STEREOTYPE THREAT EFFECTS ON MOBILITY AMONGST OLDER ADULTS

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CERTIFICATION OF APPROVAL

I certify that I have read Stereotype Threat Effects on Mobility Amongst Older Adults by Natalie Rochelle Taylor-Ketcham, and that in my opinion this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirement for the degree Master of Science in Kinesiology: Movement Science at San Francisco State University.

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STEREOTYPE THREAT EFFECTS ON MOBILITY AMONGST OLDER ADULTS

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Stereotype threat is a situational phenomenon that affects members with whom a negative stereotype exists, often leading to a decrease in performance. Older adults have endured centuries of negative, age-related stereotypes, which may affect their physical performance. There is little known about how stereotype threat may affect physical abilities in older adults, since most stereotype threat studies focus on the cognitive effects. The current study focused on the effects of stereotype threat on mobility amongst older adults. Forty-nine older adults were tested on gait performance after experiencing one of four age-related stereotype threat conditions. The blatant group experienced the most significant change between trials on these variables. This suggests that older adults may be sensitive to age-related stereotype threat by altering their gait performance. Clinical implications for this study include understanding the effects of stereotypes on older adult patients when administering mobility assessments.

I certify that the abstract is a correct representation of the content of this thesis.

Chair, Thesis Committee

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INTRODUCTION

Gait speed has been shown to be a marker for health and longevity amongst older adults (Studenski et al., 2011). A walking speed of less than one meter per second is a predictor of lower survival in older adults and can determine wellbeing when used in a clinical setting (Studenski et al., 2011). Impaired physiological factors, such as muscle weakness, medication, history of falls, disease and lowered physical activity level, may contribute to decreased walking speeds (Hausdorff, Edelberg, Mitchell, Goldberger, & Wei, 1997). Diminished physical function and mobility increases fall risk, leading to premature admittance to skilled nursing facilities (Rubenstein, 2006). However, the effects of psychological factors on mobility are not entirely understood.

Stereotype threat is a situational phenomenon and it occurs when people fear that if they perform poorly they will confirm a negative self-relevant stereotype, leading to an emotional reaction that could hinder performance (Steele, 1997; Steele & Aronson, 1995). Stereotype threat can affect a wide-variety of people, including older adults. There are many negative aging stereotypes about older adults. For example, they are stereotyped as being hard-of-hearing, visually impaired, and unhealthy (Wisdom, Connor, Hogan, & Callahan, 2014). This can lead to overt discrimination (Angus & Reeve, 2006). It can also lead older adults to experience stereotype threat. For example, when older adults know that their memory is being evaluated because of their age, they experience stereotype threat and underperform (Hess, et al., 2003; Lamont, Swift, & Abrams, 2015).

Older adults may be particularly prone to experiencing stereotype threat because they themselves believe that negative stereotypes about aging are true (see Kiefer & Sekaquaptewa, 2007). Ageism is a phenomenon that has permeated society due to declining physical and cognitive functions seen in older adults (Hausdorff, Levy, & Wei, 1999). In a study conducted by Perdue and Gurtman (1990), when college students were primed with the word "old," they made decisions about negative traits more quickly than when they were primed with the word "young," demonstrating the association between negative traits and age is an automatic or unconscious cognitive function. As individuals age, this negative association is then internalized throughout the decades of one's life until it eventually becomes a self-stereotype (Levy, 2003). It has been argued that strong, negative, ageist stereotypes ingrained in society may culminate in a fear of falling, fear of dependency, and early entry into nursing homes amongst older adults (Angus & Reeve, 2006). Furthermore, stronger belief in negative aging stereotypes is associated with poorer health and functioning in old age (Levy, 2009), and even with shortened lifespans (Levy, Slade, & Kunkel, 2002). Thus, it is important to understand how ageism affects people throughout the lifespan to combat the negative effects of such stereotypes once older age is achieved.

Even though the effects of stereotype threat on cognitive function have been extensively researched, little is known about the effects of stereotype threat on other domains such as physical function. Chalabaev, Sarrazin, and Fontayne (2009), analyzed perceived stereotype threat amongst teenage girl soccer players and its effects on their

performance. The results showed that girls who identify with the negative stereotype (that girls are worse at soccer than boys) had lower performance levels. This is important in showing how exposure to cultural stereotypes may lead to poor performance in a stereotyped domain when people believe in the stereotype (Chalabaev, et al., 2009). Swift, Lamont, and Abrams (2012), found that cultural stereotype threat could negatively affect physical capabilities in older adults. In this study, older adults (M=82.25 years old) were asked to perform a handgrip task after being told their performance would be compared with that of younger adults. Compared to the control group, the experimental group of older adults performed worse, with significantly lower handgrip strength and shorter grip time. Thus, stereotype threat can induce decline in physical performance in older adults.

One way to reduce stereotype threat for older adults may be to make them feel younger and less a part of the older group. For example, Stephan, Chalabaev, Kotter-Gruhn, and Jaconelli (2013) induced older adults to feel younger by priming them with positive feedback in regards to their handgrip strength performance. Older adults primed to feel younger showed a significant increase in their grip strength compared to older adults in the control group who were not primed. Redirecting attention away from ageism stereotypes and instead on feeling younger, resulted in improved physical function in older adults. In the current study, we build upon the idea that (a) stereotype threat can impair performance, and (b) making older adults feel less a part of the threatened group

can buffer against these effects, by examining the effects of stereotype threat on mobility in older adults.

There are many stereotypes concerning older adults and their physical ability. Older adults are often thought of as slow, frail, and immobile (Ory, Hoffman, Hawkins, Sanner, & Mockenhaupt, 2003; Minichiello et al. 2000). Older adults who believe and maintain these negative stereotypes are less likely to be physically active, active within their community, and often lack a social outlet (Palacios, Torres, & Mena, 2009). Additionally, implicitly reinforcing negative aging stereotypes has been shown to impair physical function in younger adults. In a study by Ginsberg, et al. (2012), younger adults primed with an "elderly" stereotype before completing a motor coordination task displayed lower performance speed. Bargh, Chen, and Burrows (1996) found when younger adults were primed with an implicit elderly-specific scrambled-sentence task, they walked at slower speeds down a corridor than participants who were primed with neutral age-specific words. This supports the idea that older adult stereotypes can affect performance even in younger adults (Bargh et al., 1996).

Similar effects have been observed for older adults. In general, alleviating an older adult's concern about their own motor performance, enforcing positive feedback about motor tasks, or reporting that their peers typically perform well on such tasks, lead older adults to show an increase in motor performance (Wulf, et al., 2012). However, performance improvements can also be induced through implicit priming of *positive,* rather than *negative,* aging stereotypes. For example, Levy, Pilver, Chung, and Slade

(2014) found similar results with an implicit, repetitive, positive-aging intervention. Older adults were primed explicitly or implicitly with positive age stereotypes over an 8-week period. By strengthening positive age stereotypes, older adults in the implicit intervention had a significant increase in positive self-perception and physical function when compared to the neutral-implicit and explicit conditions. This study shows that an implicit intervention can improve functioning when induced over an extended period of time. These studies support the idea that motor performance amongst older adults is influenced by a number of psychological factors, including self-efficacy, social perceptions, self-perceptions, and stereotypes (Wulf, et al., 2012; Levy, Pilver, Chung, and Slade, 2014).

Explicitly presenting stereotypic information can also affect performance in both negative and positive ways. As described earlier, when presented with a negative stereotype, performance is often impaired because of stereotype threat (Steele, 1997). However, in some instances people perceive the performance evaluation as being a "challenge" rather than a "threat". In this case, performance can improve due to a person's strong response to disconfirm the threat, known as psychological reactance (Brehm, 1989). In terms of stereotypes, psychological reactance is when an individual reacts more forcibly against the threat in order to invalidate the stereotype (Kray, et al., 2004). In a study conducted by Woller, Buboltz, and Loveland (2007), reactance was examined across age groups using the Therapeutic Reactance Scale (TRS), which measures total psychological reactance. The 28-item scale is divided into verbal and

behavioral subscales to assess oppositional behaviors. It was found that older adults, 55-64 year old, had a higher mean level of total psychological reactance when compared to younger groups (Woller, et al., 2007). Higher reactance levels seen in older adults may be due to lower perceived ability to influence their environment (Woller, et al., 2007).

Negative psychological factors, such as age-related stereotype threat, have been shown to contribute to adverse performance (Woller, et al., 2007; Angus & Reeve, 2006; Swift, Lamont & Abrams, 2012; Kray, et al., 2004). Previous research indicates stereotype threat occurs when the threat is subtle and when the person feels less capable performing the task (Ginsberg, et al., 2012; Swift, Lamont, & Abrams, 2012). However, stereotype reactance occurs when the threat is blatant and the person feels confident in performing the task (Kray, et al., 2004). Stereotype threat effects on cognitive ability have been extensively analyzed, however, little is known about the effects of stereotype threat on gait performance. During gait assessments, clinicians must be aware of the possible induced stereotype threat during instructional delivery since it may alter gait performance, either by worse performance through stereotype threat, or by improved performance through psychological reactance (Swift, Lamont, & Abrams, 2012; Woller et al., 2007).

As gait speed becomes a measurement in clinics to determine health and longevity, clinicians must be aware of how they are instructing individuals, particularly older adults, during gait assessment. The current study aims to examine the effects of stereotype threat on performance, in order to better understand the psychological factors

that may impact mobility performance in older adults. We hypothesize older adults receiving the subtle negative age stereotype prior to gait analysis will perform worse by exhibiting slower gait speeds, wider step-width, and decreased step length. In contrast, we predict older adults receiving the blatant stereotype threat will perform better during mobility tasks due to reactance, by exhibiting faster gait speeds and improved gait performance.

METHOD

Participants

Forty-nine (M age=75.3 ± 5.1, range=69-91 years) men and women were recruited to participate in this study. Participants were free of cognitive or mobility impairments, and were active community dwellers. Exclusion criteria included: no surgeries on the legs or feet in the past 5 years, total joint replacement surgery, painful arthritis in the lower limbs, frequent ankle sprains, painful feet, chronic dizziness, neurological diseases, vestibular disorders, falls in the last year, heart medication, and significant visual impairments. Each participant was randomly assigned to one of four stereotype threat conditions: Subtle Threat, Blatant Threat, Reduced Threat (Normalizing Control), No Threat.

Measures

Health status. The Qualtrics Survey electronic system was used to obtain a prescreening health questionnaire prior to the participants' appointment. The participants entered their

assigned code for confidentiality. The health questionnaire was derived from the Fullerton Health and Activities questionnaire from Fallproof! by Debra Rose, as well as added questions from Sarah Barber, PhD. Questions referred to any diagnoses, such as Parkinson's, Multiple Sclerosis, stroke, cancer, joint replacements, uncorrected visual problems, and arthritis. The health questionnaire also screened for medication usage, use of an assisted device, recent hospitalization, as well as general quality of life and physical activity questions.

Mobility assessment. This test assessed gait measures using the Protokinetics Zeno Walkway. The Zeno Walkway is a 0.61 m x 7.92 m long carpeted walkway with a 16-level pressure sensing pad filled with 1 cm square pressure sensors, which measures data at 120 Hz to assess foot placement (Protokinetics, 2014). Temporospatial gait parameters such as gait speed, step length and width were assessed using the PKMAS software from Protokinetics. Participants were asked to walk back and forth five times continuously, without talking.

Cognitive assessment. The Mini-Mental State Exam (MMSE) was used to assess the cognitive status of the participants.

Procedure

After completing the telephone screening, participants were scheduled for the study in our laboratory. Prior to the laboratory visit, participants completed the online health and functional status questionnaires. Upon arriving to the laboratory, all participants completed the informed consent and then immediately completed a baseline

measure of gait and mobility. In addition to the mobility tasks, we asked participants to complete a series of hearing tasks, but we will not be discussing the hearing protocol or results in this paper.

During the gait task, participants were asked to walk back and forth on a level surface five times. Participants were assigned to either the Subtle Stereotype Threat, Blatant Threat, Reduced Threat (Normalizing Control), or No Threat conditions. Two waves of recruitment and testing were conducted between the four conditions. The first wave of testing consisted of the Reduced Threat (Normalizing Control) and Blatant Threat conditions. The second wave of testing consisted of the Subtle Threat and No Threat conditions. Participants were asked to complete the walking task for a second time after the threat prompt was given.

I. Participants assigned to the "subtle stereotype threat" condition were told: "Clinicians believe that the way a person walks tells them a lot about that person's overall health. This is similar to the way that clinicians examine blood pressure and heart rate to know about a patient's health. The purpose of this study is to evaluate this assumption. The task that you are about to complete is sometimes used by clinicians as a vital sign of health, and some people have argued that it should be a routine task that you complete when visiting the doctor."

II. Participants assigned to the "blatant threat group" were told: "Scientific research has confirmed that gait and balance decline with age and older adults are at a greater risk of falls because of these declines. Rates of death and serious injury

due to falls have soared in recent years. The purpose of this study is to confirm previous research findings that older individuals like yourself have experienced significant declines in gait and balance. To test this, we are testing younger adults who are in their 20s and older adults in their 70s. You are part of the older adult group. We will compare your gait and balance to that of the younger adults who do not show declines. This will help us better understand why older adults like yourself exhibit declines in gait and balance."

III. Participants assigned to the "normalizing reduced threat" group were told: "Scientific research has confirmed that active older adults have minimal or no changes in their gait and balance as they age and because of their healthy lifestyle they are not at risk of falling like their less active peers. You have been chosen for this study because you are a healthy, active older adult. The purpose of this study is to confirm previous research findings that individuals like yourself have no declines in gait and balance. To test this, we are testing people who range in age from 70 to 100 and who also range in activity levels. You are part of the younger active group of older adults. We will compare your gait and balance to that of older and more frail older adults. This will help us better understand why active older adults like yourself are able to maintain their high levels of gait and balance while their frailer peers decline."

IV. Participants assigned to the "no threat" condition did not receive additional instructions other than the walking instructions. The exact instructions used

during baseline were as follows: "During the first task we would like you to walk back and forth along the carpeted walkway at your own comfortable pace. When you get to the end of the carpet, please turn around and walk back to the start. You will walk continuously back and forth until I tell you to stop. We will be video recording you while you walk. Please refrain from talking during the activity. OK – you can go ahead and start walking."

Data Analysis

Data was exported from PKMAS v.507C7C software package and imported into MINITAB 16 (Minitab Inc., State College, PA) for data analysis. Repeated measures, mixed factor, general linear model (GLM) ANOVAs (random factor-participant, fixed factors – threat condition and trial) were utilized to compare the effects of threat condition (no threat, subtle threat, blatant threat, reduced threat (normalizing control)) and trial (pre-threat, post-threat) on the dependent measures with a significance level of $\alpha = 0.05$ for all statistical tests. The six dependent variables were: stride length, stride width, stride time, stride velocity, single support percentage, and total double support percentage. There were significant interaction effects between condition and trial for all dependent measures, therefore, the analyses were broken down into two sets of one-way GLM ANOVAS. The first set of analyses was to determine whether there were significant differences in the dependent measures at the pre-test baseline between threat condition groups. The second set of analyses examined the pre-threat, post-threat differences within each group for each of the dependent measures. Due to the two waves

of recruitment and testing between conditions, we did not compare across groups, only within groups. Given the unequal sample numbers and lower statistical power due to smaller participant numbers in the subtle threat and control groups, the change scores between groups were not statistically analyzed.

RESULTS

Age, Weight, Height

There were no significant differences in age (p=.217), height (p=.316), or weight (p=.299) between the four groups. There were 12 women and 3 men in the reduced threat (normalizing control) and blatant conditions, 5 women and 3 men in the subtle condition, and 8 women and 3 men in the control condition.

Baseline gait measures

There were no significant differences between groups in the pre-threat baseline trial for stride length, width, velocity, single support % or double support % with p-values ranging p=.253-.974. There was a trend toward a significant difference between groups in stride time at baseline (p = 0.059).

Threat prompt

Within the reduced threat (normalizing control) condition, there were no significant differences between the pre- and post-tests trials for any of the dependent variables (p=0.231-.967). Within the blatant condition, there were significant increases in stride length, stride velocity, and single support % (p<.001), and significant decreases in

stride time and total double support % between trials ($p<.001$). Within the subtle condition, there was a significant decrease in stride time ($p<.001$), and stride length approached a significant decrease between trials ($p=0.06$). Within the control condition, there was a significant increase in stride length ($p=.001$) and stride velocity ($p<.001$), and significant decreases in stride time ($p<.001$) and total double support percentage ($p<.05$). Stride velocity change scores between trials was largest in the blatant group followed by the control group. No significant change was seen in stride velocity between trials for reduced threat (normalizing control) and subtle groups (Figure 1).

Table 1. Means and Standard Deviations of Age, Weight (kg), and Height (cm)

Variable	Condition	Mean	StDev.
Age	Reduced Threat	77.47	5.45
	Subtle	73.87	4.24
	Blatant	73.88	4.58
	Control	75.27	5.73
Weight (kg)	Reduced Threat	63.62	14.16
	Subtle	60.75	9.74
	Blatant	71.3	13.99
	Control	64.99	13.54
Height (cm)	Reduced Threat	162.98	9.18
	Subtle	163.49	6.59
	Blatant	169.55	9.74
	Control	162.44	10.07

Table 2. Means and standard deviations of dependent variables

Dependent Variable	Trial	Reduced Threat	Blatant	Subtle	Control
Stride Length	1	125.2±15.5	127.8±19.3	136.1±12.9	125.4±8.8
	2	124.6±11.3	130.0±16.1**	135.4±12.1	126.3±9.0**
Stride Width	1	11.6±5.0	11.2±5.1	11.5±6.1	12.7±6.2
	2	11.9±5.1	11.2±4.9	11.8±6.3	12.8±6.2
Stride Time	1	1.03±0.12	1.11±0.15	1.14±0.10	1.07±0.11
	2	1.02±0.05	1.08±0.10**	1.13±0.10**	1.06±0.10**
Stride Velocity	1	121.9±13.3	116.7±22.5	120.1±15.0	117.5±12.5
	2	122.1±13.7	121.7±19.4**	120.6±14.7	119.5±11.1**
Single Support %	1	36.2±2.1	36.0±2.3	36.1±1.8	36.3±2.0
	2	36.3±1.7	36.4±1.8**	36.2±2.0	36.4±2.1
Total D. Support %	1	27.4±3.1	27.8±3.8	27.8±3.0	27.3±3.3
	2	27.3±2.8	27.1±3.1**	27.7±3.2	27.1±3.4*

Note. p=/<.001=** p<.05=*

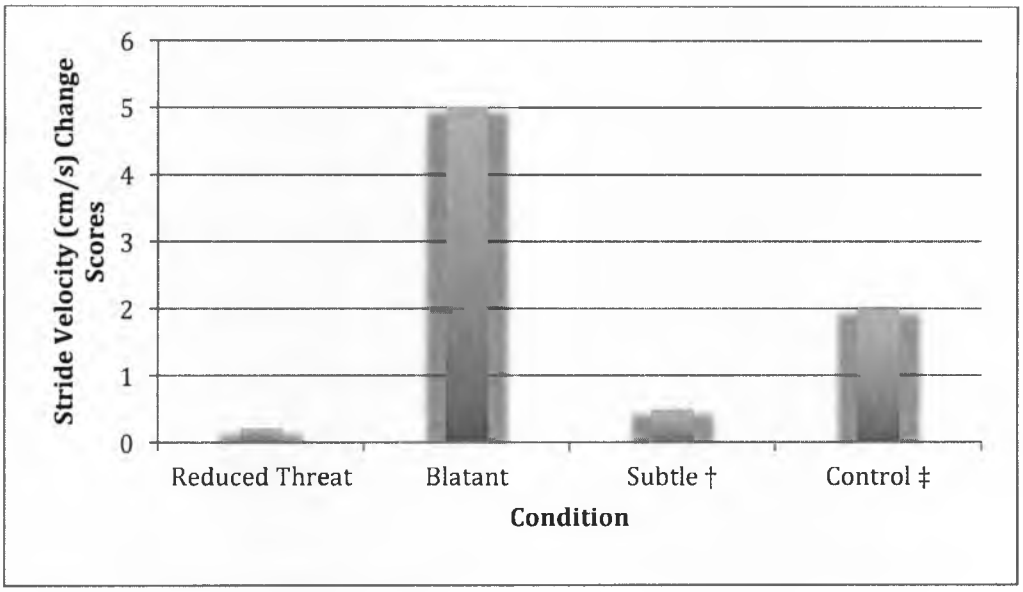

Figure 1. Results of the change in stride velocities (cm/s) between trials of the study.
Note. † 8 participants in condition.
‡11 participants in condition, 2 of which had very large increases in their post-test velocity. The other 9 participants had very little change from pre-test to post-test.

DISCUSSION

The purpose of this study was to determine the effects of stereotype threat on gait performance in older adults. This study lends further evidence that older adults' mobility is affected by these cultural stereotypes.

Participants did not significantly differ across groups in terms of age (p=.217), height (p=.316), weight (p=.299), and baseline gait performance (p=.253-.974). The equivalency across groups decreases confounding variables and demonstrates that the groups were equal on many factors that affect gait.

Within the control group, there were two participants that had large increases in stride velocity between the first and second trials. The other 9 participants had very little

change in any of the dependent measures between the first and second trials. Therefore, the change scores of these two individuals, one of which was on the frailer side, heavily influence the significant differences in the dependent measures in the control group. The significant decrease in double stance percentage in the control group could be attributed to their increased stride length and stride velocity, and their decreased stride time. However, the decreased double stance percentage seen in the control group could also be attributed to a learned effect and the participants' desire to finish the walking task.

In response to the subtle threat prompt, the subtle group decreased their stride length while also significantly decreasing their stride time. This resulted in no significant change in stride velocity for this group. Participants in the subtle group may have increased their cadence in order to walk faster during the task, which would account for the significantly decreased stride time, but not the significant differences in stride length or stride velocity. The shortening of stride length and shorter stride time suggest that the subtle group was affected by the subtle prompt, but not quite in the manner hypothesized (slower gait speed). The participants were told that "clinicians believe that the way a person walks tells them a lot about that person's overall health," focusing the participant's attention to the health-related aspects of walking and not the age-related declines, as seen in the blatant group. The language used may have not been the correct focus to induce a typical age-related stereotype threat response. However, the subtle group did perform slower in the stride time velocity change scores than the control group, which is what was expected, supporting that there may have been an induced stereotype

threat causing the decreased stride velocity change scores (Swift, Lamont, & Abrams, 2012). The results in the subtle group should be viewed with caution, as there were only 8 participants in this group.

In the blatant condition there were significant differences in most of the targeted variables (stride length, stride time, stride velocity, single support %, and total double support %) between the first and second trials. The significant increase in stride velocity may be attributed to their significantly increased stride length and significantly decreased stride time. Subsequently, the single support % may have significantly increased due to their significantly increased stride length. The significantly decreased double stance % in the blatant group could be attributed to the blatant prompt given during trial two, which focused on age-related declines in gait and balance, therefore enacting a reactance response. Participants were told that "scientific research has confirmed that gait and balance decline with age and older adults are at a greater risk of falls because of these declines." The blatant group's increase in walking speeds supports the second hypothesis and may be indicative of the blatant instructions inducing a reactance response. Participants may have felt confident in their physical abilities to perform the walking task and instead saw the task as a "challenge" rather than a "threat", therefore the older adults may have not been susceptible to the stereotype threat and instead reacted positively to the task (Kray, et al., 2004; Brehm, 1989).

There were no significant differences in any of the targeted variables within the reduced threat (normalizing control) condition (p=.231-.967). This may be due to the

positive prompt given to the participants, which may have neutralized the potential threat of the walking task. Participants were told "active older adults have minimal or no changes in their gait and balance as they age and because of their healthy lifestyle they are not at risk of falling like their less active peers." Participants may have felt comfortable in their walking abilities and did not perceive any threat from the prompt or the environment, resulting in no changes between trials.

There are few studies that have focused on stereotype effects on physical performance amongst older adults, and their findings are contradictory. Response to a stereotype threat usually causes a decrease in performance, as Swift, Lamont, and Abrams (2012) found in hand grip strength. However, another study by Horton, Baker, Pearce, and Deakin reported no effect of an age-related stereotype threat on physical performance. This may help explain the contradictory findings in this study despite what the current literature on stereotype threat suggests. The findings of this study are evidence that there must be more research in this field in order to better understand the effects of stereotype threat on mobility amongst older adults.

Clinical Implications and Relevance

Based on the findings above, there are potential implications for clinical use, including physical therapy. This study suggests that stereotype threat has an effect on mobility in older adults. This population may be sensitive to age-related clinical instructions, and clinicians must be aware of how they prompt their patients while measuring mobility abilities, as not to invoke a stereotype threat or reactance response.

The findings of the current study are relevant as our country continues to age and the burden on the health care system grows.

Limitations

The primary limitation of this study is the uneven sample sizes between the conditions (Nr=15, Nb=15, Ns=8, Nc=11), resulting in lower statistical power in the subtle and control conditions. The second limitation of this study is the two waves of recruitment and testing conducted between the Reduced Threat/Blatant Threat conditions and Subtle Threat/No Threat conditions. Due to the two waves, we were not able to compare across groups. Another limitation of the study is participants were healthy and robust older adults, and we did not test frail older adults. It is unknown how frailer older adults will react to the threat conditions and it must be studied. Another limitation of this study is the uneven recruitment between genders, with more women participants than men participants in each condition.

Future Directions

This study was intended to be exploratory and despite the limitations, has provided evidence to continue research in this realm. The trends revealed in this study warrant more research into the effects of stereotype threat and reactance response on physical ability in older adults. The temporospatial data gathered in this study may provide insight into the cognitive effects responsible for the differences observed in older adults.

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