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An examination of age-based stereotype threat about cognitive decline: Implications for stereotype threat research and theory development

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Abstract

"Stereotype threat" is often thought of as a singular construct, with moderators and mechanisms that are stable across groups and domains. However, this is not always true. To illustrate this, the current review focuses on the stereotype threat that older adults face about their cognitive abilities. Using Shapiro and Neuberg's (2007) Multi-Threat Framework, I first provide evidence that this is a self-concept threat, and not a group-reputation threat. Because this differs from the form(s) of threat experienced by other groups (e.g., the threat that minority students face about their intellectual abilities), the moderators of threat observed in other groups (i.e., group identification) do not always generalize to age-based stereotype threat about cognitive decline. Looking beyond the form(s) of threat elicited, this review also provides evidence that the mechanisms underlying stereotype threat effects may vary across the lifespan. Due to age-related improvements in emotion regulation abilities, stereotype threat does not seem to reduce older adults' executive control resources. Overall, this review highlights the need to approach the concept of stereotype threat with more granularity. This will allow us to design more effective stereotype threat interventions. It will also shed light on why certain effects "fail to replicate" across domains or groups.

Stereotype threat occurs in situations where people "must deal with the possibility of being judged or treated stereotypically, or of doing something that would confirm the stereotype" (Steele & Aronson, 1998; p. 401). In response to this, people often underperform within the stereotyped domain (Steele, 1997; Steele & Aronson, 1995; for a review see Spencer, Logel, & Davies, 2016). For example, African American students are stereotyped as being less academically gifted than their Caucasian peers. In stereotype-threat-eliciting situations, these students often underperform compared to their potential on standardized tests (e.g., Steele & Aronson, 1995). Similarly, female students are stereotyped as being less gifted in mathematics than male students. In stereotype-threat-eliciting situations, these female students often underperform compared to their potential on math tests (e.g., Ambady, Shih, Kim, & Pittinsky, 2001; Spencer, Steele, & Quinn, 1999; Walsh, Hickey, & Duffy, 1999). These are not isolated examples. In the twenty years since stereotype threat was first reported there have been hundreds of studies documenting stereotype threat effects for a wide-variety of populations and domains. For example, research has shown that stereotype-threat eliciting situations can also impair men's interpersonal sensitivity (e.g., Koenig &

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Eagly, 2005), women's negotiation abilities (e.g., Kray, Galinsky, & Thompson, 2002; Tellhed & Bjorklund, 2011), non-native speakers' ability to communicate in a second language (Paladino, Poddesu, Rauzi, Vaes, Cadinu, & Forer, 2009), and blind students' performance in a skill-training program (Silverman & Cohen, 2014).

Although there has been skepticism about the reliability, magnitude, and real world impact of stereotype threat effects (e.g., Flore & Wicherts, 2015; Stoet & Geary, 2012; Stricker & Ward, 2004), multiple meta-analyses have now confirmed that stereotype threat can impair performance (e.g., Nadler & Clark, 2011; Nguyen & Ryan, 2008; Picho, Rodriguez, & Finnie, 2013; Walton & Cohen, 2003; Walton & Spencer, 2009; but see Stoet & Geary, 2012). This includes a recent meta-analysis showing that stereotype threat reliably affects the performance of older adults (Lamont, Swift, & Abrams, 2015). For example, a prevalent stereotype about older adults is that their cognitive abilities have steeply declined. People typically associate aging with forgetfulness, cognitive incompetence, and slower or more senile thinking (e.g., Hummert, Garstka, Shaner, & Strahm, 1994). This in turn can affect older adults' cognitive performance. Although cognitive decline often occurs as people get older (e.g., Park, O'Connell, & Thomson, 2003), when older adults are placed in situations in which they could confirm the stereotype that “older adults are not cognitively capable” their performance decreases compared to their potential. This occurs on both memory tests (Hess, Auman, Colcombe, & Rahhal, 2003; for reviews, see Barber & Mather, 2014; Chasteen, Kang, & Remedios, 2012; Popham & Hess, 2016) and also on tests assessing general cognitive abilities (e.g., Barber, Mather, & Gatz, 2015; Haslam, Morton, Haslam, Varnes, Graham, & Gamaz, 2012). Furthermore, because negative stereotypes about aging are not limited to the cognitive domain (e.g., Chan, McCrae, De Fruyt, Jussim, Lockenhoff, et al., 2012; Kornadt, Meissner, & Rothermund, in press) neither are older adults' stereotype threat effects. Stereotype threat can also impair older adults' grip strength and persistence (Swift, Lamont, & Abrams, 2012), their self-reported hearing abilities (Barber & Lee, 2016), and their driving abilities (Joanisse, Gagnon, & Voloaca, 2013).

Thus, existing research suggests that stereotype threat is a far-reaching phenomenon that can impair performance in a wide-variety of domains for both younger and older adults. However, this general conclusion rests upon the assumption that “stereotype threat” is a singular concept. That is, when we say that a female student taking a math test experienced “stereotype threat” and that an older adult taking a memory test experienced “stereotype threat” we typically assume that we are referring to the same phenomenon. Although researchers may acknowledge situational variations in the magnitude of stereotype threat that is produced for different groups, they often assume that the moderators and mechanisms underlying the stereotype threat effects to be invariant across groups and domains. Because of this, results from studies examining stereotype threat for one group in one domain are expected to generalize to other groups in other domains. However, this assumption is not always true. For example, a recent meta-analysis found that race/ethnicity-based and gender-based forms of stereotype threat differ not only in the magnitude of the effects they produce, but also in their moderating factors (Nguyen & Ryan, 2008).

These incongruences could be due to variations in how stereotype threat has been defined, manipulated, and assessed across previous studies. However, they may also indicate that

stereotype threat is not a unitary phenomenon. That is, the “stereotype threat” experienced by a female student taking a math test may not be identical to the “stereotype threat” experienced by an older adult taking a memory test. As such, the factors that predispose women to experience stereotype threat about their math abilities may be different than the factors that predispose older adults to experience stereotype threat about their memory abilities. One model that explicitly addresses this issue is Shapiro and Neuberg's (2007) Multi-Threat Framework. Described in more depth below, this framework proposes that there are actually six qualitatively distinct forms of stereotype threat, which differ in their eliciting conditions and experiences.

The first aim of the current review is to apply Shapiro and Neuberg's (2007) Multi-Threat framework to the stereotype threat that older adults face about their cognitive abilities.1 In doing so, I propose that the form of stereotype threat experienced by older adults about their cognitive abilities is primarily self-concept based -- older adults are most threatened by the possibility that stereotypes about age-related cognitive declines are personally true of themselves. Importantly, this is different than the forms of threat experienced by other groups in other domains (e.g., the own and group reputation threats that African American students experience about their intellectual abilities). Delineating the qualitative differences in the type(s) of stereotype threat that different groups experience is important as it allows for more accurate predictions about when stereotype threat effects will occur and who will be most affected by them. It will also allow for better predictions about when research examining stereotype threat in younger adults will apply when examining the impact of stereotype threat on older adults' cognitive performance.

Within the broader stereotype threat literature, incongruences have also emerged in the mediators of stereotype threat effects. This in turn has led to disagreements about stereotype threat's underlying mechanisms (for reviews, see Barber & Mather, 2014; Pennington, Heim, Levy, & Larkin, 2016; Schmader, Johns, & Forbes, 2008; Smith, 2004; Spencer, Logel, & Davies, 2016; Wheeler & Petty, 2001). The second aim of this review is to examine how chronological age may moderate the mechanisms underlying stereotype threat effects. In particular, I propose that even when taking into account the type of stereotype threat elicited (as defined by the Multi-Threat Framework) younger and older adults differ in the means by which stereotype threat affects their performance. Described in more depth below, I propose that whereas younger adults' stereotype threat effects are well-accounted for by Schmader, Johns, and Forbes (2008) executive control interference integrated process model, older adults' stereotype threat effects are not. Rather, older adults' stereotype threat effects appear to be primarily due to threat-induced motivational changes (e.g., Barber & Mather, 2013a; 2013b).

[1]Although there are ageist stereotypes about many domains, the current review focuses on memory and cognition. This is the most commonly studied outcome in age-based stereotype threat research studies (see Lamont, et al., 2015). It is also a more intensely negative stereotype than other age stereotypes (Kite & Johnson, 1988), likely because age-related changes in cognition do occur (e.g., Baltes, Lindenberger, & Staudinger, 1998; Salthouse, Hambrick, & McGuthry, 1998; Schaie, 1994) and this lends stereotypes about age-related senility a “kernel of truth”. Important for the sake of the current review, despite this kernel of truth, stereotypes about age-related cognitive decline are typically more severe than most observed deficits (e.g., Blanchard-Fields & Chen, 1996; Colonia-Wilner, 1998).

Taken together, these two points suggest that a singular construct – "stereotype threat" – can actually refer to distinct phenomenon that differ in eliciting conditions and moderators, which in turn affect behavior via distinct routes as a function of age. This in turn has implications for the interventions that will be successful in ameliorating stereotype threat effects in different situations. It also sheds light on why certain stereotype threat effects may "fail to replicate" across domains or groups.

Application of the Multi-Threat Framework to age-based stereotype threat about cognitive decline

Although research has clearly demonstrated that stereotype threat can negatively affect performance, there remains ambiguity about what the "threat" actually entails. Do people feel threatened that others will negatively evaluate their group based upon their individual performance? Or do people simply worry that the stereotype is true about them? This ambiguity in what constitutes "threat" is not a new issue. In fact, this question was raised by Aronson and colleagues more than a decade ago. They note:

> "*Is stereotype threat self-threatening because it arouses a fear of being a bad ambassador of one's group to mainstream society? Or is it simply the apprehension of appearing incompetent – for the sake of one's own reputation? Or alternatively, is it merely the result of worrying that one might lack ability? Or is it some combination of these concerns?* (Aronson, Lustina, Good, Keough, Steele, & Brown, 1999; p. 43).

Although all of the above possibilities constitute "stereotype threat", the types of threat described are qualitatively distinct. As such, they should also vary in their underlying moderators and mediators, and in the interventions that will be successful in eliminating their negative effects (Shapiro, Williams, & Hambarchyan, 2013). Thus, to fully understand stereotype threat effects, it is necessary that researchers clearly define the exact form of threat they are examining.

One model for doing this is the Multi-Threat Framework proposed by Shapiro and Neuberg (2007). According to this framework there are six qualitatively distinct forms of stereotype threat that emerge from the intersection of two dimensions. The first dimension identifies the target of the threat – is it the self or one's group? Am I concerned that my performance could reflect negatively on *my abilities as an individual*? Or am I concerned that my performance could reflect negatively on *my group's abilities overall*? The second dimension identifies the source of the threat – is it arising from the self, from an outgroup other, or from an in-group other? Am I concerned that my performance will lead *me* to negatively evaluate (in my own mind) either myself or my group? Or am I concerned that my performance will lead *someone observing me* (who is either an in-group or out-group member) to make negative evaluations about either myself or my group?

As shown in Table 1, there can therefore be three forms of threat that target the self: (1) threats to how one privately views their own personal abilities, (2) threats to one's own personal reputation in the eyes of an outgroup member, and (3) threats to one's own personal reputation in the eyes of in-group member. These three forms of threat might also be thought

of as “personal identity stereotype threats”, or “self-threats” since the concerns center on how the self may be harmed by the stereotypes (see van Laar, Levin, & Sinclair, 2008; Wout, Danso, Jackson, & Spencer, 2008). According to Shapiro and Neuberg's (2007) Multi-Threat Framework, there can also be three forms of threat that target one's group as a whole: (4) threats to how one privately views the group and the group's abilities, (5) threats to one's group reputation in the eyes of an outgroup member, and (6) threats to one's group reputation in the eyes of an in-group member. These three forms of threat might also be thought of as “social identity stereotype threats”, or “group-threats”, in that the concerns center on how the group may be harmed by the stereotypes (see van Laar, et al., 2008; Wout, et al., 2008).

The exact form of stereotype threat that emerges can be predicted based upon whether or not certain eliciting factors are present (see Shapiro 2012; Table 5.2). Two eliciting factors that have received empirical support in younger adults (Shapiro, 2011) are (a) the extent to which people endorse the stereotype to be true, and (b) the extent to which people identify with the threatened group. In the following sections, I review the literature related to these two eliciting factors in older adults. To foreshadow subsequent conclusions, when considered together, these factors suggest that older adults will experience a self-concept form of stereotype threat about their cognitive abilities. That is, they should be predisposed to concerns about whether stereotypes about cognitive decline are personally true of themselves.

High stereotype endorsement elicits self-as-source forms of threat

As just noted, one factor that determines the form of stereotype threat experienced is the extent to which people self-endorse the stereotype to be true. According to the Multi-Threat Framework, belief in the stereotype is a prerequisite for experiencing self-as-source forms of threat (i.e., self-concept threat and group-concept threat). For example, an older adult must believe there is truth to the stereotype that “*cognitive abilities sharply decline with age*” in order to worry that she will be forgetful because she is an older adult (i.e., to experience self-concept threat). In contrast, although she must be aware of this socio-cultural stereotype, there is no requirement that she personally believe in its veracity in order to worry that other people will expect her to be forgetful because of her age (i.e., to experience own-reputation or group-reputation threat; Shapiro, 2011, 2012; Shapiro & Aronson, 2013; Shapiro & Neuberg, 2007).

Some evidence with younger adults has supported the claim that stereotype endorsement selectively increases self-as-source forms of stereotype threat. For example, overweight individuals often believe that weight-based stereotypes are true (e.g., “*overweight people lack self-control”*). They also self-report experiencing more self-concept threat, which is a self-as-source forms of stereotype threat (Shapiro, 2011). Furthermore, as overweight individuals' stigma consciousness increases, so too does their propensity to selectively experience a self-concept form of stereotype threat (Carels, Domoff, Burmeister, Koball, Hinman, Davis, Wagner, Oehlhof, Leroy, Bannon, & Hoffman, 2013).

One reason that overweight individuals may be particularly prone to endorsing weight-based stereotypes (and hence experience self-as-source forms of threat) is because being

overweight is a social identity that can be acquired in adulthood. As Shapiro (2011) noted, stereotype endorsement, and thus self-as-source forms of threat, should be particularly high when people acquire stigmatized identities later in life. In these situations, people first develop negative stereotypes about a group without being personally affected by them – they are stereotypes about *"them"* and not about *"me"*. Because they are stereotypes about *"them"*, people have no need to be defensive against these stereotypes and may even benefit from endorsing them (Heckhausen & Brim, 1997; Pinquart, 2002). As a result, these stereotypes become strongly internalized prior to becoming self-relevant (e.g., Levy & Banaji, 2002; Link, Cullen, Struening, Shrout, & Dohrenwend, 1989). Aging stereotypes are the quintessential example of this process.

Although aging stereotypes are multidimensional, containing both positive and negative features (e.g., Hummert, et al., 1994), beginning as children we develop negative stereotypes about older adults (e.g., Chasteen, Schwarz, & Park, 2002; Isaacs & Bearison, 1986; Seefeldt, Jantz, Galper, & Serock, 1977; for reviews, see Gilbert & Ricketts, 2008; Robinson & Howatson-Jones, 2014). For example, in one study children were shown pictures of a man at four different stages of life. Two thirds of the children considered the man in the last stage of life to be "*helpless, incapable of caring for himself, and generally passive*" (Seefedlt, et al., 1977; p. 509). Similarly, in another study children reported that older adults are less attractive, less fun, and less physically capable than younger adults (Miller, Blalock, & Ginsburg, 1984). These negative stereotypes that are formed in childhood are then reinforced for decades, for example, through repeated exposure to negative images of older adults in magazines and television (e.g., Carrigan & Szmigin, 1999; Vasil & Wass, 1993) and by negative messages about older adults on social media (Levy, Chung, Bedford, & Navrazhina, 2013). As a child or younger adult these negative stereotypes about old age are not threatening because they are not self-relevant. However, as we age these stereotypes become self-stereotypes and self-relevant. This aspect of aging stereotypes is unique. Unlike race and gender, which do not usually change across the lifespan, everyone will become an older adult if they live long enough. As Levy and Banaji (2002) noted, this means that by the time that younger adults reach old age they have spent decades expressing and internalizing negative ageist attitudes.

Because ageist attitudes have been internalized, research shows that older adults engage in self-stereotyping by themselves endorsing negative stereotypes about old age (e.g., Brewer & Lui, 1984; Brewer, Dull, & Lui, 1981; Hummert, Garstka, Shaner, & Strahm, 1994; Imamoglu, Kueller, Imamoglu, & Kueller, 1993; Schmidt & Boland, 1986). For example, people of all ages expect memory to decline with age (e.g., Lineweaver & Hertzog, 1998; Ryan, 1990). Although people expect these declines to be especially true for individuals who have traits that are also associated with aging (e.g., *lonely* or *slow-moving;* Lineweaver, Berger, & Hertzog, 2009), they also expect that their own memory will decline at the same rate as that of a "typical" older adult (Ryan & See, 1992).

As a result of these expectations, when people witness an older adult forget something they may call it a "senior moment" and think that the forgetfulness is a stable, dispositional trait of the older adult. In contrast, when people see a younger adult forget something they tend to believe this is due to a modifiable factor, such as the younger adult not exerting enough

effort (Erber & Rothberg, 1991; Erber, Szuchman, & Rothberg, 1990). Notably, older and younger adult observers are equally likely to make this ageist attribution bias (Erber, et al., 1990). Older adults' negative attitudes about aging can sometimes even be stronger than younger adults' (e.g., Hummert, Garstka, O'Brien, Greenwald, & Mellott, 2002). For example, older adults are more likely than younger adults to oppose federal programs that benefit older adults (Levy & Schlesinger, 2005) and to agree with negative ageist statements, such as '*older adults are a burden on society*' (Kruse & Schmitt, 2006).

In addition to these negative explicit attitudes, older adults also hold negative implicit attitudes about aging. A striking example of this comes from an online study with over 60,000 respondents. In this study, people had strong implicit associations between "*bad*" and "*older*". In fact, the strength of this implicit association was stronger than any other implicit attitude tested in the study, including those about race and gender. Furthermore, implicit attitudes about age were strongly negative regardless of the participants' age; they remained robustly negative even among participants in their 60's and 70's (Nosek, Banaji, & Greenwald, 2002). In fact, a subsequent study found that older adults were actually more likely than younger adults to hold negative implicit attitudes about aging (Hummert, et al., 2002).

Given that in-group preferences are one of the strongest findings in social psychology (for reviews, see Messick & Mackie, 1989; Mullen, Brown, & Smith, 1992; Tajfel, 1982), the fact that older adults hold strongly negative explicit and implicit attitudes about old age is relatively unique. Whereas race and gender stereotypes are endorsed more strongly by out-group members than by in-group members, there is a dramatic lack of in-group favoritism when it comes to aging stereotypes (Nosek, et al., 2002; see also Axt, Ebersole, & Nosek, 2014). This may be particularly problematic for older adults since other research has shown that, due to age-related inhibitory failures, older adults are more likely to rely upon stereotypes (Radvansky, Copeland, & von Hippel, 2010; von Hippel, Silver, & Lynch, 2000).

Older adults' strongly internalized negative attitudes can in turn affect their behavior at both unconscious and conscious levels. At the unconscious level, stereotype embodiment theory proposes that older adults inadvertently behave in line with internalized aging stereotypes, and that this can lead to adverse effects (e.g., Levy, 1996; 2009). Of relevance to the current review, at the conscious level, when the relevance of aging stereotypes to performance becomes explicitly salient, it can lead older adults to experience stereotype threat and underperform compared to their potential.

What form of threat do older adults experience about their cognitive abilities? The research reviewed thus far has shown that (a) stereotype endorsement predisposes people to experiencing self-as-source forms of stereotype threat (Shapiro & Neuberg, 2007), and (b) that older adults have strongly internalized ageist attitudes. This leads to the conclusion that older adults should be at risk of experiencing self-as-source forms of stereotype threat. They should feel concerned that their actions will lead them to believe that negative aging stereotypes are true of themselves (i.e., to experience self-concept threat). They should also feel concerned that if they perform poorly it will lead them to believe the negative stereotypes are true of all older adults (i.e., to experience group-concept threat).

Interestingly, these effects may be particularly true for the current generation of older adults. This is because aging stereotypes have actually become more negative in recent years. This is in large part because people are living longer due to the medicalization of aging (Ng, Allore, Trentalange, Monin, & Levy, 2015). As a result, Gullette (2011) noted that we "are edging closer to accepting a new stereotype that cognitive function falls off in midlife" (p 193). In accepting this stereotype as truth, we may be spreading an "epidemic of fear" (Gullette, 2011; p. 199) in which the current generation of older adults is experiencing heightened concern about their own abilities as they age.

High group identification elicits group-as-target forms of threat

Because of their high stereotype endorsement, the Multi-Threat Framework suggests that older adults should be at particular risk for experiencing self-as-source forms of threat (i.e., self-concept threat and group-concept threat). However, as noted earlier, stereotype endorsement is only one of the eliciting factors that dictates the type of threat that people experience. According to the Multi-Threat Framework, group identification also plays a role. Group identification refers to the extent to which people view their membership in a given group as being central to how they think about themselves (e.g., Brewer & Silver, 2000; Ellemers, Spears, & Doosje, 1997; Smith & Henry, 1996). According to the Multi-Threat Framework, group identification must be high in order for people to experience group-as-target forms of stereotype threat (i.e., group-concept threat and group-reputation threats). This is because people must feel that they are representatives of their group in order to worry that their personal failings will reflect negatively upon the group's image (Shapiro, 2011, 2012; Shapiro & Aronson, 2013; Shapiro & Neuberg, 2007). For example, if an older adult does not strongly identify with her age group, she should not care how others will perceive "older adults" based upon her performance (i.e., to experience group-reputation threat). Similarly, she should not worry that her own performance will affect her perceptions about older adults' abilities as a whole (i.e., to experience group-concept threat).

Of relevance to this review, research has shown that older adults often do not self-identify as "old" (Linn & Hunter, 1979; Neugarten & Hagestad, 1976), and therefore should not view being an older adult as central to their self-identity (i.e., they should have low group identification). Instead, older adults often perceive themselves as "not old", by maintaining younger subjective age identities (i.e., how old they feel; e.g., Baum & Boxley, 1983; Galambos, Turner, & Tilton-Weaver, 2005; Kastenbaum, Derbin, Sabatini, & Artt, 1972; Montepare & Lachman, 1989; Uotinen, Rantanen, Suutama, & Ruoppila, 2006; Zola, 1962). For example, from the age of 40 onwards, people consistently feel 20% younger than their chronological age (Rubin & Berntsen, 2006). Thus, the typical 65 year old feels as if she is 52 and the typical 70 year old feels as if he is 56. These younger self-identities can in turn affect self-assignment into the categories of middle-aged versus old. For example, in one study approximately 65% of respondents who were aged 65 or older self-identified as being young or middle-aged rather than old. Furthermore, of the people who self-identified as being middle-aged at the baseline assessment of this study, 43% maintained the view that they were middle-aged even when tested again ten years later (i.e., when they were 75 or older; Bultena & Powers, 1978). Similar results are seen when looking at how people define the end of middle age and/or the beginning of old age. As people get older they define this

transition as occurring at later ages (e.g., Barrett & von Rohr, 2008; Lachman, Lewkowicz, Marcus, & Peng, 1994; McConatha, Schnell, Volkwein, Riley, & Leach, 2003; Seccombe & Ishii-Kuntz, 1991; Toothman & Barrett, 2011), an effect that has been replicated in many different countries (Ayalon, Doron, Bodner, & Inbar, 2014). For example, in one study adults in their 40s defined the end of middle age as occurring around age 55. In contrast, adults in their 70s defined the end of middle age as occurring around age 75 (Logan, Ward, & Spitze, 1992).

Thus, despite getting older people are reticent to classify themselves as old. People justify their younger self-identities through downward social comparisons, and compare themselves to other people their age in worse circumstances (e.g., Heidrich & Ryff, 1993). For example, in one study older adult participants were presented with negative information about another older adults' competence. This resulted in older adults rating their peer's abilities as worse, but their own abilities as better (Pinquart, 2002). Older adults also engage in social downgrading by comparing themselves to ageist stereotypes about older adults (Heckhausen & Brim, 1997). By maintaining negative expectations about what older adults as a whole can do, an individual is able to feel relatively superior about her own abilities (Heckhausen & Krueger, 1993), and rate herself as doing better than most people her chronological age (Celejewski & Dion, 1998; Heckhausen & Brim, 1997). Thus, maintaining younger self-identities can actually come at the cost of reinforcing negative aging stereotypes.

Although there is a cost to maintaining younger self-identities, there are also many benefits. Older adults' who feel subjectively younger than their chronological age have higher levels of self-esteem, better health, better psychological well-being, and higher levels of life satisfaction (e.g., Bultena & Powers, 1978; Hubley & Hultsch, 1994; Kleinspehn-Ammerlahn, Kotter-Gruhn, & Smith, 2008; Stephan, Caudroit, & Chalabaev, 2011; Stephan, Sutin, & Terracciano, in pres; Ward, 1977; Westerhof & Barrett, 2005). Feeling subjectively younger is even associated with lower rates of mortality (Markides & Pappas,1982), an effect that remains significant even after adjusting for demographic factors (including chronological age) and health variables (e.g., Kotter-Gruhn, Kleinspehn-Ammerlahn, Gerstorf, & Smith, 2009; Uotinen, Rantanen, & Suutama, 2005).

Younger self-identities, and reticence to self-identify as old also has implications for the type of stereotype threat that older adults experience about their cognitive abilities. As noted earlier, according to the Multi-Threat Framework (Shapiro & Neuberg, 2007), group identification must be high in order for people to experience group-as-target forms of stereotype threat. Thus, older adults' low self-identification with the stigmatized label of “old” should mean that they do not see “being old” as central to their self-identity, and this in turn should protect them from experiencing group-as-target forms of stereotype threat. A typical 70 year old should not worry about how his memory performance will reflect upon older adults because he does not see himself as being part of this group.

Age-based stereotype threat about cognitive decline: A self-concept (and own-reputation) form of threat

Taken together, older adults' strong endorsement of negative aging stereotypes coupled with their low self-identification with the older adult group should mean that older adults are

predisposed to self-concept threat about their cognitive abilities. That is, older adults should be especially concerned with whether stereotypes about age-related declines in cognition and senility have personally affected their own abilities.

This way of describing age-based stereotype threat about cognitive decline has similarities to other research on *anticipatory dementia* (Cutler & Hodgson, 1996), which is also known as *dementia worry* (Kessler, Bowen, Baer, Froelich, & Wahl, 2012). These terms have been used to describe the health-related fears and emotional responses that occur when people think about the possibility of developing dementia. Although the ideas of dementia worry and self-concept stereotype threat have not been previously linked, there are obvious parallels. Dementia worry is in part concern that a negative stereotype (i.e., "*Alzheimer's disease is a common health problem as people get older*") is exerting an impact on one's own abilities.

Dementia worry can have negative health consequences for older adults (Cutler & Hodgson, 2014). It has also been hypothesized to exert a negative impact on older adults' cognition (Kessler, et al., 2012; see also Cutler & Bragaru, 2015). In particular, people high in dementia worry are hypothesized to catastrophize their forgetting and interpret their minor memory lapses as being indicative of dementia. Dementia worry is also hypothesized to contribute to objective cognitive impairments. Although these hypotheses have not been tested within the dementia worry literature, if we assume that dementia worry is at least in part a self-concept stereotype threat, then both of these hypotheses are supported. Stereotype threat about age-related cognitive declines negatively impacts both subjective (e.g., Bouazzaoui, Follenfant, Ric, Fay, Croizet, Atzeni, Taconnat, 2015; Hess & Hinson, 2006; Hess, Hinson, & Hodges, 2009) and objective cognitive performance (for a review, see Barber & Mather, 2014).

Describing age-based stereotype threat about cognitive decline as a self-concept threat also has parallels to research on age-changes in *possible selves* (Markus & Nurius, 1986). Possible selves include both what people hope to become in the future (e.g., being successful, being healthy/fit, or becoming a parent or grandparent) as well as what people are afraid of becoming in the future (e.g., being lonely, being diagnosed with cancer or Alzheimer's disease, or becoming unemployed). Possible selves provide insight into what people personally value, what they are motivated towards, and what makes them feel threatened (Markus & Nurius, 1986). As such, possible selves can be acquired, transformed, or abandoned over time (e.g., Frazier, Hooker, Johnson, & Kaus, 2000; Hooker, Fiese, Jenkins, Morfei, & Schwagler, 1996; Kerpelman & Pittman, 2001; Ryff, 1991). For example, research shows that the content of people's possible selves change with age; as people get older their possible selves focus more on health, social relationships, and cognitive functioning (e.g., Cross & Markus, 1991; Frazier, Cotrell, & Hooker, 2003; Frazier, Gonzalez, Kafka, & Johnson, 2002; Hooker, 1992; Hooker & Kaus, 1994; Smith & Freund, 2002). Furthermore, as people get older there is a shift away from improving abilities in order to achieve hoped-for possible selves towards maintaining abilities in order to prevent feared possible selves (Bearon, 1989; Ebner, Freund, & Baltes, 2006; Smith & Freund, 2002).

As people get older, there is also an increased focus on feared possible selves within the domain of memory. For example, in one study nearly one third of the older adults spontaneously reported fears about their memory abilities (e.g., become an "*Alzheimer's patient*" or becoming "*unable to remember*"). In contrast, no younger adults reported similar concerns (Dark-Freudeman, West, & Viverito, 2006). These fears may be particularly concerning for older adults since they feel less capable of preventing their feared selves and are more confident that their feared selves will become their reality (Cross & Markus, 1991). Taken together, older adults' fears that age-related declines will become their own personal reality is consistent with the hypothesis that older adults' often experience self-concept threat within the domains of memory and cognition.

Finally, qualitative interviews also support the assertion that age-based stereotype threat about cognitive decline is predominately self-concept based. For example, in one study, Laditka and colleagues (2011) asked older adults (aged 50 to 90) to describe how they felt about their memory and aging. The most common theme that emerged in the responses were feelings of fear and worry. Many respondents stated that they felt anxious about minor memory lapses such as misplacing their keys, forgetting someone's name, or forgetting why they went into a room. Further analyses suggested that these minor memory failures triggered self-concept threat. In the wake of forgetting, people reported worrying that negative stereotypes such as "*older adults have bad memories*" and "*Alzheimer's disease is a common problem amongst the elderly*" were personally true. For example, one respondent said: "*I know every once in a while, you, when you have a, I call it a brain freeze at this age, but whenever you have some kind of a problem remembering something, you think, oh, you know, you automatically think about Alzheimer's* (p. 1214)".

Interestingly, although older adults were most likely to provide responses that were consistent with self-concept threat, some responses were also consistent with the Multi-Threat Frameworks' concept of own-reputation threat. This was evidenced by concerns about how others view their memory or how they may be treated by others if their memory declines. For example, one older adult noted: "*Well, I don't always remember everything and my kids make remarks to me like, 'Oh, mom's getting forgetful'. I don't feel like I'm that forgetful. I don't know if they're just making fun of me* (p. 1217)".

These qualitative responses consistent with own-reputation threat highlight two important facts. First, people can (and often do) experience multiple forms of stereotype threat simultaneously. I have thus far argued that older adults' high endorsement of aging stereotypes coupled with their low group identification should (a) predispose them to self-concept threat and (b) protect them from both group-concept and group-reputation threat. However, neither stereotype endorsement nor group identification affect the likelihood of experiencing own-reputation threat (i.e., an older adults' concern that others may judge them based upon aging stereotypes). Rather, the eliciting factors for own-reputation threat are knowledge that ones' actions are visible to other people who are thought to both endorse ageist stereotypes and see one as being an older adult (see Shapiro, 2012; Table 5.2). This can often occur in conjunction with self-concept threat (see Shapiro, 2011). An older adult may believe aging stereotypes to be true, and believe that others similarly believe aging stereotypes to be true. Furthermore, although she may not view "being old" as an important

aspect of her self-identity, she may be aware that younger adult would categorize her as "old". This combination of factors will lead her to experience self-concept threat when alone, but both self-concept and own-reputation threat when in the presence of younger adults.

The second thing that the qualitative responses illustrate is that even when examining one particular domain and group, there can be individual differences in the type of stereotype threat experienced. Although age-based stereotype threat about cognitive decline may often be a self-concept threat will not necessarily be true for all older adults, or even for all sub-groups of older adults. There are likely some older adults who also (or instead) experience group-concept threat, group-reputation threat, and/or own-reputation threat. For example, within the qualitative interviews described above, concern about others' evaluations of the self (i.e., own-reputation threat) emerged as common theme amongst American Indian, Chinese American, and Vietnamese American respondents. Within this study, it was not a common theme in the responses provided by African American, Latinos, or White, Non-Latino respondents. It is possible that cultural variations in the importance or apprehension of social appraisals (e.g., Hsu, 2009; Rodriguez Mosquera, Manstead, & Fischer, 2000) and/or in the endorsement of aging stereotypes (see Bergman, Bodner, & Cohen-Fridel, 2013; Chiu, Chan, Snape, & Redman, 2001; Levy, 1999; Luo, Zhou, Jin, Newman, & Liang, 2013; Yun & Lachman, 2006 for evidence of cultural differences; but see also Chan, et al., 2012; Lockenhoff, et al., 2009 for evidence of cultural similarities) are important in determining the type of stereotype threat that people experience. These cultural differences may also modulate the way that stereotype threat impacts behavior (Levy & Langer, 1994; Yoon, Hasher, Feinberg, Rahhal, & Wincour, 2000).

It is also worth noting that although older adults (as a whole) may be predisposed to both self-concept threat (and own-reputation threat) about their cognitive abilities, they may not experience self-concept threat in other domains. For example, in addition to being stereotyped as less cognitively capable, older adults are also stereotyped as being less technologically savvy (e.g., Ryan, Szechtman, & Bodkin, 1992) and as unproductive and unmotivated employees (for a review, see Posthuma & Campion, 2008). Older adults likely do not endorse these stereotypes to the same extent that they endorse stereotypes about age-related cognitive declines. As a result, they may not be as predisposed to experiencing self-concept threat in these domains, and may rather experience only own-reputation threat. Future research is needed to investigate this possibility; to date, the majority of stereotype threat research done with older adults has focused on cognitive outcomes (see Lamont et al., 2015).

Situational differences in the form of threat elicited: Implications for identifying moderators of the effects

Although there are likely individual and subgroup differences in the response to age-based stereotype threat about cognitive decline, the above research suggests that, as a whole, older adults are particularly prone to experiencing it as a self-concept threat. However, this may be a qualitatively distinct from the form(s) of stereotype threat experienced by other groups. As

an example of this, I next examine the stereotype threat that minority students face regarding their intellectual abilities.

In general, African-American students display low stereotype endorsement; they typically do not believe that the negative stereotypes about their academic abilities are true (e.g., Shapiro, 2011). In contrast, African-American students tend to exhibit high group identification. For example, studies have consistently shown that African-Americans report that their race/ethnicity as being central to their self-concept (e.g., Charmaraman & Grossman, 2010; Herman, 2004; Jaret & Reitzes, 1999). This combination of low stereotype endorsement coupled with high group identification should mean that African American students are particularly prone to worry that others will negatively evaluate both themselves and their group if they perform poorly -- i.e., to experience own-reputation and group-reputation threat2. Supporting this, Shapiro (2011) found that minority students (who self-reported low stereotype endorsement but high group identification) experienced high levels of own-reputation and group-reputation threat.

Because race/ethnicity based threat about intellectual abilities is in large part a group-reputation form of threat, it is not surprising that group identification (i.e., seeing membership in the group as central to the self-concept) plays a moderating role. The more strongly that minority students feel connected to their racial or ethnic group the more that they should worry about whether their personal failings will reflect negatively upon their group's image. Supporting this, research with minority students has shown that increased group identification is associated with higher levels of stereotype threat (McCoy & Major, 2003), and larger stereotype-threat related performance impairments (e.g., Cole, Matheson, & Anisman, 2007; Mendoza-Denton, Downey, Purdie, Davis, & Pietrzak, 2002; Ployhart, Ziegert, & McFarland, 2003; but see Davis, Aronson, & Salinas, 2006).

Because stereotype threat is often assumed to be a singular concept, many researchers typically expect that the moderating variables identified for one group will hold when examining other groups. Based upon this assumption, many researchers would expect that group identification would also moderate older adults' stereotype threat effects, with higher levels of group identification leading to greater performance impairments. In contrast to this, the Multi-Threat Framework suggests that strength of group identification should only moderate group-as-target forms of stereotype threat. If age-based stereotype threat is indeed a self-concept (and own-reputation) form of threat, then the Multi-Threat Framework suggests that group identification should play no role in older adults' stereotype threat effects.

Little research has directly assessed this in older adults, however, in one study neither of these predictions were supported. Instead, increased group identification actually buffered older adults from some of the negative affective consequences associated with stereotype threat (Kang & Chasteen, 2009; but see Abrams, Eller, & Bryant, 2006). This surprising finding, that increased group identification reduced, rather than increased, the negative

[2]Race/ethnicity based stereotype threat effects should not be limited to younger adult students. However, to my knowledge no study has examined this topic in older adults.

consequences of age-based stereotype threat is supported by other work examining age-differences in susceptibility to age-based stereotype threat. Several studies have now shown that older-old adults (e.g., those over the age of 74), who as a whole are more likely to self-identify as being a member of the older adult age group (e.g., Montepare & Lachman, 1989), and who therefore should be more likely to see "being an older adult" as central to their self-concept, are actually less susceptible than younger-old adults (e.g., those aged 55 to 74) to experiencing age-based stereotype threat about cognitive decline (Eich, Murayama, Castel, & Knowlton, 2014; Hess & Hinson, 2006; Hess, Hinson, & Hodges, 2009). In other words, it is the older adults who *least* self-identify as being an older adult that are the *most* susceptible to exhibiting age-based stereotype threat effects within the domain of cognition.

Why are increased group identification and increased self-identification as a member of the threatened group associated with decreased stereotype threat effects for older adults? 3 Although not predicted by the Multi-Threat Framework, I propose that when people are in the process of acquiring new, unwanted, stigmatized identities, their current low levels of self-identification with the threatened group should be an additional eliciting factor for self-concept threat. For example, imagine a healthy 70 year old, who feels younger than her chronological age and self-identifies as "*not old*" (a common response in qualitative interviews; see Hurd, 2000). Furthermore, this 70 year old may find the label of "*old*" to be aversive and to represent all the negative stereotypes associated with aging. Although reticent to self-identify as old, this individual will also be aware that her chronological age is discrepant with her self-views. This may increase her concern about performing well in domains associated with age-related declines. For example, when relying upon her memory she may find herself wondering: "*Will I do well on this task, consistent with my feeling that I am NOT yet an older adult*?" or "*Will I do poorly on this task, and be forced to acknowledge that my chronological age has now made me an "older adult"?*". Qualitative interviews support this; people who self-identify as "not old" are very cognizant of the fact that they must maintain cognitive and physical health in order to keep themselves set apart from the "old" group (Hurd, 2000). If cognitive or physical health begins to decline, people may be forced to update their self-identities to the category of old, which carries with it negative connotations. Consistent with this, other research shows that people feel older, and identify more with older adults, after performing poorly on a memory test (Hughes, Geraci, & De Forrest, 2013).

This hypothesis, that transitioning to a new stigmatizable identity induces self-concept threat, has parallels to the processes outlined in Whitbourne and colleagues' identity process perspective (Sneed & Whitbourne, 2005; Whitbourne, 1986; 1987; Whitbourne & Collins, 1998; Whitbourne & Sneed, 2002). According to this theory, as people get older they are faced with numerous physical, psychological, and social role changes. This can lead to experiences that contradict the individuals' current self-identity. For example, being out of

[3]This effect is not likely driven by age-differences in domain identification. The importance placed upon memory abilities remains stable across adulthood (Hultsch, Hertzog, & Dixon, 1987) or may even increase (Hess & Hinson, 2006). Furthermore, disidentification with the threatened domain is not a readily available coping strategy for older adults in the face of stereotype threat. Whereas younger adults often cope with stereotype threat by choosing to believe that the threatened domain is unimportant to their self-worth (e.g., Major, Spencer, Schmader, Wolfe, & Crocker, 1998; von Hippel, et al., 2005), it is unreasonable for older adults to believe that avoiding senility is similarly unimportant.

breath after walking up a flight of stairs is discrepant with the idea that one is in good physical shape. Similarly, forgetting a name is discrepant with the idea that one has a good memory. In the face of these identity-discrepant experiences people have two choices – *identity assimilation* or *identity accommodation*. Identity assimilation occurs when people seek out and interpret experiences in line with their current self-identity. Identity accommodation occurs when people update and change their self-identity because of new discrepant experiences.

According to Whitbourne's (1996) identity process perspective, when discrepant experiences first occur, people tend to process them using identity assimilation procedures. For example, an individual may attribute a memory failure to fatigue or lack of effort. However, when identity-discrepant experiences become more common, they are eventually processed using identity accommodation procedures. For example, after repeated memory failures the individual may be forced to abandon the view that she is still a younger, “not old” adult with high memory functioning. Rather, she will engage in identity-accommodation by crossing the threshold into viewing herself as being old. The outcome of this will be a renewed state of balance.

This in turn has implications for when age-related cognitive changes are most attributionally ambiguous, and therefore most threatening (see Major & Crocker, 1993; Major & O'Brien, 2005). For older adults who view themselves as young and/or “not old”, the meaning of a memory lapses is still ambiguous – was it a “senior moment” caused by age? Or was it simply the result of not paying enough attention? As a result of this ambiguity, these memory lapses are extremely threatening to the self-identity. In contrast, once older adults view themselves as being old they may also accommodate their self-identities to also integrate age-related declines in physical and cognitive abilities. As a result, memory lapses are no longer attributionally ambiguous. Rather, they are consistent with the self-identity and less likely to produce stereotype threat effects. To be clear, this means that the reason younger-old adults are generally more affected by age-based stereotype threat about cognitive decline is because they are generally less likely to self-identify as “old”.

Thus, whereas it is often assumed that moderators of stereotype threat observed in one domain or for one group will generalize to other domains and groups, this is not always the case (see also Nguyen & Ryan, 2008). Previous research with younger adults has often shown that increased identification with the threatened group is associated with increased stereotype threat effects (e.g., Schmader, 2002). However, this is not the case for older adults. Rather, research shows that higher self-identification with the older adult age group (as is assumed to occur in older-old compared to younger-old adults; Eich, et al., 2014; Hess & Hinson, 2006; Hess et al., 2009), and higher endorsement that “being an older adult” is important to one's self-identity (Kang & Chasteen, 2009), are both associated with stereotype threat for older adults. This discrepant pattern of results is likely due to the fact that these groups are experiencing different forms of stereotype threat (Wout, et al., 2008). Whereas high group identification may predispose people to experience group-reputation threat, low group identification may predispose people to experience self-concept threat, at least during the transition to a new stigmatizable identity.

Age-related changes in the mechanisms underlying stereotype threat effects

To this point, I have focused on describing the exact nature of the threat that older adults face about their cognitive abilities (i.e., a self-concept and own-reputation threat). I have also explored how this may vary from the types of threat experienced by other groups (e.g., own and group-reputation threats for minority students in academic settings), and also from the type of threat that older adults face in other domains (e.g., an own-reputation threat, but not a self-concept threat, for stereotypes about older adults being poor employees). I now turn to the question of why these various forms of stereotype threat often leads to performance impairments.

Previous studies have identified many reasons why stereotype threat affects performance (for a recent review, see Pennington, Heim, Levy, & Larkin, 2016). Some studies have implicated affective variables, such as increases in arousal (e.g., Ben-Zeev, Fein, & Inzlicht, 2005), anxiety (e.g., Abrams, Eller, & Bryant, 2006; Abrams, Crisp, Marques, Fagg, Bedford, & Provias, 2008; Spencer, Steele, & Quinn, 1999; Swift, Abrams, & Marques, 2013), evaluation apprehension (e.g., Steele & Aronson, 1995), and stress (e.g., Blascovich, Spencer, Quinn, & Steele, 2001). Other studies have implicated motivational variables, such as decreased performance expectations (e.g., Cadinu Mass, Frigerio, Impagliazzo, Latinotti, 2003; Stangor, Carr, & Kiang, 1998), decreased practice in the threatened domain (e.g., Stone, 2002), increased avoidance goals (e.g., Brodish & Devine, 2009), and changes in ones' motivation to do well (e.g., Jamieson & Harkins, 2007). Finally, other studies have implicated cognitive variables, such as increased task monitoring (e.g., Beilock, Jellison, Rydell, McConnell, & Carr, 2006), divided attention (e.g., Cadinu, et al., 2003), and decreased working memory capacity (e.g., Schmader & Johns, 2003).

Interestingly, the Multi-Threat framework explicitly assumes that the mechanisms underlying stereotype threat are not moderated by the form of threat that is experienced. That is, each of putative mechanisms described above is theorized to be equally likely for each of the different forms of stereotype threat (see Shapiro & Neuberg, 2007, p. 111). Although this hypothesis remains an empirical question deserving of future research, in this section of the review I instead focus on the possibility that there may be age-differences in stereotype threat's mechanisms. I propose that regardless of the form of threat elicited (be it self-concept threat, group-reputation threat, etc.), the impact of threat on behavior depends upon the individuals' age. Stereotype threat effects seem to be best explained as arising from executive control interference for younger adults but by changes in regulatory focus for older adults.

A) The Executive Control Interference Integrated Process Model of Stereotype Threat

To reconcile the many mechanisms reported to underlie stereotype threat effects, and to take into account the fact that stereotype threat is a complex phenomenon that likely arises from an interrelated set of processes, an integrated process model was proposed by Schmader, Johns, and Forbes (2008). In brief, this model proposes that stereotype threat leads to negative affective, motivational, and physiological responses that together place demands on

the executive control component of working memory. This in turn leaves fewer attentional resources available to perform the task at hand, and hence performance suffers (at least on tasks that require controlled and effortful processing and/or active self-regulation). Thus, according to this model, executive control interference (i.e., working memory efficiency) is the common distal mediator that accounts for performance declines on tasks requiring controlled processing in the face of stereotype threat.

This model can be used to reinterpret some previous research findings. For example, some research has suggested that anxiety mediates stereotype threat effects – the more that stereotype threat leads to anxiety the greater the subsequent performance declines (e.g., Spencer, et al., 1999). In the integrated process model, it is assumed that an individual under stereotype threat experiences anxiety but actively tries to suppress this response. Because suppression is cognitively costly this leaves the individual with fewer executive control resources available to perform the required tasks, and this results in performance decrements (Schmader, et al., 2008).

Direct evidence also supports the integrated process model's assertion that executive control interference is the key mediator of stereotype threat effects in younger adults. For example, stereotype threat preferentially impairs younger adults' performance on tasks that rely upon executive control resources (e.g., Beilock, Rydell, & McConnell, 2007). Furthermore, working memory performance (which relies upon executive control) is impaired both during, and following, stereotype threat activation in younger adults (Johns, Inzlicht, & Schmader, 2008; Schmader & Johns, 2003), and these working memory deficits mediate the stereotype-threat related performance deficits in other domains (Schmader & Johns, 2003). Because of this younger adults with high working memory capacities are better equipped to handle stereotype threat than those with low capacities (Regner, Smeding, Gimmig, Thinus-Blanc, Monteil, & Huguet, 2010). This is presumably because these high capacity individuals have sufficient resources available to perform the task at hand, even after experiencing declines in working memory resources as a function of stereotype threat.

In contrast, evidence from older adults has been inconsistent in its support for the integrated process model. For example, working memory performance is not impaired following stereotype threat for older adults (e.g., Hess, Hinson, & Hodges, 2009), unless the working memory test is described to participants as being a test of memory abilities (Mazerolle, Regner, Morisset, Rigalleau, & Huguet, 2012; see also Abrams, Eller, & Bryant, 2006 in which a digit span task was used as part of a composite dependent variable). However, as noted by Hess et al (2009), labeling working memory tests as assessing memory is problematic; doing so confounds the impact of stereotype threat on working memory with the impact of stereotype threat performance impairments within the threatened domain. In other words, a possibility that seems more consistent with these findings is that stereotype threat about age-related memory decline reduces older adults' performance on all tasks that are clearly identified as assessing memory performance.

Thus, although executive control interference appears to be the key cause of stereotype threat effects in younger adults, it may not be the primary factor underlying stereotype threat effects in older adults. This difference could be due to age-related changes in emotion

regulation abilities. As noted above, according to the integrated process model, stereotype threat induces negative affective states that people actively try to suppress. However, doing this is cognitively costly and leaves fewer executive control resources available to perform the required task (Schmader, et al., 2008). Although these assumptions tend to hold true for younger adults, there is less support for them with older adults. Although some studies have found that self-reported anxiety levels mediate older adults' stereotype threat effects (Abrams, et al., 2006; Abrams, et al., 2008; Swift, et al., 2013), others have failed to observe this (e.g., Chasteen, et al., 2005; Hess, et al., 2003; Hess & Hinson, 2006). Furthermore, although stereotype threat leads older adults' to have enhanced physiological arousal, arousal does not mediate their performance decrements (Hess, et al., 2009). In other words, although stereotype threat reliably invokes negative affective responses for older adults, this does not consistently predict their subsequent performance decrements. One explanation for this is that there appear to be age-related improvements in emotion regulation abilities (e.g., Phillips, Henry, Hosie, & Milne, 2008; Scheibe & Blanchard-Fields, 2009). For example, one study found that regulating emotions while conducting a cognitive task lead to performance decrements for younger adults but not for older adults (Scheibe & Blanchard-Fields, 2009). Similarly, another study found that suppressing emotional responses reduced younger adults' memory for the emotion-eliciting stimuli, but did not have similar adverse effects for older adults (Emery & Hess, 2011). So although stereotype threat may induce negative affective states that people try to regulate, this may be more cognitively costly, and thus be more likely to reduce executive control resources, for younger adults (for a review, see Morgan & Scheibe, 2014).

Support for this assertion comes from recent work by Popham and Hess (2015). In this study, younger adults had impaired availability of working memory resources under stereotype threat. However, this effect was moderated by the younger adults' emotion regulation abilities (i.e., their self-assessed ability to control their negative emotions). Whereas younger adults with low emotion regulation abilities showed decreases in working memory under stereotype threat, younger adults with high emotion regulation abilities did not. This is similar to other research showing that the extent to which younger adults show increases in cortisol in the face of a social identity threat depends upon their emotion regulation style (Matheson & Cole, 2004), and that teaching younger adults a strategy to effectively regulate their emotions can ameliorate their stereotype threat effects (Johns, Inzlicht, & Schmader, 2008).

In contrast to the results with younger adults, Popham and Hess (2015) also found that older adults, as a whole, had higher emotion regulation abilities than did the younger adults. Building upon this, they also found that stereotype threat did not impair older adults' working memory resources. Thus, the younger adults with high emotion regulation abilities had similar outcomes to the older adults – both groups had intact working memory resources despite being confronted with stereotype threat. This supports the hypothesis that stereotype threat induces negative affective states that people try to regulate, but regulating these states is less cognitively costly for older adults (as a whole) due to age-related improvements in emotion regulation abilities. Of note, these findings also suggest that stereotype threat effects may still be driven by executive control interference for older adults who have levels of emotion regulation abilities that are more similar to those of the average younger adult.

The Regulatory Focus Model of Stereotype Threat in Older Adults

If executive control interference is not the key factor underling older adults' stereotype threat effects, then what is? Some research has suggested that older adults' stereotype threat effects may instead be better explained as arising from changes in regulatory focus. According to the regulatory focus framework, people either have a promotion or prevention orientation (Higgins, 1997). People with a promotion orientation are concerned with advancement, improvement, accomplishment, and aspirations. Their strategic inclination is to eagerly pursue their goals by approaching gains (and avoiding non-gains). In contrast, people with a prevention orientation are concerned with responsibility, protection, and safety. Their strategic inclination is to vigilantly fulfill their duties by actively avoiding losses (and approach non-losses).

Although people differ in their dispositional tendency to be promotion or prevention oriented, short-term situational fluctuations can also occur. For example, regulatory focus shifts in students across the course of the semester. At the beginning of the semester, students tend to be promotion oriented. Here, their goals are achievement oriented; they aim to improve their knowledge and gain as many points as possible on their tests and assignments. At the end of the semester, students tend to be prevention oriented. Here, their goals shift towards meeting their remaining responsibilities; they aim to make as few mistakes, and lose as few points as possible on their remaining tests and assignments (Grimm, Markman, & Maddox, 2012).

Another situation that is proposed to affect regulatory focus is stereotype threat (Seibt & Forster, 2004). When people encounter a negative self-relevant stereotype the best outcome is a non-loss rather than a gain. Because of this, in the presence of stereotype threat people abandon the approach of eagerly approaching the gains that will make them their best and instead become vigilant to avoid the losses that will make them their worst. Thus, under stereotype threat people adopt a short-term prevention orientation. Furthermore, this should be true regardless of their dispositional orientation. This idea is conceptually similar to the Stereotyped Task Engagement Process model put forward by Smith (2004) to explain stereotype threat effects in educationally-relevant settings (see also Smith, Sansone, & White, 2007). Drawing upon the achievement goal literature, Smith proposes that stereotype threat leads people to abandon performance approach goals (e.g., the desire to demonstrate competence and do their best) and instead adopt performance avoidance goals (e.g., the desire to avoid demonstrating incompetence and avoid failure).

Recent research supports the hypothesis that stereotype threat induces a prevention regulatory focus for older adults. For example, when people have a prevention regulatory focus, they are concerned with the presence or absence of losses. This leads them to be more cautious and risk-averse (e.g., Crowe & Higgins, 1997). In line with this, older adults under threat respond more slowly (Popham & Hess, 2015; see also Abrams, Eller, & Bryant, 2006), and are more risk averse in their decision making (Coudin & Alexopoulos, 2010). Furthermore, although stereotype threat is often associated with the cost of remembering fewer correct answers, it also comes with the benefit of reducing older adults' memory errors (Barber & Mather, 2013a; Popham & Hess, 2015; Wong & Gallo, 2015; but see Thomas &

Dubois, 2011). This is likely because older adults adopt a more conservative, risk-averse, response-criteria during the memory test (Barber & Mather, 2013a).

Additional evidence supporting the regulatory focus account of stereotype threat comes from studies examining the phenomenon of *regulatory fit.* In general, any goal can be pursued with either a promotion or prevention regulatory strategy. However, some goals are more compatible with promotion regulatory foci and others with prevention regulatory foci. This results in differing levels of "fit" (Higgins, 2000). For example, approach goals (i.e., striving towards a desirable end states) tend to benefit from eagerness and are therefore more compatible with a promotion regulatory focus. In contrast, avoidance goals (i.e., steering away from undesirable end states) tend to benefit from vigilance and are therefore more compatible with a prevention regulatory focus (Higgins, 2002; see also Idson, Liberman, & Higgins, 2000). Fit can lend a subjective sense of importance to the activity and enhance motivational strength (see Higgins, Idson, Freitas, Spiegel, & Molden, 2003). That is, it leads to a *feeling right experience* (Higgins, 2005), and this in turn can improve performance.

In experimental studies examining regulatory fit, researchers have often experimentally manipulated whether the task has a gains-based or losses-based financial reward. When the task has a gains-based financial reward, people are able to gain money (or a chance to win money) by performing well. When the task has a losses-based financial reward, people are able to avoid losing money from an initial larger reward provided by the experimenter by not performing poorly. In general, people with a promotion orientation (either chronically, or situationally-induced) perform best when the task has a gains-based financial reward. Conversely, people with a prevention orientation (either chronically or situationally-induced) perform best when the task has a losses-based financial reward (Shah, Higgins, & Friedman, 1998; see also Glass, Maddox, Markman, 2011; Maddox, Filoteo, Glass, & Markman, 2010; Otto, Markman, Gureckis, & Love, 2010; Worthy, Maddox, & Markman, 2007).

My own research using this paradigm has also supported the hypothesis that stereotype threat induces a prevention orientation. In these studies, older adult participants completed memory or cognitive tests either under stereotype threat or not. Test performance was associated with either gains-based financial rewards (i.e., money earned for correct responses) or losses-based financial rewards (i.e., money lost from an initial large reward for incorrect responses). Across studies, stereotype threat impaired performance when the tests had a gains-based financial reward. In contrast, it did not impair (and sometimes improved) performance when the tests had a losses-based financial reward. As shown in Figure 1, this was true for stereotype threat's impact on older adults working memory performance (Barber & Mather, 2013b). It was also true for stereotype threat's impact on older adults' free recall performance (Barber & Mather, 2013a), and performance on mental status examination tests (which include subtests assessing verbal fluency, orientation and attention, language abilities, memory abilities, and visuospatial abilities; Barber, Mather, & Gatz, 2015). This pattern of results suggests that older adults' adopt a prevention orientation when under stereotype threat; this in turn "fits" with a losses-based financial reward, enhances motivational strength, and leads to better performance.

Previous findings of older adults' performing poorly in the presence of age-based stereotype threat about cognitive decline can also be reinterpreted as representing a lack of regulatory fit. As noted by Grimm and colleagues (2009), most cognitive tests have an implicit gains-based structure. For example, even when the experimenter does not manipulate reward structure, the assumed objective of a memory test is to correctly recognize or recall as many items as possible (i.e., gain as many correct answers as possible). This implicit gains-based frame means that performance on traditional recall and recognition memory tests should be impaired for people with a prevention focus (as may be the case under stereotype threat).

Age-Differences in the Mechanisms Underlying Stereotype Threat

In the previous sections, I have outlined two potential reasons why stereotype threat may affect behavior -- the executive control interference integrated process model and the regulatory focus model. Although presented as separate causes of threat, the two models are not theoretically incongruent with one another (for a review, see Barber & Mather, 2014). For example, according to the executive control interference integrated process model, a stereotype-threat induced prevention regulatory focus will increase task monitoring (e.g., vigilance towards avoiding mistakes). This in turn is proposed to be one of the reasons why stereotype threat reduces the availability of executive control resources (Schmader, Johns, and Forbes, 2008).

This method of integrating the two models is supported in younger adults. For example, consistent with the regulatory focus model, stereotype threat leads younger adults to respond more slowly during tasks (Seibt & Forster, 2004), to be more risk-averse in their decisions (Carr & Steele, 2010), and to endorse prevention-related goals such as "*avoid doing poorly on the test"* (Brodish & Devine, 2009). Regulatory fit patterns are also observed for younger adults. That is, younger adults' stereotype threat effects disappear, and sometimes even reverse when the task has a losses-based structure (Chalabaev, Dematte, Sarrazin, & Fontayne, 2015; Chalabaev, Major, Sarrazin, & Cury, 2012; Grimm, et al., 2009; Seibt & Forster, 2004; but see Finnigan & Corker, 2016). Importantly, for younger adults the short-term benefits of regulatory fit come with costs; the initial mobilization of cognitive resources that leads to regulatory fit benefits quickly leads to cognitive fatigue and reduced executive control resources for subsequent tasks (Stahl, Van Laar, & Ellemers, 2012; see also Hutchison, Smith, & Ferris, 20013).

Thus, for younger adults, the executive control interference integrated process model of stereotype threat is generally supported. For a variety of reasons (which include, but are not limited to, changes in regulatory focus) stereotype threat reduces younger adults' executive control resources. This in turn leads to performance declines (see Schmader, et al., 2008). In contrast, this executive control interference integrated process model is not well supported when examining older adults. This is perhaps because older adults have enhanced emotion regulation abilities and therefore do not need to exert as much cognitive effort towards suppressing the negative affective responses associated with stereotype threat (Popham & Hess, 2015). Rather, older adults' stereotype threat effects appear to be primarily due to motivational changes in regulatory focus – when confronted with stereotype threat older adults become vigilant to avoid confirming the conclusion that they have experienced age-

related declines (see Barber & Mather, 2013a, 2013b; Barber, Mather, & Gatz, 2015). More broadly, this finding fits with the hypothesis that motivational factors become increasingly important for understanding cognitive performance as people get older (Hess, 2014).

Finally, it is also worth reiterating that these mechanisms should not depend upon the form of threat that is elicited. Regardless of the form of stereotype threat, there should be age differences in the underlying mechanisms -- threat should impact younger adults due to reductions in executive control resources and older adults due to motivational changes. This is a particularly important point when examining non-age-based forms of stereotype threat. Older adults' responses to race-based or gender-based forms of threat should similarly show support for the regulatory focus account rather than the executive control interference account. Future research is needed to test this hypothesis.

Implication for stereotype threat interventions

The research reviewed thus far suggests that age-based stereotype threat about cognitive decline is primarily self-concept and an own-reputation based, and that older adults respond to these threats by adopting a prevention orientation in which they become cautious and risk-averse. These conclusions have implications for which interventions will be successful in ameliorating older adults' stereotype threat performance deficits within the domain of cognition. They also shed light on which interventions will fail, despite being effective in eliminating stereotype threat effects for other groups or in other domains. This is because stereotype threat interventions will only be effective if they are tailored to address the qualitative experiences and processes that cause the evaluative concern to have negative effects (see Shapiro, Williams, & Hambarchyan, 2013).

Within the broader stereotype threat literature, role model interventions are often successful in eliminating stereotype threat effects. In these studies, participants are exposed to an in-group member who is accomplished within the stereotyped domain. Looking to these role models for inspiration and reassurance is thought to be beneficial, and can often lead to positive outcomes (e.g., Dasgupta & Asgari, 2004; Marx & Ko, 2012; Marx & Roman, 2002; McIntyre, Lord, Gresky, Ten Eyck, Frye, & Bond, 2005; McIntyre, Paulson, & Lord, 2003; McIntyre, Paulson, Taylor, Morin, & Lord, 2010). However, a recent study with younger adult participants found that whereas role model interventions are successful in ameliorating *group-as-target* forms of threat, they do not impact *self-as-target* forms of stereotype threat (Shapiro, Williams, & Hambarchyuan, 2013). Given that self-concept and own-reputation threats are self-as-target forms of stereotype threat, this suggests that role model interventions (such as exposing participants to portrayals of ‘golden-agers’, the subgroup of older adults who are active, capable, happy, independent, and sociable; Hummert, et al., 1994), may be ineffective at reducing age-based stereotype threat about cognitive decline. However, to my knowledge this intervention has not yet been examined with older adults, and future research is needed to test these hypotheses.

As a self-concept form of threat, age-based stereotype threat may instead be best combated by value affirmation interventions. According to self-affirmation theory (Steele, 1988; see also Sherman & Cohen, 2006), people are motivated to maintain a sense of *self-integrity.*

This is defined as a global sense of efficacy and the belief that one is in control of their own life. In stereotype-threat eliciting situations, self-integrity is threatened, particularly when people's sense of self-worth is tied to the stereotyped domain (see also Aronson, Quinn, & Spencer, 1998; Steele, et al., 2002). Threats to self-integrity can be combated through value affirmation interventions. These interventions build upon the idea that self-integrity is a global narrative and that our sense of worth is not tied to a single domain. Thus, if there is a threat to the self-identity in one domain people should be able to combat it by affirming their worth in a different domain. A common experimental strategy to do this is to first ask participants to select a value that is important to them (e.g., relationship with their friends or family, their religion) and then ask them to write about why this value is important to them (McQueen & Klein, 2006) and how it connects them to other people (Shnabel, Purdie-Vaughns, Cook, Garcia, & Cohen, 2013). Research with younger adults shows that these value affirmation interventions can lower physiological stress responses (Creswell, Welch, Taylor, Sherman, Gruenewald, & Mann, 2005) and improve younger adults' performance in stereotype-threat eliciting situations (e.g., Cohen, Garcia, Apfel, & Master, 2006; Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Hall, Zhao, Shafir, 2013; Martens, Johns, Greenberg, & Schimel, 2006; Miyake, Kost-Smith, Finkelstein, Pollock, Cohen, & Ito, 2010).

However, as with role model interventions, the efficacy of value affirmation interventions depend upon the form of stereotype threat. Research by Shapiro and colleagues (2013) has shown that value affirmations are particularly useful in reducing self-as-target forms of stereotype threat, such as self-concept threat. In contrast, value affirmations are ineffective in reducing group-as-target forms of stereotype threat, such as group-reputation threat (Shapiro, Williams, & Hambarchyan, 2013). Thus, if age-based stereotype threat about cognitive decline is a self-concept threat, then value affirmations may prove particularly effective at ameliorating it.

Although this intervention has not yet been studied in older adults, it has parallels to studies examining how older adults' cognition is affected by prior task success and failures. In a first study by Geraci and Miller (2013), all older adults were given a memory test. However, prior to the memory test one group of older adults was given a simple cognitive task that they could easily complete, a second group of older adults were given a difficult cognitive task that they would fail to complete, and a third control group was not given a prior task. Results showed that participants in the prior task success group had the best memory performance and the lowest levels of anxiety. In contrast, there were no differences in either memory performance or anxiety levels between participants in the prior task failure group and those in the control group (Geraci & Miller, 2013). This pattern suggests that when older adults were able to affirm their abilities within the threatened domain their performance improved, and this could have been due in part to a reduction in feelings of stereotype threat within this domain. Although a subsequent study failed to find the same benefit when the task success occurred in a different domain – in this case motor task performance (Geraci, Hughes, Miller, & De Forrest, in press) – this may have been caused by older adults' not similarly valuing their success in the unrelated domain. Value affirmation interventions work by reminding participants that their self-identity is not tied only to the threatened domain, but rather also resides in other domains of personal importance. Thus, task success or

affirmation of abilities should only be effective in alleviating stereotype threat when the affirmation is personally important to the participants. Current research in my lab is ongoing to further examine this possibility and to more specifically test the efficacy of this intervention for older adults.

An alternate intervention for reducing self-concept threat builds upon Dweck and colleagues' distinction between entity and incremental theories about the malleability of personal qualities and abilities (e.g., Dweck, Chiu, & Hong, 1995; Dweck & Leggett, 1988; Molden & Dweck, 2006; Murphy & Dweck, 2009; Rattan, Good, & Dweck, 2012). When people have an entity theory (i.e., a fixed mindset) they view their personal abilities as relatively stable and immutable. In contrast, when people have an incremental theory (i.e., a growth mindset) they view abilities as dynamic and malleable. These two views lead to different reactions in the face of failure, and also different reactions to stereotype threat. For example, younger adults who hold fixed mindsets show exacerbated performance impairments under stereotype threat (Aronson, Fried, & Good, 2002). This is perhaps because individuals with fixed mindsets interpret a stereotype-threat-induced performance failure as a reflection that they do not possess the skills needed to succeed. This in turn may lead them to feel increased anxiety, and a cascade of subsequent performance deficits. However, this can be ameliorated by teaching people to adopt a growth mindset in which they view their abilities as malleable (Aronson, et al., 2002).

Growth mindset interventions should be particularly effective in eliminating self-concept threat. This is because the intervention operates by alleviating the concern that personal self-worth and identity can be negatively affected by a single performance failure. As such, it is not surprising that growth mindset interventions are effective for older adults. In general, older adults are more likely to hold fixed mindsets than younger adults (Plaks & Chasteen, 2013; see also Neel & Lassetter, 2015). Furthermore, as older adults' endorsement of entity theories / fixed mindsets increases, the lower their memory performance. However, mindset interventions can ameliorate this deficit; exposing older adults to a growth mindset about memory (e.g., information about neural regeneration and the capacity of the brain to compensate for age-related declines) improves their memory performance (Plaks & Chasteen, 2013).

Finally, an untested intervention is to teach older adults to maintain a promotion regulatory focus in the face of threat. Given that the majority of cognitive tasks have an implicit gains-based structure, a promotion focus will lead to an experience of regulatory fit and improve performance. To implement this, older adults could be taught that threat-eliciting situations tend to make people cautious, risk averse and focused on avoiding failure (e.g., Barber & Mather, 2013a; 2013b). However, to perform optimally they should make sure that they approach the cognitive task with eagerness, less cautiousness, and focus on becoming their best. Future research is needed to determine whether older adults are capable of overriding threat-induced prevention regulatory foci, and whether this type of educational intervention can ameliorate older adults' threat effects within the domain of cognition.

The above intervention possibilities all focus on older adults. However, it should also be possible to ameliorate age-based stereotype threat about cognitive decline by improving

people's aging attitudes before they reach old age. A large body of literature has now demonstrated that negative aging attitudes in midlife are associated with poorer longitudinal outcomes. When followed longitudinally, people who have negative aging attitudes in midlife also have poorer memory (Levy, Zonderman, Slade, & Ferrucci, 2012; see also Robertson, King-Kallimanis, & Kenny, 2015) and poorer functional health in old age (Levy, Slade, & Kasl, 2002). These health declines include greater decreases in hearing abilities (Levy, Slade, & Gill, 2006), a higher likelihood of experiencing a cardiovascular event (such as a heart attack or stroke; Levy, Zonderman, Slade, & Ferrucci, 2009), steeper declines in hippocampal brain volume, and greater accumulation of amyloid plaques and neurofibrillary tangles (i.e., biomarkers associated with Alzheimer's disease; Levy, Ferrucci, Zonderman, Slade, Troncoso, & Resnick, 2015). Perhaps most remarkable, people who have negative aging attitudes in midlife have significantly shorter lifespans, dying about 7.5 years sooner than their peers who had positive aging attitudes in midlife (Levy, Slade, Kunkel, & Kasl, 2002).

Combined with the fact that self-concept threat arises more strongly for people who endorse aging stereotypes as true, this suggests that interventions may have the largest impact if they can improve aging attitudes before people reach old age. There have been many methods used to accomplish this. For example, students' aging attitudes are improved through classes that teach about the positive aspects of getting older (e.g., Cottle & Glover, 2007; Ferrario, Freeman, Nellett, & Scheel, 2007; Lee & Waites, 2006; O'Hanlon & Brookover, 2002; Snyder, 2006). Aging attitudes are also improved when people have positive interactions with older adults (e.g., Couper, Sheehan, & Thomas, 1991; Dorfman, Murty, Ingram, Evans, & Power, 2004), an effect that occurs even for children (Aday, Sims, & Evans, 1991; Caspi, 1984). However, it is worth noting that the dynamics and nature of these intergenerational interactions determines the efficacy of this intervention (see Chua, Jung, Lwin, & Theng, 2013; Hale, 1998; Knox, Gekoski, & Johnson, 1986).

Concluding Remarks

When we first see another person we automatically categorize them according to their race, sex, and age. These three categorizations occur quickly (in less than one second), with minimal effort, and are thought to be essential to social perception. Because of this, researchers have often refer to these three dimensions as being ‘automatic’ or ‘primitive’ categories (e.g., Bargh, 1994; Brewer, 1988; Fiske & Neuberg, 1990; Hamilton & Sherman, 1994). However, of these three categories, the bulk of stereotype threat research has focused on race-based and sex/ gender-based forms of threat. In contrast, there has been considerably less attention paid to age-based stereotype threat.

One reason for this discrepancy may be because ageism is one of the most socially-condoned and acceptable forms of prejudice to hold (see Nelson, 2002; 2005; Palmore, 1999). An example of the social acceptability of ageism can be seen in the 2008 United States Presidential election. During this election, Democratic candidate Barack Obama, a 47-year old African American male, faced off against Republican candidate John McCain, a 71-year old Caucasian male. Whereas it would have been taboo to speculate on whether or not Obama would make a good President due to his race, there was national discourse on

whether or not McCain would make a good President due to his age. Leading up to the election, there were segments on popular news shows debating this issue and late-night comedians made jokes insinuating that McCain was developing dementia and experiencing age-related frailties. McCain himself even poked fun at his age, likely as a tactic to defuse the issue by bringing it up himself.

Overt ageism is not limited to the political domain; it is also prevalent in everyday situations. In fact, 84% of older Americans and 91% of older Canadians reported having experienced at least one incident of overt ageism, and over half of respondents reported experiencing multiple incidents (Palmore, 2004). These incidents include being called insulting names, being ignored, or being told that they are “too old” to complete certain activities (Palmore, 2001; 2004). In fact, the European Social Survey found that ageism was the most commonly experienced form of prejudice within their sample (Abrams & Swift, 2012)

In addition to hostile ageism, older adults also experience benevolent ageism. According to the Stereotype Content Model, stereotypes are often multi-faceted in nature (e.g., Brewer, Dull, & Lui, 1981), with both negative and positive components (e.g., Cuddy, Fiske, & Glick, 2008; Hummert, Garstka, Shaner, & Strahm, 1994). For example, stereotypes differ in the extent to which they group is perceived as being competent (i.e., skillful, able, confident) and in the extent to which they are perceived as being warm (i.e., good-natured, trustworthy, sincere). As a whole, older adults are perceived as low in competence but high in warmth (Cuddy, Norton, & Fiske, 2005). This combination is the signature of a pitying stereotype. Because of this older adults are liked but patronized, they are viewed as “doddering but dear” (Cuddy & Fiske, 2002; Cuddy et al., 2008).

Although positive stereotypes about older adults (e.g., warm or cute) may appear harmless, but can still be detrimental. For example, based upon their assumptions about age-related hearing loss, well-meaning people sometimes talk to older adults using exaggerated-intonations, an increased speech volume, and a slower speech rate (Giles, Fox, Harwood, & Williams, 1994; Nelson, 2005). However, older adults view this as disrespectful and patronizing (Ryan, Bourhis, & Knops, 1991). A similar response to benevolently-provided physical assistance can be seen in this older man's attitudes: “*Just because you're old everybody thinks ‘poor old soul -- he's past it’. I mean people open doors, well I detest it. That helping me with the coat and things like that, I don't want it, I don't need helping on with me coat. I mean I lead a perfectly normal life. In fact I perhaps even have a more mobile life than some of the young ones do”* (Pain, Mowl, & Talbot, 2000, p. 386).

Ageism (be it hostile or benevolent) can also lead older adults to experience stereotype threat. Although this can happen across many domains (because there are many negative stereotypes about older adults), the current review has focused on age-based stereotype threat about cognitive decline. When completing a cognitive tasks, older adults often experience stereotype threat -- they are aware that their behavior could confirm to themselves and/or the people watching them the veracity of negative stereotypes about age-related senility and cognitive declines. In response to this, older adults often underperform on cognitive tasks compared their potential (see Lamont, et al., 2015).

This finding is often used to support the general conclusion that stereotype threat is a pervasive phenomenon that affects performance for a wide-variety of populations in many different domains. However, as noted earlier, this conclusion implicitly assumes that stereotype threat is a singular concept – that a female student's experience of "stereotype threat" about her math abilities is the same as a minority student's experience of "stereotype threat" about his intellectual abilities, which is in turn the same as an older adults' experience of "stereotype threat" about her memory abilities. Furthermore, because stereotype threat is often viewed as a singular construct, researchers typically expect that the moderators and mechanisms underlying stereotype threat effects will be invariant across groups and domains. However, as reviewed here, these assumptions are not always true.

Looking first at differences in the experience of threat, Shapiro and Neuberg's (2007) Multi-Threat Framework proposes that there are actually six phenomenologically-distinct forms of threat that can occur. They further propose that the form of threat experienced can be predicted based upon the presence of absence of particular eliciting factors. Building upon their framework, in the current review I argue that older adults' high endorsement of ageist stereotypes coupled with their low self-identification as being "old", should predispose them to experience self-concept threat. Older adults should be particularly concerned with whether age-related declines have personally affected them. Furthermore, although self-concept threat may occur alongside own-reputation threat (i.e., concern that others will judge them based upon ageist stereotypes), older adults should not typically experience either group-concept or group-reputation threat (i.e., concerns about how one's own behavior will reflect upon older adults as a whole).

Notably, older adults' self-concept threat about their cognitive abilities is qualitatively different than the form(s) of threat experienced by other groups, and even from the form(s) of threat older adults experience in other domains. This distinction is important for moving stereotype threat research theory forward in several ways. First, by understanding the different possible forms of threat, we will be able to more accurate determine whether or not a group is experiencing stereotype threat. For example, Bennett and Gains (2010) conclude that there is little evidence of stereotype threat affecting older adults' in the real-world because "*older people are simply concerned about their own performance rather than that of others within their group"* (p. 444). However, when using the language of the Multi-Threat Framework this conclusion can be edited to include more nuances-- older adults' preoccupation with their own abilities simply means that they will not experience group-reputation or group-concept threat. In contrast, they should be particularly prone to experiencing self-concept threat.

A second benefit of delineating the form of threat being studied is that we will be better at predicting when findings about stereotype threat in one group/domain will apply when examining other groups/domains. This in turn will lend clarity in situations where findings would otherwise appear contradictory, or when effects observed in one group do not replicate in other groups. For example, researchers often note that high group identification leads to greater stereotype threat effects (e.g., Schmader, 2002). But based upon the Multi-Threat Framework (Shapiro & Neuberg, 2007), this should only be true for group-as-target forms of threat (i.e., group-reputation and group-concept threat) and should not replicate for

self-as-target forms of threat. Furthermore, in the current review I suggest that low (rather than high) group identification leads to greater self-concept-based stereotype threat when individuals are in the process of acquiring unwanted stigmatized identities. During this process, performing in line with the stereotype is particularly threatening to the self-concept because it provides evidence of membership in the stigmatized group. This may be why younger-old adults are more prone to experiencing age-based stereotype threat about cognitive decline than older-old adults (Eich, et al., 2014; Hess & Hinson, 2006; Hess, et al., 2009).

In addition to describing the form(s) of threat experienced by older adults, the current review also suggests that the mechanisms underlying threat are not always age invariant. In general, stereotype threat effects are not expected to emerge until middle-childhood when people become aware of cultural stereotypes (McKown & Weinstein, 2003; but see Flore & Wicherts, 2015). However, even after stereotype threat effects emerge, they do not remain invariant across the life course. Although younger adults have not been shown to exhibit stereotype-threat effects due to their age (Hehman & Bugental, 2013), their other social identities can elicit threat and lead them to underperform. When this happens, their threat effects are best explained by Schmader, Johns, and Forbes' (2008) executive control interference integrated process model. This model proposes that for a variety of reasons (including changes in regulatory focus) there is a reduction in the availability of executive control resources under threat, and this in turn leads to performance impairments.

In contrast, because of age-related improvements in emotion regulation (Scheibe & Blanchard-Fields, 2009), older adults' stereotype threat effects do not appear to be caused by changes in executive control resources. Rather, for older adults stereotype threat effects are best explained by motivational changes in regulatory focus (Barber & Mather, 2013a; 2013b; Popham & Hess, 2015). Because of this stereotype threat should actually be beneficial to older adults if performance would benefit from a more cautious, error-free approach.

At first glance, the hypothesis that the same behavioral outcome (i.e., poor task performance resulting from a threat experience) can be caused by distinct mechanisms as a function of age seems counterintuitive. However, there are other phenomena in which the same operation is carried out by vastly different mechanisms (Marr, 1982), and mechanisms underlying behavior are sometimes age-specific. For example, people acquire languages in different ways before versus after the critical period (Lenneberg, Chomsky, & Marx, 1967).

More generally, the hypothesis that stereotype threat effects operate via distinct mechanism as a function of age calls attention to the need for increased diversity in the populations and domains that we study. As noted by Henrich, Heine, and Norenzayan (2010a; 2010b), the majority of the participants in psychology experiments are WEIRD – they are Western, educated, and from industrialized, rich, and democratic countries. They also tend to be younger adult students at American universities. Relying upon these WEIRD samples can be problematic since people, as a whole, are not WEIRD. As a result, lab findings with university-aged students do not always generalize to other populations. Similar to this, the current review shows that older adults' responses to age-based stereotype threat about cognitive decline are not identical to younger adults' responses to other commonly-studied

forms of threat. It is possible that this is not an isolated example; stereotype threat effects may vary in other less-studied populations as well. However, until we include individuals from a broader range of backgrounds and in more geographic locations, we will not be able to tell where theory has been overgeneralized.

In including a more diverse range of participants, greater emphasis also needs to be placed on understanding how multiple identities interact to affect experiences of stereotype threat. Although some research has addressed this in younger adults (e.g., Gonzalez, Blanton, & Williams, 2002; Gresky, Eyck, Lord, & McIntyre, 2005; Rydell, McConnell, & Beilock, 2009; Shih, Pittinsky, & Ambady, 1999), as of yet, this is an unstudied topic in older adults. However, peoples' experiences of aging and ageism depend upon their other identities. For example, there is a double-standard of aging such that “looking old” is viewed more harshly for women (e.g., Harris, 1994), and older women are at double jeopardy of being negatively judged based upon both their age and their gender (e.g., Granleese & Sayer, 2006). Looking beyond gender, there is more generally evidence that inequalities between groups become greater in old age. This is because over the course of the lifespan the advantaged groups have more opportunities to accumulate resources such as education, wages, and wealth (e.g., Crystal & Shea, 1990; Dannefer, 1987; 2003; DiPrete & Eirich, 2006; O'Rand, 1996; 2001). Cumulatively-disadvantaged individuals' life experiences of low social power may sensitize them to the evaluations of others (e.g., Fiske, 1993) and increase their attention to threat (Keltner, Gruenfeld, & Anderson, 2003). As a result, compared with more advantaged individuals, they may be more prone to experiencing age-based forms of stereotype threat.

In summary, “stereotype threat” is often thought of as a singular construct with age-invariant mechanisms. However, relying upon these overgeneralizations can lead to seemingly contradictory findings across populations and studied domains. The current review suggests that, using Shapiro and Neuberg's (2007) Multi-Threat Framework, we should actually think of “stereotype threat” as referring to distinct phenomenon that differ in eliciting conditions and moderators. By using this framework, researchers can be more specific about the form(s) of threat they are studying, and this will allow for more nuanced theory development. The current review also suggests that experiences of threat can affect behavior via distinct routes as a function of age. By identifying and further studying these differences we will be better equipped to intervene and improve performance for a wider-range of individuals.

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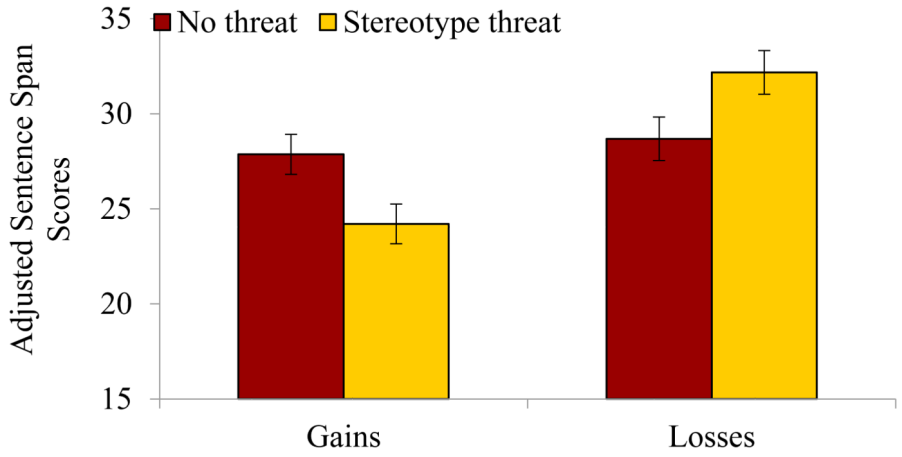

Figure 1.

Sentence span scores (adjusted for baseline performance) as a function of stereotype threat condition and task reward structure in Experiment 1A of Barber and Mather (2013b). Stereotype threat significantly impaired working memory performance when remembering led to monetary gains, but significantly improved performance when forgetting led to monetary losses. This pattern is consistent with the hypothesis that stereotype threat induces a prevention regulatory focus for older adults. Error bars represent the standard errors of the adjusted means.

Table 1

adapted from Shapiro (2012)

The qualitatively distinct forms of stereotype threats that make up the Multi-Threat Framework: These six core stereotype threats emerge from the intersection of two dimensions: the source of the stereotype threat and the target of the stereotype threat

		Target of the stereotype threat	
		Self (Personal Identity)	**Group (Social Identity)**
Source of the stereotype threat	**Self**	**Self-concept threat**: Concern that my behavior will confirm in my own mind that the negative stereotype is personally true of me.	**Group-concept threat:** Concern that my behavior will confirm in my own mind that the negative stereotype is true of my group.
	Other - outgroup member	**Own-reputation threat (outgroup):** Concern that my behavior will confirm in the minds of outgroup members, that the negative stereotype is personally true of me.	**Group-reputation threat (outgroup):** Concern that my behavior will confirm in the minds of outgroup members that the negative stereotype is true of my group.
	Other – in-group member	**Own-reputation threat (in-group):** Concern that my behavior will confirm in the minds of in-group members, that the negative stereotype is personally true of me.	**Group-reputation threat (in-group):** Concern that my behavior will confirm in the minds of in-group members, that the negative stereotype is true of our group.