis is placed on diabetes prevention and risk reduction through preventative measures. Additional interests include weight-management through behavioral interventions. Responsibilities include data management and analysis, laboratory management and supervision of graduate and undergraduate research assistants. Specific research projects include:

Exercise for Peripheral Neuropathy and Diabetes (EXPAND) study: Development and assessment of a pilot behavioral health intervention for exercise promotion in older adults with diabetes and peripheral neuropathy. Assessed feasibility of at-home resistance band training. Conducted recruitment, individual intake interviews and led training sessions in resistance band exercises at Joslin Diabetes Center in New Albany, Indiana. Worked with supervisor to develop scripts for video-based exercise tutorials. Maintained follow-up recruitment post-intervention.

Type 2 Diabetes and Insulin Study: Doctoral dissertation incorporating multi-phase data collection and ancillary longitudinal study of perceptions regarding blood glucose testing. Aided data collection at Joslin Diabetes Center. Maintained web-based data tools for longitudinal data collection. Lead coordinator for online data collection and follow-up contact with participants. Collected medical chart data for review.

2011 – 2012 Graduate Research Assistant, **Stress and Health Research Program,** Department of Psychological and Brain Sciences, University of Louisville
Supervisor: Tamara Newton, Ph.D.

Duties included development of an internally funded pilot study collecting salivary biological markers to stress and rumination in an undergraduate population, building an INQUISIT software program to measure memory latency while ruminating and data analysis of inflammatory responses to stress in post-abuse women.

2009 – 2011 Research Assistant; Undergraduate Manager, **Relationship Research Lab,** Department of Psychology, Auburn University

Supervisor: Richard Mattson, Ph.D.

Coordinated the program's undergraduate research under the direction of Dr. Mattson, required to organize and chair weekly research meetings and to direct research tasks of ten undergraduate research assistants. Involved in the development of a community-based study assessing the prevalence of domestic abuse in East Alabama, and acted as lead recruiter of primarily low-income underserved participants.

2010 – 2011 Research Assistant; **Drugs and Behavior Research Lab,**
Department of Psychology, Auburn University
Supervisor: Christopher Correia, Ph.D.

Aided in the development and data collection of a study to monitor and improve awareness of college drinking, assisted with National Alcohol Screening Day data collection and assessment of behavioral indicators of alcohol or illicit and prescription substance abuse.

PUBLICATIONS

2014 **Knight, H.,** McDonough, S., Stetson, B., & Mokshagundam, S. (2014). *Mediational effects of stress and social support on diet in women with diabetes and hyperlipidemia.* (Preparing for submission to The Diabetes Educator).

2014 **Knight, H.,** & Stetson, B. (2014). *Social comparison within the theory of planned behavior: A focus on dietary behavior.* (Preparing for submission to the Journal of Health and Social Behavior).

2014 **Knight, H**., Stetson, B., Krishnasamy, S., & Mokshagundam, S. P. (2014). Diet self-management and readiness to change in underserved adults with type 2 diabetes. *Primary Care Diabetes* (published online December 2014).

2014 Silvestri, M., **Knight, H.**, Britt, J., & Correia, C. (in press). Prevalence and correlates of non-medical use of prescription drugs among students attending national alcohol screening day. *Addictive Behaviors*.

2013 Stetson, B., **Knight, H**., & Prakash Mokshagundam, S. (2013). Nutrition and lifestyle
change in older adults with diabetes mellitus and metabolic syndrome. In *Handbook of Clinical Nutrition in Aging (3rd Edition).*

PUBLISHED ABSTRACTS

2014 **Knight, H.,** McDonough, S., Ward, J., Cooper, J., Stetson, B., & Mokshagundam,

S. (April 2014). Mediational effects of stress and social support on diet in women with diabetes and hyperlipidemia. *Annals of Behavioral Medicine, 47*, Suppl 1, s289.

2014 Ward, J., **Knight, H**., McDonough, S., Cooper, J., French C., Mokshagundam, S., &

Stetson, B. (April 2014). Levels of chronic care support and associations with diet adherence level in older adults with insulin-treated type 2 diabetes. *Annals of Behavioral Medicine, 47*, Suppl 1, s279

2014 Stetson, B., Schlundt, D., Ward, J., **Knight, H.,** Cooper, J., Krishnasamy, S., Mokshagundam, S. (April 2014). Reliability and validity of a brief diabetes self-care measure with low-income, underserved adults. *Annals of Behavioral Medicine, 47*, Suppl 1, s270

2014 Cooper, J., Stetson, B., **Knight, H.,** McDonough, S., Ward, J & Mokshagundam, S. (April 2014). Self-reported health behaviors and barriers discriminate between targeted levels of glycemic control in a diabetes clinical sample. *Annals of Behavioral Medicine, 47*, Suppl 1, s130

2013 **Knight, H.,** Stetson, B., Cooper, J., Ward, J., Krishnasamy, S., Mokshagundam, S. P. (March, 2013). Diet Adherence and Readiness to Change in Underserved Adults with Type 2 Diabetes. *Annals of Behavioral Medicine, 43*, Suppl 1, s270.

2013 Cooper, J., Stetson, B., Ward, J., **Knight, H**., Krishnasamy, S., Mokshagundam, S. P. (March, 2013). Levels of Provider Care and Health Behaviors in Underserved Adults with Type 2 Diabetes. *Annals of Behavioral Medicine, 43,* Suppl 1, s100.

CONFERENCE PRESENTATIONS

2015 **Knight, H.,** Stetson, B,. McDonough, S., Krishnasamy, S., Mokshagundam, S. P. (2015).

Mediation Effects of Health-related Coping and Blood Glucose Control in Adults with Type 1 Diabetes. Poster to be presented at the 36th Society of Behavioral Medicine Annual Meeting; San Antonio, TX.

2015 McDonough, S., Stetson, B,. **Knight, H**., Krishnasamy, S., Mokshagundam, S. P. (2015). *Continuum of Obesity and Diet Perceptions in Non-insulin Using Adults with Type 2 Diabetes*. Poster to be presented at the 36th Society of Behavioral Medicine Annual Meeting; San Antonio, TX.

2012 **Knight, H.,** Fleming, K., Newton, T., Fernandez-Botran, R., Miller, J., & Ellison Burns, V. (2012). *Inflammatory responses while anticipating recall of a*

potentially traumatic stressor. Poster presented at the 12th Women's Health Congress; Washington, DC.

2012 Fleming, K., **Knight, H.,** Newton, T., Fernandez-Botran, R., Miller, J., & Ellison Burns, V. (2012). *Emotional/Verbal Abuse Predicts Severity of Posttraumatic Stress and Depression Symptoms in Post-Abuse Women.* Poster presented at the 12th Women's Health Congress; Washington, DC.

2010 Silvestri, M., **Knight, H.**, Britt, J., & Correia, C. (2010). *Prevalence and correlates of non-medical use of prescription drugs among students attending national alcohol screening day*. Poster presented at the 44th ABCT SIG Poster Exhibition, San Francisco.

2010 Cunningham, K., **Knight, H**., Brown, S., Reynolds, A., Mattson, R., & Franco-Watkins, A. (2010). *How happy are you with your relationship really? Examining the utility of implicit recall and recognition tasks in measuring relationship functioning*. Poster presented at the 15th Annual Research and Teaching Festival at Auburn University, Auburn.

CLINICAL INTERESTS

Behavioral Medicine and Clinical Psychology in Medical Settings, Integrated Primary Care and Pain Management, Health Behavior Change using Cognitive-Behavioral (CBT), Mindfulness, and Acceptance and Commitment (ACT) therapy

CLINICAL EXPERIENCE

Clinical Experience

2013 - Present: Graduate Clinical Assistant;
Noble H. Kelley Psychological Services Center, University of Louisville;
Supervisor: Bernadette Walter, Ph.D.

Conduct intake interviews for incoming clients, develop integrative reports and initial case conceptualizations to present to specialized treatment teams. Act as first-line contact for individuals in crisis calling the clinic for treatment or assessment and refer as necessary. Act as point person managing crisis situations within the clinic. Supervise graduate students' clinical activities including intake assessments and therapy sessions. Collaborate with external agencies to provide referrals, outreach and client case management. Responsible for management of clinical operations, including chart audits, ensuring appropriate protocol followed by student therapists and supervisors, and scheduling and payment records. Entrusted with clinic key and file room and supply access. Attend weekly meetings with clinical director to discuss incoming clients and other clinic concerns.

2013 – Present: Graduate Student Therapist; **Mindfulness Team**;
Noble H. Kelley Psychological Services Center, University of Louisville
Supervisor: Paul Salmon, Ph.D.

Implement a mindfulness-based approach to the assessment and treatment of a diverse case-load of clients with varying psychological disorders. Specific mindfulness and acceptance-based interventions are individually tailored to meet the biological, psychological and social needs of each client in order to treat individuals holistically. Additionally provide peer support and feedback for other team members as they work with individual clients. Specific experiences include substance-use management, adherence to management of chronic diseases, and treatment of depression and anxiety in a diverse metropolitan community-based population. Therapeutic techniques include Acceptance-Based Behavioral Therapy, Acceptance and Commitment Therapy, and Dialectical Behavior Therapy. Receiving continued instruction from a licensed psychologist.

2011 – 2013: Graduate Student Therapist; **Cognitive-Behavior Therapy Team**;
Noble H. Kelley Psychological Services Center, University of Louisville
Supervisor: Janet Woodruff-Borden, Ph.D.

Implemented cognitive-behavior therapy and dialectical behavior therapy approaches to assess and treat varied psychological disorders in a diverse client population. Tailored techniques to meet individual needs and incorporated specific manualized treatments for disorders; specifically generalized anxiety disorder, obsessive-compulsive disorder, mood disorders and emotion regulation. Participated in weekly conceptualization-centered supervision, including support and feedback for other team members' treatment interactions.

Assessment Experience

2011 – Present: Graduate Student Therapist, Noble H. Kelley Psychological Services Center, University of Louisville;
Supervisors: Bernadette Walter, Ph.D.; David Winsch, Ph.D.

Child experience: administration of assessments and completion of integrative reports under the supervision of licensed psychologists including; Advanced Placement and ADHD assessment of children and teenagers for school settings (use of the WISC-IV and structured assessment interviews)

Adult experience: administration of assessments and completion of integrative reports under the supervision of licensed psychologists including; administration of the WAIS-IV, Woodcock-Johnson III, WMS-IV, Trail Making Test, Bender-Gestalt Test, PPVT-IV, personality assessments (MMPI-II and MCMI-III) and adult structured interviews for the assessment of cognitive functioning, learning disabilities and ADHD.

2013: Graduate Student Therapist, Buchholz Psychological Services Center, Louisville; *Supervisor:* David Winsch, Ph.D.

Conducted assessments and developed integrative reports for children ages 1-month to 18-years seeking Social Security allowances. Referrals included cognitive, physical and emotional disabilities and incorporated interaction with the child's family of origin. Assessment measures included: WISC-IV, WPPSI-III, BSID-III, Beery VMI-VI, GARS-II, and the Vineland-II. Provided a feedback report to the Social Security office based on assessment results and behavioral observations. Weekly individual supervision from a licensed psychologist.

External Practicum Experience:

2015 – Present: Behavioral Health Therapist, **Athena's Sisters,** Louisville, KY
Supervisor: Bernadette Walter, Ph.D.

Provided psychiatric screenings and brief psychological interventions to women veterans and active service members enrolled within the Athena's Sisters charity program. Worked with women suffering from PTSD, depression and substance abuse issues. Completed extensive readings and discussions with veterans regarding the impact of military sexual traumas. Met weekly with a licensed psychologist and military veteran to discuss means to provide culturally sensitive psychological treatment for female military veterans.

2014 – Present: Behavioral Health Therapist, **Family Scholar House,** Louisville, KY
Supervisor: Bernadette Walter, Ph.D.

Provided stress-management and resilience techniques to low-income, single parents enrolled in the Family Scholar House charity program. Conducted weekly didactic sessions utilizing cognitive-behavioral and mindfulness techniques to foster stress-resilience. Administered cognitive and behavioral assessments of stress-management with the goal of measuring intervention efficacy.

2014 – Present: Behavioral Health Therapist, **Health Promotion Office,** University of Louisville, KY
Supervisors: Paul Salmon, Ph.D., Karen Newton, RD

Developed and implemented an empirically-based mindful-eating pilot program for student, staff and faculty populations. Conducted weekly health behavior psychoeducation groups for students and staff promoting progressive muscle relaxation techniques for insomnia, mindfulness-based stress management, and healthy diet adherence. Collaborated with Health Promotion campus staff including physicians, counselors and registered dieticians to improve health information delivery. Received weekly supervision from a licensed psychologist.

2013 – 2014: Behavioral Health Therapist, **Pain Management Clinic**, University of Louisville Hospital, KY.
Supervisor: Brian Monsma, Ph.D.

Assessment: Conducted psychological assessment and developed integrative reports as part of a multi-disciplinary pain management team. Assessments included screening for presence of psychopathology, psychosocial health and neurological concerns (MOCA) as they relate to appropriateness for spinal cord stimulator implantation and other surgical procedures.
Intervention: Conducted intake interviews and psychotherapeutic interventions for predominantly low-income, disabled patients in a non-pharmacological pain management clinic. Treatment concerns related to coping with chronic pain and management of related psychosocial problems and psychopathology as well as behavioral pain management strategies, insomnia interventions, smoking cessation and weight management. Completed referrals to inpatient psychiatry when pharmacological intervention was appropriate. Available to provide crisis intervention for patients with medical anxiety or phobia. Received weekly individual supervision.

Additional Clinical Experience:

2013 Behavioral Health Counselor, Camp Hendon Diabetes Camp, Leitchfield, KY
Supervisor: Vasti Broadstone, MD

Behavioral health camp counselor with a pediatric type 1 diabetes population ages 6 to 18. Responsibilities included week-long dietary management and carbohydrate adjustment, insulin calculations, and blood glucose rounds daily and nightly. Collaborated extensively with a multidisciplinary health professional team including physicians, registered nurses, pharmacists and dieticians to aid glycemic data tracking.

2013 Behavioral Health Counselor, Moving Mountains for Multiple Sclerosis, National Multiple Sclerosis Society, Mt. St. Francis, IN
Supervisor: Bernadette Walter, Ph.D

Co-facilitated "discovery weekend" for children ages 6 to13 living with parents with multiple sclerosis (MS). Group aimed to implement developmentally appropriate psychoeducation and perspective-taking techniques, while discussing the impact of MS on the family.

2010 – 2011: Crisis Hotline Operator, Crisis Center of East Alabama, Auburn, AL
Supervisor: Douglas Reardon, M.A.

Completion of extensive Suicide Intervention Training and Affective Listening training and supervision. Volunteered four hours per week to phone-based

interventions for suicidality, substance abuse and domestic violence for an under-privileged county catchment area. Supervised by mental health professionals to ensure callers were receiving appropriate treatment

PRESENTATIONS

2014 Guest Speaker, **Joslin Diabetes Center**, Floyd Memorial Hospital, New Albany IN

Talk title: "Type 2 Diabetes: Coping with the Holidays"

Discussed the physiological impact of excessive food consumption during the holiday period with community members with type 2 diabetes. Incorporated information regarding stress management and means to become aware of the physiological sensations associated with overeating and blood sugar changes. Included mindful eating practices and body awareness techniques.

2014 Guest Speaker, **Joslin Diabetes Center**, Floyd Memorial Hospital, New Albany IN

Talk title: "The Emotional Side of Diabetes"

Discussed the psychological impact of diabetes to community members with type 1 and type 2 diabetes. Incorporated information regarding prevalence rates of depression and anxiety and discussed means to reduce the daily stress associated with chronic illness.

TEACHING EXPERIENCE

2014 Graduate Teaching Assistant/Clinical Assistant, *Noble H. Kelley Psychological Services Center, Louisville, KY*
Course: Intellectual and Cognitive Assessment
Supervisor: Bernadette Walter, Ph.D.

Demonstrated the administration of cognitive assessment tools (WISC-IV, WAIS-IV, WJ-III) to incoming clinical graduates students. Led group discussions regarding the assessment of cognitive functioning in general and clinical populations. Grading of WISC-IV, WAIS-IV and WJ-III administrations and integrative reports. Provided feedback of administration accuracy and areas for improvement.

2013 - Present Graduate Teaching Assistant/Clinical Assistant, *Noble H. Kelley Psychological Services Center, Louisville, KY*
Course: Clinical Interview Skills
Supervisor: Janet Woodruff-Borden, Ph.D.

Conducted and developed discussion-based classes to implement clinical training practice with incoming clinical psychology graduate students. Responsibilities included the role of lead Teaching Assistant reporting class progress to the director of clinical training, leading group discussions, facilitating clinical role-plays and grading weekly student assignments. Additionally, worked with faculty members to incorporate diversity issues into the course curriculum.

VOLUNTEER/COMMUNITY SERVICE EXPERIENCE

2014 – Present Clinical Psychology Program Representative, *University of Louisville, KY*
Represented the clinical psychology cohort as a faculty-student mediator.

2012 - Present Society of Behavioral Medicine, Ad Hoc Abstract Submission Reviewer
Worked with Barbara Stetson, Ph.D. to critique and evaluate abstract submissions for the 2013, 2014 and 2015 *Society of Behavioral Medicine's Annual Meeting.*

2010 - 2011 Volunteer, *Opelika Boys and Girls Club, AL*
Led homework sessions for children between the ages of 5 and 12, participated in a child mentoring program and assisted care workers in delivering child care to young infants.

WORKSHOPS AND SUPPLEMENTAL TRAINING

2015 Conference for the Promotion of Veteran Cultural Competence in Providers,
Brown and Williamson Club, University of Louisville
Full day conference addressing cultural competencies and case management needs associated with U.S. veteran populations in service provision. Included specific training for work with female veterans.

2015 Women Veterans Conference
Brown and Williamson Club, University of Louisville
Attended a conference to gain further experience with specific issues experienced by female veterans and how service providers may better meet their needs.

2014 Seminar in the Promotion of Veteran Cultural Competence,
University of Louisville
Full day didactic seminar addressing cultural competencies associated with U.S. veteran populations in service provision. Included specific training for work with female veterans.

2013 Seminar in Treatment Courses in Post-Traumatic Stress Disorder,
University of Louisville

Full day psychoeducational seminar on current approaches to symptoms, diagnosis, and treatment of post-traumatic stress disorder with a focus on interventions with military veterans.

2012 Seminar in Comprehensive Behavioral Intervention for Tics/Tourette's Disorder, *University of Louisville*
Full day didactic seminar devoted to treatment courses for tics and Tourette's disorders, including interactive and role-play components.

CULTURAL COMPETENCY

2013 Volunteer Activity Leader; *Transgender Awareness Week*, Louisville, KY
Led a structured workshop for community individuals to promote awareness of issues affecting transgendered and LGBQ individuals. Specific discussion included sensitivity to LGBTQ issues and ways to tailor clinical endeavors to the LGBTQ community.

2011 – 2014 Seminars attended: Multicultural Awareness, Tailoring Psychotherapy to Service
Members, Eating Disorder Treatment, Substance Abuse Treatment, Severe Psychopathology, Mindful Eating and Healthy Behaviors, Distress Tolerance, LGBTQ
issues in psychotherapy, Trauma and PTSD, Impulsivity and Addictive Behaviors, Pain
Management, Family Systems Theory

PROFESSIONAL ORGANIZATION MEMBERSHIPS

2012 - Present *Society of Behavioral Medicine,* student member.
Special interest groups: Student, Diabetes, Physical Activity

2009 - Present *Psi Chi National Honors Society in Psychology,* student affiliate

2009 - Present *American Psychological Association*, student affiliate

ACADEMIC AND EXTRACURRICULAR HONORS

2014 Successfully completed the University of Louisville Clinical Psychology Program Comprehensive Examinations, receiving a "*Distinguished Pass"*

2012 Received the "Capital One Academic All-American Award for Outstanding Student-Athletes" University of Louisville, KY.

2010	Nominated for the "Georgia Vallery Award for Outstanding Psychology Senior" Auburn University, AL
2008 – 2010	Liberal Arts College Dean's List; Auburn University (7 semesters)
2008 – 2012	Selected to the Academic NCAA All-American Honor Roll in varsity Track and Field and Cross Country
2007 – 2011	Four-time NCAA All-American in varsity Track and Field and Cross Country
2009 – 2011	Team Captain, Auburn University Cross Country & Track and Field Team