

THESIS

MIRROR, MIRROR BY THE STAIRS: THE IMPACT OF SELF-AWARENESS ON STAIR
VERSUS ELEVATOR USE IN COLLEGE STUDENTS

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ABSTRACT

MIRROR, MIRROR BY THE STAIRS: THE IMPACT OF SELF-AWARENESS ON STAIR VERSUS ELEVATOR USE IN COLLEGE STUDENTS

Previous research has indicated that self-awareness-inducing mirrors can successfully incite behavior change, such as encouraging helping. However, few studies have examined how mirror exposure and perceived body size influence physical activity participation. The present study assessed stair versus elevator use on a western college campus and hypothesized that mirror exposure would increase stair use. One hundred and sixty-seven students enrolled in an introductory psychology course were recruited to take a survey interested in their “transportation choices” at an indoor campus parking garage. Participants were individually exposed to either no mirror, a standard full-length mirror, or a full-length mirror manipulated to make the reflected body size appear either slightly thinner or slightly wider than normal before being asked to go to the fourth floor of the garage for a survey. Participants’ choice of floor climbing method (stairs or elevator) was recorded and they were administered an internet-based survey assessing demographic information, body mass index (BMI), self-awareness, and other variables likely to be associated with stair use. Results from logistic regression analyses revealed that participants who were not exposed to a mirror (OR = 0.37, 95% CI: 0.14 – 0.96), males (OR = 0.33, 95% CI: 0.13 – 0.85), those with lower BMI (OR = 0.84, 95% CI: 0.71 – 0.99), those with higher exercise participation (OR = 1.09, 95% CI: 1.02 – 1.18), and those engaging in more unhealthy weight-control behaviors (OR = 1.55, 95% CI: 1.14 – 2.11) were significantly more likely to take the stairs. Implications and future directions are discussed.

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Introduction

The span and significance of health benefits resulting from participation in physical activity are well documented in scientific literature. Along with aiding in the prevention of obesity and weight-related diseases (Hill & Wyatt, 2005), regular physical activity has been linked to improvements in cardiorespiratory fitness, blood pressure, flexibility, strength, and psychological functioning (Fletcher et al., 1996). Despite such health benefits, recent national data suggest that only 20.3% of adults age 18 years and older met the Physical Activity Guidelines for both aerobic and muscle-strengthening physical activity in 2012 (Centers for Disease Control and Prevention [CDC], 2014). Furthermore, the percentage of adults reporting meeting guidelines for physical activity may be overestimated, as activity data collected objectively via accelerometry indicates a substantially lower percentage (Tucker, Welk, & Beyler, 2011). In conjunction with increasing physical activity, decreasing time spent sitting can also greatly improve health outcomes. In fact, reducing sedentary time to less than three hours per day may be associated with a two-year increase in life expectancy (Katzmarzyk & Lee, 2012).

Research has identified the age period of 18-29 years as a time in which adults are especially vulnerable to unhealthy weight gain and significant declines in physical activity (Gordon-Larsen, Adair, Nelson, & Popkin, 2004). It is during this key period of adulthood that approximately 68% of high school graduates attend college (United States Department of Labor, 2012) and experience significant lifestyle changes which may substantially impact their health. For example, less than 35% of college students are meeting the recommended guidelines for physical activity (Deng, Castelli, Castro-Pinero, & Guan, 2011). Because of the drastic changes experienced in independence, social influences, living arrangements, etc. for most students

during the transition from high school to college, research has primarily focused on weight-related health behaviors in first-year (freshman) college students. Many researchers have recognized freshman year as a “critical period” for weight gain and associated unhealthy dietary and activity behaviors within adulthood (Anderson et al., 2003; Butler, Black, Blue, & Gretebeck, 2004; Holm-Denoma et al., 2008; Wengreen & Moncur, 2009). Several studies have found that, for the majority of both male and female students, body weight increases and total time spent engaging in physical activity decreases from high school to college (Anderson et al., 2003; Butler et al., 2004; Holm-Denoma et al., 2008; Racette, Deusinger, Strube, Highstein, & Deusinger, 2005; Wengreen & Moncur, 2009). Specifically, college students gain 3.75 pounds during their freshman year (Anderson, Shapiro, & Lundgren, 2003; Holm-Denoma, Joiner, Vohs, & Heatherton, 2008) and perform an average of approximately 193 fewer minutes of vigorous physical activity per week than they performed in high school (Downs & Ashton, 2011). Overall, physical activity behaviors and their influences are significantly understudied in the college-aged population, especially when compared to similar health behaviors like dietary intake (Nelson, Gortmaker, Subramanian, & Wechsler, 2007). Interestingly, one study found that caloric intake significantly decreased over the course of participants’ first semester at college, suggesting that a decline in physical activity is at least partly responsible for weight and fat gain in this population (Butler et al., 2004).

Such declines in physical activity among the college-aged population make evident the need for intervention in this area, especially as young adults become more sedentary and have fewer opportunities for regular physical activity. The increased focus on academics and primarily sedentary work, such as studying at a desk, may be one reason why college students are at risk. One study found that college students were sedentary for nearly 30 hours per week

not including sleeping time, and this was primarily due to studying (Buckworth & Nigg, 2004). Some research has even reported that along with adults over the age of 60, older adolescents were the most sedentary group in the United States, spending over half of their waking time being sedentary (Matthews et al., 2008). The time period after college is also high-risk for sedentary behaviors, especially as many adults work primarily sedentary jobs, such as in an office. Tudor-Locke, Leonardi, Johnson, and Katzmarzyk (2011) determined that American adults spend nearly one-third of their entire day at work, and those in mostly sedentary jobs are sitting for approximately 11 hours per day. Because sedentariness has been found to be a significant risk factor for unhealthy weight gain and the development of weight-related diseases (Healy et al., 2008; Hu, Li, Colditz, Willett, & Manson, 2003) and has indicated deleterious health effects independent of insufficient physical activity (Hamilton, Healy, Dunstan, Zderic, & Owen, 2008), strategies that both reduce sedentary time and promote routine, leisurely activity are vital.

Stair Use

One approach that has been used to reduce sedentary time and promote routine, leisurely physical activity is encouraging use of the stairs in multi-level environments over using an elevator or escalator. Stair promotion has been attempted in various public settings including subway stations (Blamey, Mutrie, & Aitchison, 1995), shopping malls (Brownell, Stunkard, & Albaum, 1980; Kerr, Eves, & Carroll, 2001), and office buildings (Graham, Linde, Cousins, & Jeffery, 2013; Kerr, Yore, Ham, & Dietz, 2004). Laboratory research on caloric expenditure has found that climbing the stairs requires 8.6 times more energy expenditure than the resting state (Bassett et al., 1997), which is likely to be operating while riding in an elevator or escalator. Furthermore, a study by Teh and Aziz (2002) concluded that stair climbing meets the American

College of Sports Medicine's minimum physical activity intensity requirements for health gains due to the cardiovascular responses that result. Clearly, the promotion of stair use over more sedentary elevator or escalator use has great benefits for both public health researchers and individuals looking to increase their daily energy expenditure through means that are convenient and inexpensive. Two main intervention strategies have been implemented in an attempt to increase stair use: point-of-decision prompts and stairwell enhancement. Each of these strategies, including their benefits and limitations, will be discussed in more detail in the following sections.

Point-of-decision prompts. Point-of-decision (POD) prompts are posters or signs containing messages that encourage healthy behaviors, such as using the stairs in an office building over an elevator or escalator. These signs are typically placed in areas where people are expected to make a choice between two or more options (with one of the options being the targeted healthy behavior). Messages on POD signs may include statements like, "Improve your waistline, use the stairs" (Soler et al., 2010). Previous POD prompt research has noted that larger-sized posters may be more effective at increasing stair use than smaller signs and messages with two positive reasons for stair use (e.g., "Stay healthy, save time, take the stairs") may be more effective than messages with just one reason (Kerr et al., 2001). Overall, POD prompts have been identified as effective tools to increase the use of stairs over an elevator or escalator (Soler et al., 2010). In fact, two studies found that signs posted near adjacent stair wells and escalators in public locations that encouraged stair use were associated with nearly doubled rates of walking up the stairs as was seen at baseline (Blamey et al., 1995; Brownell et al., 1980).

The research supporting the effectiveness of POD prompts in increasing stair use is encouraging, especially because POD prompts are likely to be one of the more cost-effective strategies for improving routine physical activity. Nevertheless, stair use interventions using POD prompts can experience implementation and sustainability issues including removal of the prompts (Soler et al., 2010) and/or reactance to the prompts (Sussman & Gifford, 2012). People can easily tear paper prompts down, rendering them ineffective, or may exhibit reactance by displaying a behavior that is opposite of what was advised as a result of not wanting to be told what to do (Brehm, 1966). Indeed, research has found that reactance from just one person resulted in the removal of energy conservation signs that encouraged students to turn off lights in unoccupied campus bathrooms and lights being intentionally left on (Sussman & Gifford, 2012). If seeing stair use POD signs induces reactance, individuals would purposely not use the stairs and the benefits of this intervention strategy would once again be negated.

Stairwell enhancement. Another strategy used to promote stair use in multi-level buildings is that of stairwell enhancement. Stairwell enhancement involves improving the aesthetic feeling of stairwells through adornments like paint, carpet, music, and artwork. Some research on stairwell enhancement efforts has found that the addition of music to an office building stairwell increased stair use after three months of intervention (Kerr et al., 2004). In another study, the addition of both music and art to worksite stairwells significantly increased stair use over the span of two years (Graham et al., 2013). Research on this strategy also supports combining POD prompts and stairwell enhancements to increase stair use among workers (Graham et al., 2013; Kerr et al., 2004).

Stairwell enhancement strategies share several of the implementation issues associated with POD prompts, including ineffective aesthetic improvement and risk of artwork or other

adornment removal. In addition, adequate sustainability of both POD signs and stairwell enhancement efforts is of concern, as people may become less interested in them over time. For example, after success at the beginning of their POD prompt intervention, Marshall, Bauman, Patch, Wilson, and Chen (2002) had rates of stair use similar to baseline when the prompts were removed and no significant change in use after reintroduction of the prompts. Thus, stair use may increase initially but eventually decline as the novelty of the prompts or stairwell aesthetics wears off. Research should instead explore theory-based, innovative methods to encourage stair use over the long-term.

An inexpensive intervention strategy for promotion of stair use that may limit reactance and serve as a combined POD prompt and aesthetic enhancement is the use of a mirror near stairwells. Not only could hanging a mirror improve the artistic look and/or feel of a stairwell, but theory suggests that a mirror could serve as an effective POD prompt that heightens self-awareness and induces positive behavior change. In the next section, the theoretical framework behind the use of mirrors to encourage stair use will be discussed.

Theoretical Framework

Cognitive dissonance. Festinger's (1957) theory of cognitive dissonance postulates that a difference in attitudes and behavior will lead to feelings of discomfort. Individuals will then attempt to relieve the unpleasant feelings by changing either their attitudes (Elliot & Devine, 1994) and/or their behavior (Draycott & Dabbs, 1998), making for an effective persuasion strategy. In fact, several interventions that create cognitive dissonance among participants to induce positive attitude or behavior change have been successful (Freijy & Kothe, 2013). Researchers argue that the hypocrisy paradigm explains behavior (vs. attitude) change because dissonance results from an individual making a positive value statement about a behavior and

then being reminded of their past failures involving the same behavior (Aronson, Fried, & Stone, 1991). Prevention and intervention efforts that have successfully induced positive health behavior change via the hypocrisy paradigm include those that increased condom use (Thompson, Kyle, Swan, Thomas, & Vrungos, 2002), reduced risk factors for eating disorders (Becker, Smith, & Ciao, 2006), and increased sunscreen use (Stone & Fernandez, 2011).

Regarding exercise behavior change specifically, Bator and Bryan (2009) utilized the hypocrisy paradigm by asking college students to give reasons why they do not exercise regularly and then asked them to sign a poster promoting regular exercise in the campus fitness facility to which they belonged. They found that participants in the hypocrisy condition reported higher intentions to exercise and used their card to get into the fitness facility more often the following week than those in the control condition. This study shows that, despite limited research on the topic, use of the hypocrisy paradigm to induce cognitive dissonance and increase regular exercise is encouraging.

Objective self-awareness. Objective Self-Awareness (OSA) theory (Duval & Wicklund, 1972), operates under the notion that when attention is directed toward the self, objective self-awareness is induced and a subsequent comparison of the self to a “standard” is made. Duval and Wicklund (1972) define “standard” as the combination of what the individual considers to be the correct behavior, attitudes, and traits of a person. If there is a discrepancy between the self and the standard after comparison (cognitive dissonance), the individual will experience unpleasant feelings and will therefore try to close the perceived gap. As a result of this drive for consistency between the self and the standard, self-awareness has been found to be a moderator of the relationship between attitudes and behavior (Carver, 1975; Wicklund, 1975) such that attitudes are more predictive of behavior when the individual is aware of the self.

Self-awareness has been induced in studies by the presence of items such as a video camera or a mirror (Govern & Marsch, 2001). For example, Carver (1974; 1975) investigated the willingness of participants to punish incorrect responses in a learning task by shocking the learner in the presence or absence of a mirror. In one study, all participants were under the impression that the standard of behavior involved positive values toward high aggression. This study found that those in the mirror condition shocked the learner at significantly higher levels than those in the no-mirror control condition (Carver, 1974). In a similar study, those in the mirror condition who held more positive attitudes toward the use of physical aggression shocked the learner at higher levels, but the controls in the no-mirror condition did not differ from one another, even with varying attitudes toward physical aggression (Carver, 1975). Taken together, these studies indicate that aggression can be facilitated through inducing salience of positive attitudes toward aggression and having a mirror present.

Other studies using OSA theory, and specifically mirrors, to induce certain behaviors include the classic experiment on cheating behaviors conducted by Diener and Wallbom (1976). The researchers found that significantly fewer participants cheated on an anagram test in the mirror-induced self-aware condition than in the no mirror condition. They speculated that the reduction in cheating was due to a combination of increased self-awareness (OSA theory) where a mirror made personal values more salient, and decreased deindividuation, or a higher sense of responsibility for personal actions as a result of self-awareness (see Zimbardo, 1970). Research by Beaman, Klentz, Diener, and Svanum (1979) supports Diener and Wallbom's (1976) work and the idea that the presence of a mirror can decrease transgressive behavior. Beaman and colleagues (1979) found that when a mirror was placed behind a bowl of candy on Halloween, trick-or-treating children took less candy than when there was no mirror present due to

heightened self-awareness. Additionally, when the experimenters told the children to only take one piece of candy from the bowl, more children complied if they had been asked their name and a mirror was present. These findings indicate that a mirror not only increased self-awareness and subsequent benevolent behavior when no standard was given, but also moderated the relationship between individuation and honesty when a standard of behavior was provided.

Turning attention away from decreasing transgressive behavior and toward increasing prosocial behavior, Abbate, Isgrò, Wicklund, and Boca (2006) cleverly examined the role of mirrors in producing helping behavior. They objectively measured helping behavior by the number of postcards that arrived in England from Italy after a researcher asked participants to mail one for her as a favor because she was short on time. Significantly more postcards were mailed in the mirror condition than in a control condition that replaced a mirror with a picture of someone else (Abbate et al., 2006). This study indicates that the presence of a mirror can increase individuation and facilitate helping behavior due to the act of helping being made more salient and being seen as a standard of correct behavior. Although the use of mirrors to induce self-awareness has been found to successfully promote positive behavior change, few studies have distinguished between different categories of self-awareness and investigated the types of mirrors required to induce such categories.

It is important to note that research has demonstrated self-awareness as a separate state from self-consciousness. While self-consciousness is typically believed to be more of a stable, personality-like trait (Buss & Scheier, 1976; Carver & Glass, 1976), self-awareness depends on the situation and is considered highly changeable (Carver & Glass, 1976). Govern and Marsch (2001) argue that there are three different states of self-awareness that individuals could experience: public self-awareness, private self-awareness, and awareness of immediate

surroundings. Public self-awareness involves a focus on the aspects of the self that can be seen by other people, such as physical features, whereas private self-awareness involves more of a focus on internal aspects of the self, such as memories or feelings of pain (Buss, 1980).

Awareness of immediate surroundings focuses on attention to the environment and events going on near or around the self. Public self-awareness, then, is most likely to lead to socially acceptable behavior change as a result of individuals attempting to relieve discomfort felt from possible social evaluation (Froming, Walker, & Lopyan, 1982).

Along with discerning between different types of self-awareness, Govern and Marsch (2001) discuss how different sizes of mirrors induce either public or private self-awareness. Because public self-awareness involves a heightened focus on aspects of the self that are observable by others, full-length mirrors that show the whole body are used to induce this type of awareness. In contrast, small mirrors that only show the head and shoulders, such as handheld mirrors, are used to induce private self-awareness (Govern & Marsch, 2001). While several studies have manipulated general self-awareness using either large mirrors (Beaman et al., 1979; Diener & Wallbom, 1976), or small mirrors (Abbate et al., 2006; Carver, 1975), few have examined what levels of public, private, and environmental awareness are induced by a certain-sized mirror. The present study aims to use full-length mirrors to induce public self-awareness. Furthermore, although previous research on OSA theory has studied the role of mirrors in producing aggression, honesty, and helping behaviors, few studies to my knowledge have investigated the role of self-awareness through the use of mirrors in increasing physical activity behaviors.

One study examining mirrors in conjunction with physical activity found that exercising in a mirrored environment was associated with more negative feelings than exercising in a non-

mirrored environment among inactive women (Martin Ginis, Jung, & Gauvin, 2003). In their study, female participants reported less positive engagement, decreased tranquility, and smaller increases in revitalization after exercising in front of a mirrored wall than the women who exercised in front of a non-mirrored wall (Martin Ginis et al., 2003). These findings support OSA theory in that sedentary women who were made self-aware by the presence of a mirror felt that they were farther from the ideal standard with regard to exercise and therefore reported more negative feelings than those not made self-aware. The authors speculate that the mirrors also increased the negative feelings reported by the primarily sedentary participants because they likely had less self-efficacy for performing the exercises than active women, and the mirrors showed their performance (Martin Ginis et al., 2003).

In addition, Martin Ginis and colleagues' (2003) results imply that mirrored gyms or other locations where physical activity could take place may actually deter certain women from being active there, particularly if they have experienced negative feelings from doing so in the past. The proposed study thus aims to explore this idea further by exposing people to a mirror and heightening their self-awareness before rather than during a physical activity possibility (stair climbing). If OSA theory is again supported, individuals who are made self-aware with a mirror and who feel they are not upholding a standard of publicly correct behavior will be more likely to minimize their cognitive dissonance by choosing to take the stairs instead of an elevator. Low self-efficacy for exercise should not be a concern for this study, as the physical activity will not take place in front of the mirror and walking up the stairs is not a structured exercise routine like what was performed in Martin Ginis et al.'s (2003) experiment. As such, primarily sedentary participants should feel more comfortable in their ability to ascend a staircase than they would in their ability to perform a structured bout of exercise. Because Martin Ginis and

colleagues' (2003) study only looked at the effect of mirrors on female participants' feelings after exercise, the proposed study will also investigate possible gender differences in stair use after exposure to a full-length mirror.

Body Size and Physical Activity

Research on self-perception of body size among adolescents indicates that those who are and/or those who perceive themselves to be more overweight can be more likely to engage in weight-management behaviors, including dieting and exercise, but may do so using extreme or unhealthy approaches (Huenemann, Shapiro, Hampton, & Mitchell, 1966; Neff, Sargent, McKeown, Jackson, & Valois, 1997). In their study examining college students' motivations to engage in exercise, Kilpatrick, Hebert, and Bartholomew (2005) discovered that exercise motivations were primarily extrinsic and appearance-based, whereas motivations for sports participation were more intrinsic (e.g., enjoyment, challenge). Such findings indicate that the college population may be drawn to non-sport physical activity primarily for appearance- and weight-loss purposes. However, Ingledew and Markland (2008) found that appearance and weight-related motives for exercise, versus health and fitness-related motives, were negatively associated with exercise participation. Therefore, appearance-based motives such as weight-loss may actually deter participation in exercise, especially among larger individuals who likely have more weight to lose. To further explore this issue, the present study will assess participants' healthy (e.g., exercising more, eating more fruits and vegetables) and unhealthy (e.g., fasting, taking laxatives) behaviors typically associated with weight control, and how each of these types of behaviors may be predictive of stair use.

Along with different psychological motivations for engaging in physical activity, research has identified important physical characteristics that may encourage or deter active

participation. Proffitt (2006) uses an “economy of action” theory to explain how people will visually perceive distances and slopes depending on their physical resources, with the goal to act in an energy-efficient manner (not to have energy expenditure exceed energy consumption). For example, people who carried a heavy backpack perceived farther distances and steeper slopes than those who saw equivalent distances and slopes but had more physical resources and fewer energy costs associated with traversing these environments (Proffitt, 2006). Therefore, it is conceivable that heavier individuals would perceive a staircase to be steeper than normal-weight individuals, because like those wearing a backpack, an ascent up a staircase would require more energy. A study done by Bhalla and Proffitt (1999) supports such a notion, as the researchers found participants’ fitness level to be negatively correlated with their slant judgments. If heavier individuals and those with lower fitness levels perceive a staircase to be steeper, they are likely to choose a more energy-efficient method of ascending multiple floors, such as an elevator or escalator that does not require as much of their own physical exertion. Indeed, observational data from Eves (2014) is consistent with Proffitt’s (2006) theory and demonstrates that certain demographic groups with more physiological limitations for stair climbing, including women and overweight individuals, do avoid the stairs more than their counterparts (men and normal weight individuals).

Hypotheses

In light of the identified gaps in previous research, the proposed study aims to investigate the influence of a mirror and perceived body size on individuals’ stair versus elevator use. Specifically, the present study will examine whether or not the presence of a mirror (self-awareness) increases stair over elevator use relative to a control condition in which no mirror is present; and how stair and elevator use fluctuate when the mirror is distorted to make the

reflected body size appear thinner or wider. Although most studies discussed have conducted stair use interventions with adult populations (Blamey et al., 1995; Brownell et al., 1980; Graham et al., 2013; Kerr et al., 2004), it is reasonable to assume that similar strategies will translate well to college students. Like working adults, college-aged students are sedentary for a large portion of the day due to factors like studying (Buckworth & Nigg, 2004), and their highly-frequented environment (college campus) is likely to have several multi-level buildings with both stairs and elevators where interventions may be implemented. Considering these factors and the past research on the role of mirrors in promoting self-awareness and their influence on physical activity, there are four hypotheses for the present study:

H1: A higher percentage of college students will use the stairs in the mirror conditions than in the no-mirror condition.

Objective Self-Awareness (OSA) theory states that individuals compare themselves to a “standard of correctness” when attending to the self (Duval & Wicklund, 1972). I argue that stair use can be seen as more of a “correct” behavior than elevator use because stair climbing is active and known to be good for health. Therefore, I expect that when a full-length mirror is present, people will become more self-aware and will proceed to compare themselves with a publicly acceptable standard, which will then motivate them to act in accordance with the “correct” behavior of stair use.

H2: A higher percentage of males than females will use the stairs.

Martin Ginis and colleagues (2003) found that inactive women who were active in front of a mirror and subsequently made more self-aware reported more negative feelings associated with exercise than those who were active in a non-mirrored environment. Furthermore, Eves (2014) observed fewer women than men taking the stairs and argued that the results were at least

in part due to women typically having less strength than men and carrying more body weight and fat for reproductive purposes, which would support Proffitt's (2006) economy of action theory.

H3: BMI will be inversely associated with stair use, such that those with higher BMI will be less likely to use the stairs than those with lower BMI.

Proffitt's (2006) economy of action theory postulates that those who are less energy-efficient, such as heavier individuals, will perceive equivalent slopes as steeper than those with more energy resources due to a desire to keep energy costs from exceeding energy consumption. Therefore, like Eves' (2014) observations, I expect individuals with a higher BMI to perceive a steeper staircase than individuals with a BMI in the normal range and subsequently be more likely to avoid stair climbing in favor of a more personally energy-conserving elevator.

H4: I will explore stair use among both types of size-distorting mirrors.

Consistent with the research by Huenemann et al. (1966) and Neff et al. (1997), it is conceivable that students who see a mirror that makes their body appear slightly larger than normal will be more likely to take the stairs due to a stronger desire to lose weight. However, it is also possible, based on research by Bhalla and Proffitt (1999) and Eves (2014), that a mirror that makes a user appear slightly smaller than normal would produce increased stair use as well due to fewer perceived physical limitations for climbing stairs. I will therefore test these competing hypotheses to determine whether stair use is higher after exposure to a thinning mirror or widening mirror.

Method

Participants

One hundred and seventy-four undergraduates from Colorado State University's (CSU) Department of Psychology student research pool were recruited to take part in this study. Students from two introductory psychology courses voluntarily signed up for the study via a provided link to the psychology research page. The study was titled "psychological influences on transportation choices" so as to be consistent with the parking garage study location. Participants who completed the study were awarded research participation credit for the introductory psychology course in which they were enrolled. Institutional Review Board (IRB) approval from CSU was obtained prior to commencement of the study (see Appendix B for IRB approval letter).

Research Design

This study utilized a quasi-experimental design. Exposure to the presence of a mirror was manipulated to create four conditions: a standard mirror, a thinning mirror, a widening mirror, and a no-mirror control condition. Participants were exposed to one of the four mirror conditions depending on the day they signed up for the study (semi-random assignment). The primary independent variable was type of mirror condition (categorical) and the primary dependent variable was the dichotomous behavior of stair or elevator use (categorical).

Materials and Measures

Mirror manipulation. The standard mirror condition exposed participants to a regular, full-length framed mirror that shows the entire body, in order to induce public self-awareness (Govern & Marsch, 2001). The thinning mirror and widening mirror conditions included the same mirror as the standard condition, but the mirrors were bent in such a way that participants'

reflections appeared slightly, not noticeably, thinner or wider than they would normally be, respectively. The participants assigned to the control condition were not exposed to a mirror. As a manipulation check, the item, “Did you see your reflection in a mirror near the stairs and elevator on the first floor of the parking garage?” appeared at the end of the questionnaire to assess whether or not participants saw their reflection. The participants who answered “yes” to this question were then prompted to answer how their reflection appeared to them using the response options, “it appeared as it normally does,” “it appeared wider than normal,” and “it appeared thinner than normal.”

Stair and elevator use. Participants’ stair or elevator use was assessed through investigator observation. Members of the research team recorded the method of transportation used by each participant along with their condition (i.e., standard mirror, thinning mirror, widening mirror, or no-mirror control).

Demographics. A questionnaire administered online via the software system Qualtrics was used to collect participants’ demographic information including their age, sex, race, ethnicity, height, body weight, and physical injury/disability status (see Appendix A for questionnaire). Questions assessing participants’ sex, race, ethnicity, and physical injury/disability status were modeled on the questions identified by Dorsey and Graham (2011). Height and body weight were used to calculate each participant’s body mass index (BMI), a weight-for-height assessment that is standardized for both sexes and for all ages of adults. Participants’ individual BMI was calculated by dividing their weight in kilograms by the square of their height in meters (kg/m^2 ; World Health Organization [WHO], 2013). BMI calculations were also used to create a “weight status” variable in which participants were labeled according

to the body weight categories outlined by WHO (2013) as either underweight (BMI < 18.5 kg/m²), normal weight (BMI = 18.5-24.9 kg/m²), or overweight/obese (BMI ≥ 25 kg/m²).

Opinions toward the parking garage. In order to make the survey items appear consistent with the study description and location, two “filler” items asking participants about the perceived safety and usability of the parking garage were included. One item asked participants to rate the safety of the parking garage from the floor they are on using a Likert scale of 1 – “not safe”, 3 – “somewhat safe”, and 5 – “very safe” and the second item asked participants to rate the usability of the garage from the floor they are on using a Likert scale of 1 – “not usable”, 3 – “somewhat usable”, and 5 – “very usable.”

Active transportation, physical activity, and weight-control behaviors. Participants’ primary method of campus transportation was assessed with the item, “What is your primary method of transportation on and around campus?” Response choices included “motor vehicle (car)”, “motorcycle/motorized scooter”, “bicycle”, “skateboard/non-motorized scooter”, “walking”, and “other” with a space for participants to fill in their method if it was not listed. Participants’ frequency of strenuous, moderate, and mild physical activity was then measured with three items from the Project Eat-III Survey for young adults (Neumark-Sztainer, Goeden, Story, & Wall, 2004). The items were modified from Godin and Shepard (1985) and Sallis et al. (1993). Finally, weight control behaviors were assessed using three different items from the Project Eat-III Survey for young adults (Neumark-Sztainer et al., 2002; Neumark-Sztainer, Wall, Perry, & Story, 2003). These items assessed participants’ use of unhealthy (e.g., fasting) and healthy (e.g., eating more fruits and vegetables) strategies for weight control, as well as their use of both healthy (e.g., exercising more) and unhealthy (e.g., using steroids) strategies for increasing muscle size or tone during the past year.

Self-awareness. As a manipulation check and to assess participants' self-awareness, the Situational Self-Awareness Scale (SSAS) developed and empirically tested by Govern and Marsch (2001) was administered. The nine-item scale asked participants to rate the extent to which they agree (1 "strongly disagree" to 7 "strongly agree") with statements about their public and private awareness, as well as their awareness of immediate surroundings based on how they were feeling right at that moment (Govern & Marsch, 2001). Sample items from each category of awareness include: "Right now, I am concerned about the way I present myself" (public), "Right now, I am conscious of my inner feelings" (private), and "Right now, I am keenly aware of everything in my environment" (surroundings). The SSAS has been determined to be a valid and reliable scale for assessing self-awareness and distinguishing between public, private, and environmental awareness (Govern & Marsch, 2001).

Body size perception. As a manipulation check and to measure participants' perceived body size, the Contour Drawing Rating Scale (CDRS; Thompson & Gray, 1995) was used. The CDRS includes nine female and nine male front-view contour drawings that sequentially increase in body size from left to right (Drawing 1 being the thinnest and Drawing 9 being the largest body size). Participants were asked to identify the sex-matched drawing that most closely resembles their own body. The CDRS has been determined to be a valid and reliable ($r = .78, p < .001$) scale for measuring body-size perception (Thompson & Gray, 1995).

Perception of staircase steepness. Participants' perception of the steepness of the staircase in the parking garage was measured with the item, "If zero degrees represents flat ground and 90 degrees represents a vertical wall, how steep (0-90 degrees) do you believe the staircase in the parking garage is?" Participants were able to provide their own answer in a blank box.

Procedure

Prior to any data collection, participants were assigned to one of the four conditions previously described. Mirrors for the three mirror conditions were placed on an easily-viewed wall approximately equidistant from the stairs and the elevator in the Lake Street parking garage on the CSU campus (see Appendix C). The no-mirror condition did not have a mirror on the wall. Individual participants were instructed to meet near the Parking Services office on the first floor of the enclosed parking garage. Signs were posted on the doors of both entrances to the Parking Services area directing participants to a check-in table inside placed in front of the wall with the mirror. On the check-in table, there was a sheet instructing participants to go to the fourth floor at their study time where a researcher would give them a questionnaire. The researcher on the fourth floor of the garage privately recorded the participant's condition and transportation method (stairs or elevator) used and then greeted the arriving participant. Participants were consented and administered an online questionnaire from a laptop that confidentially assessed their demographic information, opinions about the safety and usability of the parking garage, preferred method of transportation around campus, physical activity behaviors, weight-control behaviors, self-awareness, body size perception, perception of staircase steepness, and the appearance of a mirror and their reflection. All participants were thanked and debriefed as to the true nature of the study following completion of the questionnaire.

Statistical Analysis

This study aimed to investigate the effect of increased self-awareness (brought about by exposure to a full-length mirror) on stair use. Participants' stair use was assessed via investigator observation. Participants' demographic information, opinions about the parking garage, preferred method of transportation around campus, physical activity behaviors, weight-control behaviors, self-awareness, and body size perception were assessed via questionnaire following the behavioral observation.

Descriptive Statistics

Following data collection, descriptive statistics on participants' age, sex, race, ethnicity, BMI, and physical injury/disability status were calculated using SPSS 17.0 for Windows. Descriptive statistics included means for continuous variables (BMI) and frequencies for categorical variables (sex, age, race, ethnicity). Chi-square analysis, analysis of variance (ANOVA) and independent-samples t-tests were performed to confirm that there were no significant differences in target variables (sex, BMI, body size perception) by mirror condition and to determine how self-awareness levels were impacted by mirror exposure.

Logistic Regression

A logistic regression model was run in SPSS to test the primary study hypotheses, controlling for covariates taken from past research: age, sex, race, ethnicity, BMI, preferred method of transportation around campus (dichotomized into active vs. non-active), physical activity behaviors (total mild, moderate, and strenuous), weight loss behaviors (total healthy vs. unhealthy), self-awareness (total private, public, and immediate surroundings), and body size perception. To test H1, all three mirror conditions were combined into one "mirror" condition; then predicted odds of stair use were compared between the mirror and no-mirror groups. H2

was tested by comparing predicted odds of stair use among males and females. To test H3, the BMI variable was used to predict stair use. Finally, H4 was tested by comparing stair use among those in the thinning and widening mirror conditions. Here, another logistic regression was run where instead of combining mirror conditions, they were examined separately with a dummy-coded variable using no-mirror as the reference group.

Power Analysis

A power analysis for the logistic regression was conducted using G*Power 3.1.9.2. Effect size for the analysis was based on previous research examining a similar stair use intervention that found small to medium effects (Kerr et al., 2001). Results from the analysis indicate that a sample size of 204 participants total is needed to achieve power at the .80 level. As such, the present study aimed to recruit approximately 200 participants from the psychology research pool.

Results

After excluding the data of participants who opted out of inclusion after learning the study had used deception to manipulate mirrors and/or who reported having a physical injury that makes it difficult to walk or climb stairs ($N = 7$), a total of 167 students who took either the stairs or the elevator to the fourth floor of the parking garage study location remained. A majority of the sample identified as male, 18-25 years old, white and not being of Hispanic, Latino/a, or Spanish ethnic descent (see Table 1). Mean BMI for the sample was 22.6 kg/m^2 ; most participants had a BMI within the normal range (70.9%), while 18.2% were within the overweight BMI range and 5.5% fell into each of the underweight and obese BMI categories. Chi-square analyses revealed that participants' sex ($p = 0.59$) and BMI category ($p = 0.63$) did not significantly differ by experimental condition. Additionally, a one-way analysis of variance (ANOVA) indicated that participants' body size perception did not significantly differ across the four conditions ($p = 0.82$).

Self-Awareness

The mean self-awareness (SA) score for the sample was 32.1 (out of 45) and 9.0 (out of 15) for public self-awareness, which is comparable to mean SA scores found elsewhere in collegiate samples (Govern & Marsch, 2001). SA means and standard deviations for the four experimental conditions were: $M = 31.94$, $SD = 4.11$ (no-mirror, $N = 36$), $M = 31.72$, $SD = 4.82$ (standard mirror, $N = 43$), $M = 31.95$, $SD = 3.80$ (thinning mirror, $N = 42$), and $M = 32.81$, $SD = 5.52$ (widening mirror, $N = 37$). Results from a one-way ANOVA indicated that participants' mirror condition did not significantly affect their overall self-awareness, $F(3, 157) = 0.42$, $p = 0.74$ or their public self-awareness, $F(3, 159) = 0.56$, $p = 0.65$. In addition, an independent-samples t-test was conducted to assess if overall self-awareness and public self-awareness

differed as a function of whether or not participants' reported seeing a mirror near the stairs and elevator. Results indicated that neither type of self-awareness was affected by consciously seeing a mirror (overall SA: $t(155) = 0.20, p = 0.84$; public SA: $t(157) = 0.83, p = 0.41$).

Collinearity of Predictor Variables

To assess the relationships between key covariates identified from previous research, a correlation matrix was run along with the base logistic regression model. The matrix indicated no strong correlations between any of the variables (see Table 2), so all variables were retained in the subsequent models. In order to determine the precise similarity between the race and ethnicity variables and the BMI and body size perception variables (the latter pair had the highest correlation at 0.7), variance inflation factor and tolerance statistics were also obtained and indicated non-problematic collinearity between each of these variable pairs. As such, these variables were kept as separate covariates in all models.

Hypotheses Testing

Overall, more participants took the stairs (61.7%) than the elevator (38.3%). For all four hypotheses, logistic regression was performed to determine the odds of stair (vs. elevator) use controlling for nine covariates identified from previous research: sex, race/ethnicity, BMI, body size perception, use of active transportation, overall self-awareness, exercise behavior, unhealthy weight-control behaviors, and healthy weight-control behaviors. Age was excluded as a covariate due to the homogeneity of the sample (all participants were enrolled in an introductory psychology course and 96.3% identified as being within the 18-25 year age range). For hypothesis 1, the odds of stair use were compared among participants in the no-mirror control condition and participants in any of the three mirror conditions. Overall, this model was significant, $X^2(11) = 32.71, p = 0.001$. The model predicted approximately 28% of the variance

in stair use (Nagelkerke R^2) and correctly classified 72.3% of cases. Participants' mirror exposure, sex, BMI, total exercise, and both unhealthy and healthy weight-control behaviors significantly predicted their odds of stair use (see Table 3). Surprisingly, significantly more participants who were exposed to a mirror (39.5%) took the elevator over the stairs than participants who were not exposed to a mirror (34.2%), holding all nine covariates constant. The lower stair use among those in the mirror conditions thus fails to support hypothesis 1.

Along with the participants who were not exposed to a mirror, significantly more males (73.0%) than females (49.3%) chose to take the stairs, indicating that hypothesis 2 was supported. Specifically, males were approximately three times more likely to take the stairs than females while controlling for race, ethnicity, BMI, body size perception, use of active transportation, overall self-awareness, exercise behavior, unhealthy weight-control behaviors, and healthy weight-control behaviors. Holding these same covariates constant, participants' BMI was also significantly predictive of stair use such that higher BMI was associated with a reduction in likelihood of stair use, thus supporting hypothesis 3. Post-hoc analyses were conducted investigating whether there was an interaction between mirror condition and each of the sex and BMI variables, but no significant interaction was detected for either. Notable continuous predictors that were significantly positively associated with greater likelihood of stair use were overall exercise participation and participation in unhealthy weight-loss behaviors (odds ratios, p-values, and confidence intervals for these covariates are displayed in Table 3). Interestingly, participation in healthy weight-loss behaviors, such as exercising more and eating more fruits and vegetables, was inversely related to stair use such that as the number and frequency of healthy weight-loss behaviors increased, the likelihood of stair use decreased.

To address hypothesis 4 by exploring how exposure to a thinning mirror or a widening mirror influences stair use, a second logistic regression model was run that compared each of the mirror conditions to the no-mirror condition, which served as the reference group. Overall, this model was significant, $X^2(13) = 33.41, p = 0.001$, and mirror-type predictors approached significance such that compared to the no-mirror condition and controlling for the previous covariates, exposure to either a thinning or widening mirror was associated with a reduction in the likelihood of using the stairs (see Table 4). Specifically, those in the thinning mirror condition were approximately 33% as likely to use the stairs, $p = 0.053$, 95% CI [0.11, 1.02], and those in the widening mirror condition were only about 31% as likely to use the stairs, $p = 0.055$, 95% CI [0.09, 1.02] as those in the no-mirror condition. Regarding the exploratory question posed by hypothesis 4, these results indicate that there are no significantly different effects on stair use after exposure to either a thinning or widening mirror.

Table 1

Descriptive Statistics for Stair Use Covariates

Covariates	n(%) or <i>M(SD)</i>
No Mirror	38(22.8%)
Standard Mirror	45(26.9%)
Thinning Mirror	45(26.9%)
Widening Mirror	39(23.4%)
Male	89(54.3%)
White	141(87.6%)
Non-Hispanic	139(86.9%)
BMI	22.6(3.6)
Body Perception (out of 9)	5.2(1.3)
Active Transportation	112(68.3%)
SA (out of 45)	32.1(4.6)
Total Exercise (out of 24)	12.4(6.3)
Unhealthy WC (out of 9)	1.0(1.6)
Healthy WC (out of 12)	5.8(3.2)

Notes. For categorical covariates (No Mirror, Male, White, Non-Hispanic, Active Transportation), label reflects reference group. BMI, Body Perception, SA, Total Exercise, Unhealthy WC, and Healthy WC are continuous variables. BMI = body mass index. SA = self-awareness. WC = weight-control behaviors.

Table 2

Covariate Correlations

	1	2	3	4	5	6	7	8	9	10
1. Female	1.00	0.13	0.07	0.22	0.07	-0.01	0.05	0.25	-0.27	-0.33
2. Non-White	0.13	1.00	-0.23	0.11	-0.05	0.02	-0.02	0.04	-0.20	0.18
3. Hispanic	0.07	-0.23	1.00	-0.07	-0.01	0.02	-0.01	-0.08	0.03	-0.07
4. BMI	0.22	0.11	-0.07	1.00	-0.70	-0.05	-0.04	-0.17	-0.26	-0.01
5. Body Perception	0.07	-0.05	-0.01	-0.70	1.00	-0.03	-0.02	0.15	0.02	-0.17
6. Inactive Transportation	-0.01	0.02	0.02	-0.05	-0.03	1.00	-0.08	-0.02	0.10	-0.01
7. SA	0.05	-0.02	-0.01	-0.04	-0.02	-0.08	1.00	-0.03	-0.13	0.04
8. Total Exercise	0.25	0.04	-0.08	-0.17	0.15	-0.02	-0.03	1.00	0.18	-0.43
9. Unhealthy WC	-0.27	-0.20	0.03	-0.26	0.02	0.10	-0.13	0.18	1.00	-0.24
10. Healthy WC	-0.33	0.18	-0.07	-0.01	-0.17	-0.01	0.04	-0.43	-0.24	1.00

Notes. For ease of interpreting categorical covariates (Female, Non-White, Hispanic, Inactive Transportation), the label reflects the non-reference group. Therefore, positive correlations indicate that being in the labelled group is positively associated with the comparison variable. BMI, Body Perception, SA, Total Exercise, Unhealthy WC, and Healthy WC are continuous variables. BMI = body mass index. SA = self-awareness. WC = weight-control behaviors.

Table 3

Odds Ratios (OR) for Stair Use Covariates

Covariates	OR	<i>p</i>	95% CI
Mirror	0.37	0.04	0.14 – 0.96*
Female	0.33	0.02	0.13 – 0.85*
Non-White	0.47	0.22	0.14 – 1.56
Hispanic	0.71	0.59	0.20 – 2.50
BMI	0.84	0.05	0.71 – 0.99*
Body Perception	1.15	0.54	0.74 – 1.80
Inactive Transportation	0.62	0.25	0.28 – 1.39
SA	1.01	0.88	0.92 – 1.10
Total Exercise	1.09	0.02	1.02 – 1.18*
Unhealthy WC	1.55	0.01	1.14 – 2.11*
Healthy WC	0.85	0.04	0.72 – 0.99*

Notes. For ease of interpreting categorical covariates (Mirror, Female, Non-White, Hispanic, Inactive Transportation), the label reflects the group associated with the direction of the OR. Therefore, an OR less than 1.0 indicates the covariate has an inverse relationship with (decrease in) stair use. BMI, Body Perception, SA, Total Exercise, Unhealthy WC, and Healthy WC are continuous variables. BMI = body mass index. SA = self-awareness. WC = weight-control behaviors.

* $p < 0.05$.

Table 4

Odds of Stair Use among Individual Mirror Conditions

Covariates	OR	<i>p</i>	95% CI
Reg. Mirror	0.48	0.21	0.15 – 1.50
Thin Mirror	0.33	0.05	0.11 – 1.02
Wide Mirror	0.31	0.05	0.09 – 1.02
Female	0.33	0.02	0.13 – 0.86*
Non-White	0.44	0.19	0.13 – 1.49
Hispanic	0.71	0.60	0.20 – 2.53
BMI	0.84	0.05	0.71 – 1.00
Body Perception	1.16	0.51	0.74 – 1.82
Inactive Transportation	0.61	0.23	0.27 – 1.37
SA	1.01	0.80	0.93 – 1.11
Total Exercise	1.10	0.02	1.02 – 1.18*
Unhealthy WC	1.57	0.01	1.15 – 2.14*
Healthy WC	0.85	0.05	0.72 – 1.00

Notes. Categorical covariate label reflects the group associated with the direction of the OR. An OR less than 1.0 indicates the covariate has an inverse relationship with stair use. BMI, Body Perception, SA, Total Exercise, Unhealthy WC, and Healthy WC are continuous variables. OR = odds ratio. BMI = body mass index. SA = self-awareness. WC = weight-control behaviors.

* $p < 0.05$.

Discussion

This study examined predictors of a person's choice to take the stairs or the elevator to a higher floor in a public building, specifically focusing on how the presence of a mirror and the individual's perceived body size influence this choice. Contrary to what was hypothesized, it was found that more people who were exposed to one of three mirror conditions chose to take the elevator over the stairs than those who were not exposed to a mirror. Although previous research has indicated that full-length mirrors that show the entire body can heighten overall self-awareness and induce public self-awareness particularly (Govern & Marsch, 2001), self-awareness was not found to significantly differ across the mirror and the no-mirror control conditions in the present study. Therefore, it is plausible to assume that the hypothesis of increased stair use among the mirror conditions was not supported because participants' self-awareness was not affected and thus they did not mentally compare themselves to an ideal standard, as postulated by OSA theory (Duval & Wicklund, 1972).

Another possibility is that self-awareness was induced by exposure to a mirror, but the awareness returned to baseline levels by the time the participant got to the fourth floor and completed the self-awareness portion of the questionnaire. In addition, many participants could have lower intrinsic motivation for engaging in physical activity, as has been found to be common among college students (Kilpatrick et al., 2005). Past research has concluded that exposure to a mirror and increased public self-awareness both have negative effects on intrinsic motivation (Plant & Ryan, 1985). If students are primarily extrinsically-motivated to engage in physical activity to begin with and then experience a reduction in intrinsic motivation as a result of mirror exposure, they would have to believe that stair use would positively impact their weight or appearance, which is not likely the case after only one time. Furthermore, if students

felt that they were far from the ideal standard (e.g., do not exercise enough), heightened self-awareness from exposure to a mirror would likely have deterred them from using the stairs. Such an explanation is supported by the fact that most college students are not regularly active (Deng et al., 2011) and by Martin Ginis and colleagues' (2003) research which found that inactive people who exercised in front of a mirror became more self-aware and subsequently reported more negative emotions associated with the exercise experience than those who exercised in front of a non-mirrored wall. Consequently, it could be argued that individuals with low intrinsic motivation for engaging in physical activity, who are not regularly active, and who are reminded of these characteristics via exposure to a mirror have fewer positive reasons and less desire to be active by using the stairs. Indeed, this study's discovery that less total exercise participation is associated with less stair use supports such conjecture.

In addition to differences in stair use after exposure to a mirror, the present study found sex differences in the choice to use the stairs or the elevator. Overall, males were found to be more likely to use the stairs than females, which is consistent with past research (Eves, 2014; Kerr et al., 2001). Although males were more likely to use the stairs overall, no significant sex-by-mirror exposure interaction was found. This indicates that the presence of a mirror did not significantly alter the substantial already-existing differences in stair use based on sex. Along with participant sex, BMI was predictive of stair use such that those with lower BMI were more likely to use the stairs than those with higher BMI, a finding also supported by previous research (Eves, 2014).

When compared to the no-mirror condition and controlling for all other covariates, more people in both the thinning and widening mirror conditions, but not in the standard mirror condition, chose to take the elevator over the stairs. Furthermore, the increased odds of elevator

use in the two manipulated mirror conditions were similar, implying that there were no differences in behavior based on whether a person's body size appeared slightly thinner or wider. Because past research has determined that mirrors that show the entire body primarily induce public self-awareness (Govern & Marsch, 2001) and an increase in public self-awareness negatively affects intrinsic motivation for a behavior (Plant & Ryan, 1985), participants exposed to the thinning or widening mirror could have experienced even greater increases in self-awareness than those exposed to the non-manipulated standard mirror due to the manipulated mirrors departing from "normal" appearance. It could be that participants in these conditions were more likely to notice the mirror because of its slight distortion, and thus experienced even higher self-awareness and preference for the less-active elevator transportation method.

Another interesting finding from the present study that should be noted is the fact that unhealthy weight-loss behaviors were positively associated with stair use while healthy weight-loss behaviors were negatively associated with stair use. That is, individuals who engaged in more behaviors like skipping meals or taking diet pills were more likely to take the stairs while individuals who more frequently engaged in behaviors like exercise and watching portion sizes were less likely to take the stairs. Although exercise was included as a "healthy" weight-control behavior and more total exercise participation was associated with greater likelihood of stair use, it could be that participants indicating their engagement in exercise as part of their overall healthy weight-loss behavior are more extrinsically-motivated to perform physical activity than those with higher overall exercise participation because they are focusing more on controlling their weight (appearance) in the first place. So, perhaps type of motivation is explaining these seemingly contradicting findings regarding participants' exercise behavior, such that those who exercise more overall take the stairs more because they enjoy being active or desire to improve

their health whereas those who exercise as part of a weight-control strategy take the stairs less because they do not believe stair use will improve their appearance. Previous research supports such a notion, as appearance and weight-related motives for exercise, versus health and fitness-related motives, have been found to be inversely associated with exercise participation (Ingledeu & Markland, 2008).

There are some limitations to the present study that warrant discussion. First, several participants who were in a mirror condition reported not seeing a mirror (about 25% of this portion of the sample). It could be problematic if these individuals truly did not see a mirror when one was present because its influence on self-awareness and stair use would be nullified. Because the mirror was large and placed at eye-level near the participant instructions sheet, it is possible that participants unconsciously registered the presence of a mirror, but did not consciously recall seeing one later. However, if most of these participants really failed to notice the mirror, it would behoove future research to assess how self-awareness might influence behavior with a more distinctive mirror, such as one that is an odd shape or has been painted a bright color. Second, although this study purposely had participants arrive one at a time to avoid social influence, some participants' transportation choice could have been impacted by the presence of other people in the parking garage. It is assumed that the issue of social influence was minimal in the present study, though, because the part of the parking garage where the questionnaire was administered typically has low pedestrian traffic and most people who are there do not need to travel to an upper-floor (the higher-traffic area is on the opposite side of the garage). Lastly, the diversity of the study sample was limited; future research should attempt to investigate stair use among older students, minorities, and those outside of the college environment, such as adults working in multi-level office buildings.

Several important implications also arose from the present study and are worth consideration. Even though the current results reveal that exposure to mirrors may actually decrease stair use among college students, other research has indicated that this population is likely to have extrinsic (e.g., weight, appearance) rather than intrinsic (e.g., enjoyment, health) motives for performing physical activity. Furthermore, extrinsic motives are likely the result of enhanced public self-awareness because public self-awareness implies the possibility of social evaluation (Froming et al., 1982; Plant & Ryan, 1985). Taken together, these findings imply that future mirror interventions may be more successful at increasing physical activity among college students if the students are exposed to both a mirror and a reason to engage in the behavior. For example, if college students are primarily motivated to engage in physical activity by external sources such as other people, normative signage could be placed near the mirror that encourages stair use by stating that most other students take the stairs. Results from this study are consistent with such a statistic, since nearly 62% of the total sample took the stairs over the elevator. Moreover, recent research has demonstrated that exposure to descriptive norm signs stating that most people use the stairs led to a significant decrease in elevator use on a college campus (Burger & Shelton, 2011).

It is likely that a combination of a mirror and normative signage would produce greater stair use than either strategy alone because mirrors have been known to strengthen the predictive power of attitudes on behavior due to increased self-awareness (Carver, 1975; Wicklund, 1975). That is, if an individual's attitude toward stair use is made more positive by informing them that stair use is a "popular" behavior among their peers, they should be most likely to actually use the stairs when a mirror is present, reminding them of their attitude. Another option to increase stair use besides capitalizing on social norms could be to include signage with a mirror that describes

a positive, personally-relevant reason for using the stairs. For instance, a POD prompt could describe the health benefits of using the stairs to further encourage a positive attitude toward stair use. This strategy may be more appropriate for an environment where elevator or escalator use is more normative than stair use, such as in an office building. For populations like college students who are more likely to have appearance- and weight-based motives for physical activity participation, the prompts should describe the number of calories burned from using the stairs or how stair use can be considered a form of exercise. On the other hand, the cardiovascular benefits of stair use could be emphasized on signage targeting people with intrinsic motives for participating in physical activity, such as those who want to improve their fitness. Future research should therefore explore both motivation for physical activity participation and stair use in a variety of locations.

The present study assessed stair vs. elevator use on a college campus by students who were either exposed to a full-length mirror or to no mirror. Students who were not exposed to a mirror, males, those with lower BMI, those with higher total exercise participation, and those who engaged in more unhealthy weight-control behaviors were significantly more likely to use the stairs. Conversely, students who were exposed to a mirror and specifically those who saw either a thinning or widening mirror were more likely to take the elevator. Although not measured in this study, a lack of intrinsic motivation for engaging in physical activity among college students may be an explanation for the mirrors' effect on stair use and should be examined further. Nevertheless, a majority of students used the stairs over the elevator and thus descriptive norm interventions, used in conjunction with mirror exposure, may result in higher rates of stair use. In sum, the health benefits of stair climbing are noteworthy, and findings from

the present study provide an important stepping stone for future research aiming to promote stair use over more inactive floor climbing methods, such as elevator or escalator use.

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Appendix A – Questionnaire Items

Self-awareness

Please respond to each statement based on how you feel RIGHT NOW, AT THIS INSTANT – not how you feel in general, or at this point in your life.

1. Right now, I am keenly aware of everything in my environment (1 strongly disagree to 5 strongly agree)
2. Right now, I am conscious of my inner feelings (1 strongly disagree to 5 strongly agree)
3. Right now, I am concerned about the way I present myself (1 strongly disagree to 5 strongly agree)
4. Right now, I am self-conscious about the way I look (1 strongly disagree to 5 strongly agree)
5. Right now, I am conscious of what is going on around me (1 strongly disagree to 5 strongly agree)
6. Right now, I am reflective about my life (1 strongly disagree to 5 strongly agree)
7. Right now, I am concerned about what other people think of me (1 strongly disagree to 5 strongly agree)
8. Right now, I am aware of my innermost thoughts (1 strongly disagree to 5 strongly agree)
9. Right now, I am conscious of all objects around me (1 strongly disagree to 5 strongly agree)

Demographics

10. What is your age?
 - a. Under 18 years
 - b. 18-25 years
 - c. 26-33 years
 - d. 34-41 years
 - e. 42-49 years
 - f. 50 years or over
11. What is your sex?
 - a. Male
 - b. Female
12. What is your race? (1 or more categories may be selected)
 - a. White
 - b. Black or African American
 - c. American Indian or Alaska Native

- d. Asian Indian
- e. Chinese
- f. Filipino
- g. Japanese
- h. Korean
- i. Vietnamese
- j. Other Asian
- k. Native Hawaiian
- l. Guamanian or Chamorro
- m. Samoan
- n. Other Pacific Islander

13. Are you Hispanic, Latino/a, or of Spanish origin? (1 or more categories may be selected)

- a. No, not of Hispanic, Latino/a, or Spanish origin
- b. Yes, Mexican, Mexican American, Chicano/a
- c. Yes, Puerto Rican
- d. Yes, Cuban
- e. Yes, another Hispanic, Latino/a, or Spanish origin

14. What is your height?

_____ feet and _____ inches

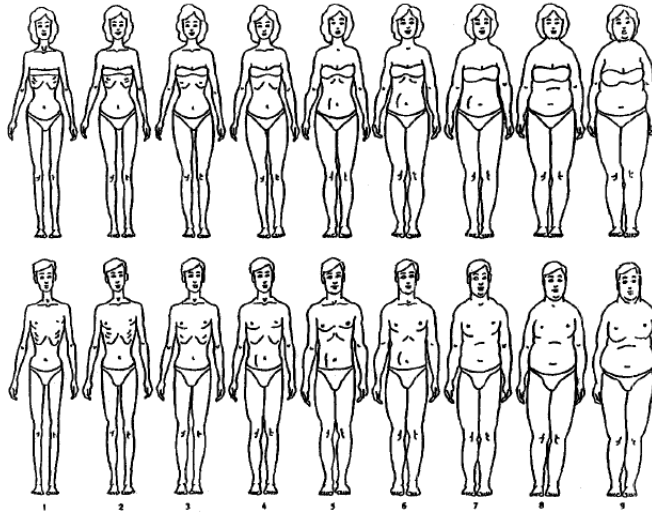
15. What is your body weight?

_____ pounds

16. Do you have serious difficulty walking or climbing stairs due to physical injury (e.g., on crutches)?

- a. Yes
- b. No

Body size perception



17. Participants were asked to identify (radio button) the sex-matched drawing that most closely resembles their own body.

Opinions toward parking garage

18. How would you rate the safety of the parking garage from the floor you are currently on?
- 1 (not safe)
 - 2 (somewhat safe)
 - 3 (very safe)
19. How would you rate the usability of the parking garage from the floor you are currently on?
- 1 (not usable)
 - 2 (somewhat usable)
 - 3 (very usable)

Active transportation

20. What is your primary method of transportation to and/or around campus?
- Motor vehicle (car)
 - Motorcycle/motorized scooter
 - Bicycle
 - Skateboard/non-motorized scooter
 - Walking
 - Other: _____

Physical activity

In a usual week, how many hours do you spend doing the following activities?

21. Strenuous exercise (heart beats rapidly). Examples: biking fast, aerobics, jogging, basketball, swimming laps, soccer, rollerblading.
- None
 - Less than ½ hour a week
 - 1/2 – 2 hours a week
 - 2 ½ - 4 hours a week
 - 4 ½ - 6 hours a week
 - More than 6 hours a week
22. Moderate exercise (not exhausting). Examples: walking quickly, easy bicycling, volleyball, skiing, dancing, skateboarding, snowboarding.
- None
 - Less than ½ hour a week
 - 1/2 – 2 hours a week
 - 2 ½ - 4 hours a week
 - 4 ½ - 6 hours a week
 - More than 6 hours a week
23. Mild exercise (little effort). Examples: walking slowly, bowling, golf, fishing, snowmobiling.
- None
 - Less than ½ hour a week
 - 1/2 – 2 hours a week
 - 2 ½ - 4 hours a week
 - 4 ½ - 6 hours a week
 - More than 6 hours a week

Weight loss behaviors

24. Have you done any of the following things in order to lose weight or keep from gaining weight during the past year?
- Fasted (yes/no)
 - Ate very little food (yes/no)
 - Took diet pills (yes/no)
 - Made myself throw up (yes/no)
 - Used laxatives (yes/no)
 - Used water pills (yes/no)
 - Used food substitute like powder or a special drink (yes/no)

- h. Skipped meals (yes/no)
 - i. Smoked more cigarettes (yes/no)
 - j. Followed a high protein/low carbohydrate diet like Atkins or another (yes/no)
25. How often have you done each of the following things in order to lose weight or keep from gaining weight during the past year?
- a. Exercise (never/rarely/sometimes/on a regular basis)
 - b. Ate more fruits and vegetables (never/rarely/sometimes/on a regular basis)
 - c. Ate less high-fat foods (never/rarely/sometimes/on a regular basis)
 - d. Ate less sweets (never/rarely/sometimes/on a regular basis)
 - e. Drank less soda pop (not including diet pop) (never/rarely/sometimes/on a regular basis)
 - f. Watched my serving sizes (never/rarely/sometimes/on a regular basis)
26. How often have you done each of the following things in order to increase your muscle size or tone during the past year?
- a. Changed my eating (never, rarely, sometimes, often)
 - b. Exercised more (never, rarely, sometimes, often)
 - c. Used protein powder or shakes (never, rarely, sometimes, often)
 - d. Used steroids (never, rarely, sometimes, often)
 - e. Used another muscle-building substance (such as creatine, amino acids, hydroxyl methylbutyrate [HMB], DHEA, or growth hormone) (never, rarely, sometimes, often)

Perception of staircase steepness

27. If zero degrees represents flat ground and 90 degrees represents a vertical wall, how steep (0-90 degrees) do you believe the staircase in the parking garage is?
- a. _____ degrees

Mirror manipulation check

28. Did you see your reflection in a mirror near the stairs and elevator on the first floor of the parking garage?
- a. Yes, I saw my reflection in the mirror
 - i. How did your reflection appear to you?
 - 1. It appeared as it normally does
 - 2. It appeared wider than normal
 - 3. It appeared thinner than normal
 - b. I saw a mirror but did not see my reflection
 - c. I did not see a mirror



Appendix B – IRB Approval Form

Research Integrity & Compliance Review Office Office of the Vice President for Research 321 General Services Building -
Campus Delivery 2011 Fort Collins, CO TEL: (970) 491-1553 FAX: (970) 491-2293

DATE: November 19, 2014
TO: Graham, Dan, Psychology
Hodgin, Katie, Psychology, Kraiger, Kurt
FROM: Swiss, Evelyn, Coordinator, CSU IRB 2
PROTOCOL TITLE: Psychological Influences on Transportation Choices
FUNDING SOURCE: NONE
PROTOCOL NUMBER: 14-5270H
APPROVAL PERIOD: Approval Date: November 19, 2014 Expiration Date: Oct. 28, 2015

NOTICE OF APPROVAL FOR HUMAN RESEARCH

The CSU Institutional Review Board (IRB) for the protection of human subjects has reviewed the protocol entitled: Psychological Influences on Transportation Choices. The project has been approved for the procedures and subjects described in the protocol. This protocol must be reviewed for renewal on a yearly basis for as long as the research remains active. Should the protocol not be renewed before expiration, all activities must cease until the protocol has been re-reviewed.

If approval did not accompany a proposal when it was submitted to a sponsor, it is the PI's responsibility to provide the sponsor with the approval notice.

This approval is issued under Colorado State University's Federal Wide Assurance 00000647 with the Office for Human Research Protections (OHRP). If you have any questions regarding your obligations under CSU's Assurance, please do not hesitate to contact us. Please direct any questions about the IRB's actions on this project to: IRB Office -(970) 491-1553;

RICRO_IRB@mail.Colostate.edu

Evelyn Swiss, IRB Coordinator -(970) 491-1381; Evelyn.Swiss@Colostate.edu Swiss, Evelyn

Swiss, Evelyn

Approval is to recruit up to 200 participants with the approved recruitment, consent, and debriefing. Because of the nature of this research, it will not be necessary to obtain a signed consent form. However, all subjects must be consented with the approved electronic cover letter. The requirement of documentation of a consent form is waived under § __.117(c)(2).

Approval Period: November 19, 2014 through October 28, 2015
Review Type: EXPEDITED
IRB Number: 00000202

Appendix C – Study Location and Setup

