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Extending the Stereotype Embodiment Model: A Targeted Review

Feargus Fawsitt
University College Cork

Annalisa Setti
University College Cork and Trinity College Dublin

Perceptions of aging (PoA) can negatively impact older adults in domains such as cognition, mobility and health. The stereotype embodiment model outlines how perceptions of aging are internalized over a lifetime and have consequences on health in later life. However, the mechanisms through which negative PoA produce their negative effects remains unclear. Recent literature on stereotype threat in older adults indicates inefficient resource allocation to the task at hand, highlighting regulatory focus and executive functioning as plausible mechanisms. In light of these findings, we propose a revised stereotype embodiment model to argue that these two mechanisms could also explain the detrimental effects of negative PoA. Specifically, we focus on evidence for working memory interference and sustained attention and we highlight directions for testing the role of these mechanisms.

What is the significance of this article for the general public?
This review aims to highlight the pathways through which negative views of aging become self-fulfilling prophecies. Additionally, it highlights areas which are of interest for future interventions in helping people age successfully and free from the consequences of negative stereotypes.

Keywords: perceptions of aging, stereotype threat, stereotype embodiment model, attention, regulatory focus

Older adults are generally viewed negatively in Western societies, with stereotypes such as older adults being considered forgetful, frail, deaf, and helpless. These views are adopted by people at every stage of life including children (Cuddy, Norton, & Fiske, 2005; Isaacs & Bearison, 1986) and older adults themselves. Over the life span these views, which are originally held against an out-group (the elderly by the young), start becoming applicable to the person holding them. Someone who spends their life thinking that older adults have poor memories eventually has to contend with the fact that in older age this stereotype also applies to them. Many older adults not only have to contend with this internalized ageism but also with the explicit negative beliefs and prejudices held by others. Older adults are reminded of these whenever they are implicitly evaluated in completing a task, for example trying to remember a fact or story in front of other people, or clinically when they are being evaluated by a clinician for cognitive decline.

Research shows that growing older while holding negative views on aging negatively impacts the individual's health and psychological well-being (Levy, 2009). Perceptions of Aging (PoA) are defined as the way people of any age view older adults and the aging process. This is distinct but related to self-perceptions of aging which is how people view their own aging process. These constructs are related but people's attitudes to themselves do not always match up with their general attitudes to aging (Levy,

Feargus Fawsitt, School of Applied Psychology, University College Cork; Annalisa Setti, School of Applied Psychology, University College Cork, and The Irish Longitudinal Study on Ageing, Trinity College Dublin.

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Correspondence concerning this article should be addressed to Feargus Fawsitt, School of Applied Psychology, University College Cork, Ireland. E-mail: feargus.fawsitt@ucc.ie

2008). Negative self-perceptions of aging occur when an individual views their own aging process negatively. This includes viewing their own mental and physical state as prone to age-related deterioration and believing they have little or no control over this decline. Negative self-perceptions of aging can be considered a form of internalized ageism whereby individuals hold negative PoA and see them as applicable to themselves (Levy, 2009). Ageism is harmful in a social sense, with older people being discriminated against, but the studies on negative PoA show that it also has negative, internally generated consequences for the discriminators as they become older adults.

It is difficult to quantify what portion of the population holds negative PoA, however considering the societal views of older people, it is likely to be a significant one, especially if we consider that the effect does not only hold for extreme cases. For example, in a study of 600+ participants, Levy, Slade, Kunkel, and Kasl, (2002) found that participants scoring below the median in their negative PoA test had a mean life expectancy 7.6 years shorter than those over the median, over a period of 22.6 years.

The effects of holding negative PoA are extensive. They impact health in that they predict cardiovascular events (Levy, Zonderman, Slade, & Ferrucci, 2009), biomarkers of Alzheimer's (Levy et al., 2016), and respiratory mortality (Levy & Myers, 2005). Importantly, PoA predicts longevity (Levy et al., 2002) and affects psychological well-being, with increased loneliness (Pikhartova, Bowling, & Victor, 2015), dependency (Coudin & Alexopoulos, 2010), and earlier onset and persistence of depression (Freeman et al., 2016). Behavioral factors are also influenced, such as engagement with health behaviors, including physical activity and diet (Beyer, Wolff, Warner, Schüz, & Wurm, 2015; Huy, Schneider, & Thiel, 2010; Levy & Myers, 2004). Also influenced is physical ability, such as functional health (Levy et al., 2002) and walking speed (Robertson, Savva, King-Kallimanis, & Kenny, 2015a).

Current theories of how negative PoA contribute to negative consequences of aging aim to establish a causal relationship between the two. Research has looked at the association between negative PoA before growing old and how these views are internalized and eventually become self-directed in old age. In particular, the stereotype embodiment model from Levy (2009) provides the foundation by which to define these factors and the pathways through which they act. The model indicates three main pathways: the physiological pathway, the behavioral pathway, and the psychological pathway.

The *physiological pathway* is related to physiological stress caused by considering the negative PoA as applicable to oneself. The *behavioral pathway*, which acts through changes in behaviors, such as not attending medical examinations because illness is considered as normal in older age by someone who views growing old negatively. Finally, the *psychological pathway* relates to the psychological mechanisms through which negative PoA and stereotype threat contribute to negative outcomes. For example, withdrawal and lack of effort in daily tasks. The stereotype embodiment model constitutes a framework to study negative PoA; however, it remains underspecified in regard to the mechanisms, cognitive and psychological, behind these pathways as research has progressed significantly as has our understanding of the area. In the present article, we focus specifically on these mechanisms proposing a revised version of the model which also aims to integrate the literature on stereotype threat as a part of the reinforcement of negative PoA.

The original definition of *stereotype threat* proposed that "stereotype threat is being at risk of confirming, as self-characteristic, a negative stereotype about one's group" (Steele & Aronson, 1995, p. 797). This definition was originally only applied to African Americans performance in tests of intellectual ability but has since been extended to other groups. These include older adults, who are affected in a number of domains including for example, memory and attention (Lamont, Swift, & Abrams, 2015; Meisner, 2012). Older adults tend to suffer self-concept threat (Barber, 2017; Shapiro & Neuberg, 2007) meaning that they tend to be worried about confirming the stereotypes to themselves rather than or in addition to how others view them, although these forms of threat aren't mutually exclusive. For example, an older adult performing a memory test might be worried about doing poorly as they would feel that it proves they are getting "old," as stereotypically older adults have poorer memory. Older people are afraid of performing in such a way that it would suggest they are actually "old." In fact, as

people age, they tend to move their estimates of what makes someone "old" away from their own age and older adults tend not to classify themselves as "old": This can be seen as a way to try to avoid applying the older age stereotypes to themselves while still worrying about confirming stereotypes and being seen as old by others (Taylor, Morin, Parker, Cohn, & Wang, 2009). When facing stereotype threat, they are reminded of potentially being "old" or that others might view them as old. For a fuller account of this kind of stereotype threat see Barber, (2017).

The literature distinguishes between implicit and explicit threat; explicit threat is associated with negative consequences when the individual embraces the stereotype and refers it to the self. It occurs when older adults are deliberately exposed to the idea that they are expected to perform more poorly due to their age. This form of threat is called explicit priming (Barber, Mather, & Gatz, 2015). Another way to induce stereotype threat is to use implicit cues, that is, implicit priming, such as flashing words too quickly for conscious recognition associated with negative or positive stereotypical connotations of older adults (Levy, 1996). The relevance of implicit threat outside of a lab setting has not been investigated in research in older adults to the best of our knowledge. This is one reason that research exploring explicit threat has had more attention in recent years (Meisner, 2012).

Implicit threat, different from explicit threat, appears to operate also on individuals for whom the stereotype is not relevant. Exposure to implicit stereotype threat causes even young adults to embody these stereotypes, including a slower walking speed and poorer memory (Dijksterhuis, Aarts, Bargh, & van Knippenberg, 2000; but see Levy, 1996; Hess, Hinson, & Statham, 2004; see also Wheeler & Petty, 2001 for a review and Barber & Mather, 2014 for a detailed description of age based stereotype threat).

According to the multi-threat framework (Shapiro & Neuberg, 2007), an individual must endorse a stereotype in order to be subjected to the "self-concept" stereotype threat. Following this model, an older adult who scores highly for negative PoA would be more susceptible to the explicit stereotype threat. Some research has shown that holding positive PoA has a protective effect against stereotype threat (Fernández-Ballesteros, Bustillos, & Huici, 2015). However, implicit threat could also operate in older adults, even those who do not hold very strong negative ideas on their own aging. We will focus on the mechanisms underlying explicit threat (explicit priming) literature as its consequences in nonlab settings are clearer (Barber et al., 2015). The negative impact of implicit threat should still be taken into account however as it adds to our picture of the effects of stereotype threat on older adults.

On the basis of this association between negative PoA and susceptibility to stereotype threat, the revision of the stereotype embodiment model we propose is based on this emerging literature on stereotype threat in older adults. The literature indicates that lack of executive control, including interference in working memory (Lamont et al., 2015), poor sustained attention and difficulty in maintaining focus, and a mismatch between task requirements and individual attitude toward the task (Barber & Mather, 2013) are plausible mechanisms that lead to negative consequences of stereotype threat and to negative consequences of negative PoA.

In this revised model, we focus on the psychological pathway and we highlight the plausible mechanisms linking negative PoA with poor behavioral outcomes that are based on the literature on stereotype threat. As a consequence, we propose that the behavioral pathway is not standalone but should be better conceived as a consequence of the physiological and psychological/cognitive pathway. However, we recognize that behavior could in turn have profound psychological effects. For this reason, we propose that this is a loop where negative PoA are associated with poorer executive control and task engagement and consequently, negative behavioral outcomes, which, in turn, feed more negative PoA and further negative psychological consequences. In the original model, the psychological pathway was the effect of stereotype threat on performance, with exposure to negative stereotypes leading to poorer performance. The revised model is presented in Figure 1. In the next sessions we first review the relevant literature on stereotype threat in older adults and then detail the revised model we propose. Finally, directions for future research are discussed.

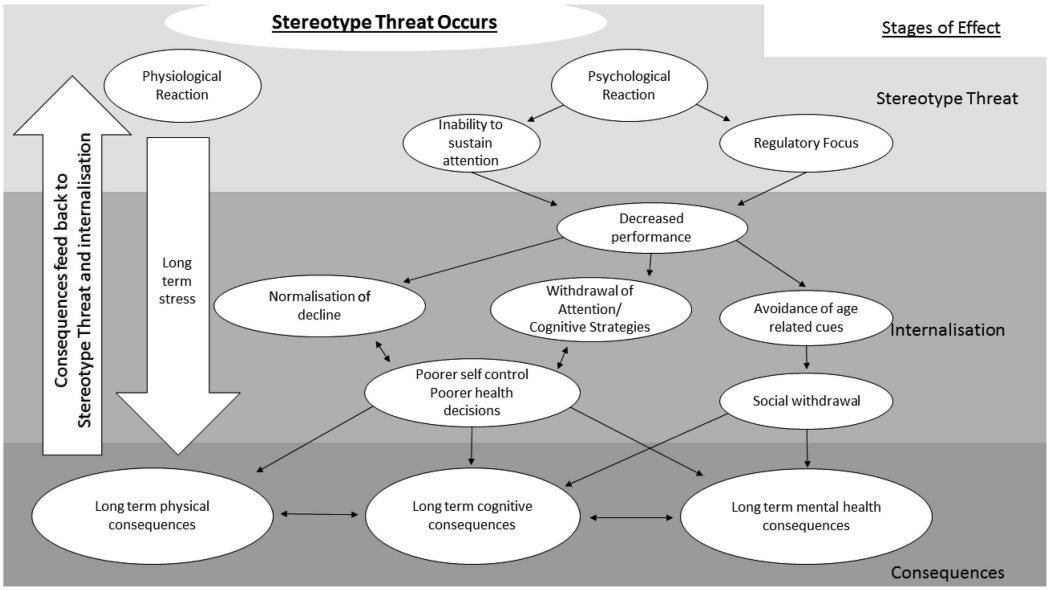

Figure 1. Revised stereotype embodiment model. This figure illustrates the pathways through which stereotype threat leads to long term consequences of negative perceptions of aging (PoA).

Stereotype Threat in Older Adults

Emotional regulation, stress/arousal, withdrawal of effort, regulatory focus, and narrowing of attention have been proposed as mechanisms for stereotype threat to act on behavior (Grimm, Markman, Maddox, & Baldwin, 2009; Inzlicht & Kang, 2010; Johns, Inzlicht, & Schmader, 2008; Osborne & Walker, 2006). Stereotype threat spillover has also been shown, which causes even domains not directly stereotyped to be negatively impacted (Beilock, Rydell, & McConnell, 2007), for example handwriting in older adults Levy (2012).

As well as a decrease in performance, stereotypes are associated with a reduction in self-efficacy (Desrichard & Köpetz, 2005), will to live (Levy, Ashman, & Dror, 1999), and an increase of arousal/physiological stress (Levy, Hausdorff, Hencke, & Wei, 2000; although see Hess, Hinson, & Hodges, 2009 for different results).

Schmader, Johns, and Forbes (2008) propose executive control interference as a cause of the negative effects of stereotype threat. Executive control is the ability of an individual to control and sustain attention, avoiding attentional lapses and mind wandering in a task (Diamond, 2013). In Schmader et al. (2008) model, executive control deficits are associated with working memory interference. Working memory is a multicomponent system with a limited capacity that stores and processes information short term (Baddeley, 2002). In essence, the threatening situation leads to exhausting working memory capacity, for example due to increased mind wandering. Mind wandering is likely to occur under threat (Mrazek et al., 2011).

Although mind wandering under threat has not been examined specifically in older adults yet, it has been shown that older adults tend to have more task interference when they mind wander (Zavagnin, Borella, & De Beni, 2014), despite experiencing less mind wandering than younger adults. Older adults also experience more negative thoughts associated with mind wandering even if not under stereotype threat, which could be potentially associated with negative consequences under stereotype threat. It is also important to distinguish between sustained attention and mind wandering as they are related. Lapses in sustained attention may lead to instances of mind wandering but mind wander-

ing is not necessarily a consequence of a lapse in sustained attention; importantly, mind wandering can be qualified by the nature of mind wandering events. The content of mind wandering is also important. Mind wandering is when thoughts unrelated to the completion of a task interrupt, while sustained attention is the ability to focus on a task or stimulus (Christoff, Irving, Fox, Spreng, & Andrews-Hanna, 2016).

The distinction between task-related and task-unrelated mind wandering is important because previous studies have shown their differential effects on performance. Task-related mind wandering occurs when thoughts relate to the task but do not help performance ("I don't think I can do this" or "I wonder if I should be doing this differently"). Conversely, task-unrelated mind wandering pertains to a completely different context, for example "What am I going to make for dinner?" Mind wandering is not always negative and can actually improve performance on creative tasks but doesn't appear to be beneficial in more controlled cognitive tasks (Mooneyham & Schooler, 2013). Older adults also tend to experience more task interference as their mind wandering tends to be task related (McVay, Meier, Touron, & Kane, 2013).

A well supported cause of poor performance under stereotype threat is a lack of regulatory fit, which plays a large role in stereotype threat in older adults (Gaillard, Desmette, & Keller, 2011). Regulatory focus theory pertains to goal pursuit strategies. Individuals use either a promotion-focused or a prevention-focused strategy when performing a task (Higgins, 2000). A *promotion focus* means an individual is oriented toward making gains, such as getting a high mark on an exam. A *prevention focus* means an individual is more concerned with avoiding a particular outcome, such as failing an exam. This can lead to more cautious behavior. For example, in cognitive tests, a promotion focus can lead to a decrease in response time, whereas a prevention focus can lead to an increase in response time as individuals are more focused on avoiding a wrong answer. When an individual adopts a promotion-focused strategy and performs a task with instructions that encourage this, that is, when the regulatory focus meets the demands of the task, there is regulatory fit. When the strategy and the task do not match, there is a regulatory mismatch. Regulatory mismatch results in poorer performance on tasks.

There is evidence to suggest, from work with other groups and older adults, that stereotype threat induces the adoption of a prevention strategy in individuals. This leads to underperformance in promotion-focused tasks (Barber et al., 2015; Gaillard et al., 2011). Older adults seem predisposed to a more prevention-focused orientation, and stereotype threat manipulations can exacerbate this (Barber et al., 2015) to the detriment of performance in promotion-focused tasks. Grimm et al. (2009) argued that most cognitive tasks are promotion-focused and individuals under stereotype threat adopt a prevention focus. Therefore, older adults, adopting a prevention focus, would be disadvantaged in performing gain-based tasks. For example, older adults might be too cautious in decision making and perform worse on tests for dementia in clinical settings. This is supported by the impact of stereotype threat on performance in tests of dementia (Barber et al., 2015).

We propose that stereotype threat is a potential antecedent for negative PoA, whereby from being subjected to threatening situations, the threat becomes chronic when the aging individual sees the negatives views of aging as applicable to oneself. In addition, negative PoA can be a catalyst for negative effects of stereotype threat, based on the multi-threat model (Shapiro & Neuberg, 2007).

In the present revised version of the stereotype embodiment model (Levy, 2009), we use the previously summarized evidence to specify the mechanisms operating in the psychological pathway.

The Psychological Pathway Revised

On the basis of the stereotype threat literature, the revised model proposes that executive dysfunction and a lack of regulatory fit are the two main causes of cognitive and physical deficits associated with negative PoA (see Figure 1). Executive dysfunction is in line with the original stereotype embodiment model (Levy, 2009), which indicated withdrawal of effort as a potential cause of negative consequences of negative PoA. However, withdrawal of effort, in the original model, remains a generic term. Here we specify potential processes associated with executive dysfunction.

The first potential mechanism is working memory interference. In the case of negative

PoA, the older individual may use working memory capacity to process task-irrelevant thoughts. If older individuals devote part of their cognitive effort to task-irrelevant negative ideas about aging and themselves, that is, task-irrelevant mind wandering, they would have fewer resources to devote to the task at hand. This would lead to working memory interference and to working memory load. This condition could become a chronic effect in individuals with negative PoA, especially if we consider that in our society we are frequently exposed to age-related stereotypes (Donlon, Ashman, & Levy, 2005).

Alternatively, older adults may suffer from excessive task-related mind wandering (Zavagnin et al., 2014) thinking too much about how to approach the task at hand and eventually adopt overly conservative strategies (Gaillard et al., 2011). Research is needed on whether older adults may suffer from task-related working memory overload, not as much harboring negative or irrelevant thoughts. For example, trying to reflect excessively on the task at hand, which can affect performance negatively especially in familiar tasks such as gait (a person's manner of walking), which present a high level of automaticity (Mazerolle, Regner, Morisset, Rigalleau, & Huguet, 2012; Robertson et al., 2015a). This kind of task-related working memory disruption has been shown to affect performance in other populations, for example in athletes (Beilock & Gray, 2012; Beilock, Jellison, Rydell, McConnell, & Carr, 2006).

More research is needed to understand what kind of mind wandering is associated with negative PoA and whether there is a difference between age-related or not-age related mind wandering in how performance is affected. This could be tested first by assessing the working memory capacity under threat in older adults in conjunction with self-reported mind wandering. One may expect the strongest effects of threat in tasks loading heavily on working memory (e.g., N-Back), whereas tasks that can be resolved with little working memory load, such as exogenous attention tasks or speed of processing (e.g., choice response time tasks) should show a milder effect. However, some evidence suggests that performance under stereotype threat in older adults in the digit span task is not impacted (Hess et al., 2009), possibly because the task is not sufficiently challenging. It should be noted that effects of negative PoA are present in tasks with low working memory impact, such as auditory thresholds and therefore further research is needed on this matter.

The effect of negative PoA on psychophysical tasks such as visual assessment and hearing thresholds (Levy, Slade, & Gill, 2006) may be better explained by another cognitive deficit potentially present in individuals with negative PoA: sustained attention. Poor sustained attention could include disengagement from the task and/or difficulty in keeping a sufficient level of alertness and task engagement as suggested by work of Langer, Djikic, Pirson, Madenci, and Donohue (2010). Preliminary findings support a correlation between sustained attention performance, assessed by the sustained attention to response time task (Robertson, Manly, Andrade, Baddeley, & Yiend, 1997) and negative PoA, as well as poor sensory integration over time and negative PoA (Fawsitt, Setti, & Cassarino, 2015) A correlation between poorer sustained attention and more negative PoA has also been found cross-sectionally in a larger national study (Robertson & Kenny, 2015). In addition, executive functions decline (assessed by verbal fluency) is associated with negative PoA. In this large longitudinal study, verbal fluency decline was associated with negative PoA at 2-years follow-up (Robertson, King-Kallimanis, & Kenny, 2015).

Indirect support of the sustained attention hypothesis can be found in the evidence that negative effects of negative PoA can be counteracted by helping the individual to engage in the task and pay attention by adopting positive priming (Langer et al., 2010). In the Langer et al. (2010) study, adult participants were encouraged to believe they had better vision by impersonating the role of a group characterized by excellent vision (pilots and in the second study athletes). Similar results were achieved in a second experiment where individuals were primed to read smaller writing on an eye chart by reversing the direction of the change in size (starting small at the top and becoming larger at the bottom). The results from all three experiments showed that participants' scores in eye tests could be improved using these techniques.

Although not yet studied in the PoA literature, another mechanism potentially related to withdrawal of effort is susceptibility to external distraction. While mind wandering is an internal

source of distraction, it is also possible that older adults with negative PoA do not focus attention sufficiently well, being more subjected to distraction induced by irrelevant stimuli in the environment. There is evidence of the effect of stereotype threat on older adults' attention performance (Lambert et al., 2015). We can expect that other components of the attention system may be affected (Petersen & Posner, 2012). However, to our knowledge, no study tests specifically the effect of negative PoA on selective attention tasks. It is important to distinguish between different forms of attention as it is a multicomponent construct (Sarter, Givens, & Bruno, 2001). Complementarily, lower inhibition capacities characterizing older adults (Hasher, Stoltzfus, Zacks, & Rypma, 1991) may be exacerbated by negative PoA.

Empirical evidence explicitly assessing whether working memory interference/overload or task disengagement (poor sustained attention/alertness) or poor selective attention or inhibition are at the grounds of the effect of negative PoA on performance is lacking. These alternative hypotheses need to be tested empirically in future studies. It is possible that working memory interference or overload may be at play when the threat is explicit, while failure in sustaining attention and task monitoring may be the mechanism underlying the effect of negative PoA when not under threat (Robertson et al., 2015), further research is needed on this topic.

In regulatory focus theory (Higgins, 2000) older adults use a prevention-focused strategy while under stereotype threat (Barber, 2017; Barber & Mather, 2013). This can either enhance or impair performance depending on whether the task performed matches or whether it calls on skills that are impaired by a particular strategy; for example, creativity is hampered by adopting a prevention focus (Baas, De Dreu, & Nijstad, 2008). Prevention focus could characterize individuals with negative PoA so that they become conservative and try to avoid losses. This in turn may impair performance when the task is oriented to gains (Barber, 2017). Although strong evidence supports this hypothesis for older adults under stereotype threat, to our knowledge no studies have specifically considered negative PoA in relation to it. As susceptibility to self-concept threat is endorsing the stereotype and fear of confirming it to yourself, this is an important link in the research that has not yet been explored.

In sum, we propose that withdrawal of effort, as indicated in the stereotype embodiment model (Levy, 2009) can be further specified by two mechanisms: executive dysfunction and regulatory mismatch. Within executive dysfunction, several specific processes are hypothesized as potential causes of deficits, chiefly working memory interference, and sustained attention. Lapses in sustained attention may lead to poor task performance, therefore confirming the stereotypes and feeding negative PoA. Within working memory interference, one can hypothesize task-irrelevant mind wandering or task-related mind wandering as potential causes. Although task-irrelevant mind wandering is in line with the idea of withdrawal of effort, task-related mind wandering appears linked to an excessive engagement in the task and fear of failure. This is in turn linked with the regulatory focus hypothesis, whereby older adults under threat become more conservative and try to avoid losses, which could apply also to individuals with negative PoA when not under threat.

Behavioral Consequences

As depicted in Figure 1, executive dysfunction and regulatory mismatch then lead to poor performance and lowered self-efficacy, which is, in turn, associated with normalization of decline and poor health decisions. Older adults with negative PoA can see the negative consequences of aging as inevitable compared with older adults with more positive views (Sargent-Cox & Anstey, 2015). As people grow older they expect a decline in health, in perceptual abilities, in mental faculties, and even in the ability to complete daily tasks (Kite, Stockdale, Whitley, & Johnson, 2005; Sarkisian et al., 2001). These changes seem inevitable to people and this can lead people to considering any change associated with old age as unavoidable (Williamson & Fried, 1996), this mechanism is referred to as normalization of decline. Normalization of decline may also lead to overreliance on other people. In turn, being over cared for leads to a decline in self-efficacy as well as performance in older adults (Avorn & Langer, 1982). Although it is possible that older adults who make poor health decisions

due to poor PoA may benefit from letting caring others make more decisions for them, this will increase their dependency and their lack of self-efficacy, which are in turn related to poor health (Solomon, 1990). Not taking part in decision making encourages dependence, initially in health decisions but increasingly in different areas. This is most evident in institutions where learned helplessness can negatively impact on patient's health (Langer & Rodin, 1976).

Normalization of decline is linked with behavioral consequences. Older adults with negative PoA are less likely to engage in health seeking behaviors (Sarkisian, Hays, & Mangione, 2002). For example, older adults with negative PoA are less likely to engage in behaviors that promote cardiovascular health such as exercise and a healthy diet (Emile, Chalabaev, Stephan, Corrion, & d'Arripe-Longueville, 2014; Levy & Myers, 2004) and are less likely to attend check-ups or investigate symptoms via doctor visits (Sarkisian et al., 2002). This normalization of decline leads to a vicious cycle where individuals who do not engage in heart healthy behaviors will have more heart problems and will be less likely to act on them (Huy et al., 2010), and this effect snowballs into negative health consequences. It should be noted however, that normalization of decline is not a necessary consequence of negative PoA. Some individuals are more resilient to these stereotypes and refuse to consider their personal declines normal but can still hold negative PoA (Levy, 2008). This could also make those older adults more susceptible to self-concept stereotype threat. The elucidation of this dissociation in future studies would be useful to clarify to what extent normalization of decline is an avoidable consequence of negative PoA.

In the present revised model, we propose that the behavioral pathway is better represented as a continuation of the psychological pathway, with effects like poor health decisions and avoidance behaviors accumulating to result in major negative consequences. These consequences are then seen in the longitudinal research (Kotter-Grühn, Kleinspehn-Ammerlahn, Gerstorf, & Smith, 2009; Levy et al., 2002; Sargent-Cox, Anstey, & Luszcz, 2014).

Conclusion

In the present article, we propose a revision of the stereotype embodiment model (Levy, 2009) that integrates the findings from the literature on stereotype threat. The original model, while providing a framework for research in the field of negative PoA, needs to be further specified in relation to the cognitive and psychological mechanisms at play. The original model focused on how older adults internalize negative PoA and gave an outline for how negative PoA create negative consequences using three pathways. The psychological pathway dealt with how expectations shaped outcomes through stereotype matching. The behavioral pathway illustrated how poorer expectations for aging led to less engagement with health behaviors. Finally, the physiological pathway showed how the biological stress response often caused by stereotype threat and negative PoA can lead to poorer health outcomes. Continued and prolonged stress contributes to health problems.

Our adaption to the pathways used by the stereotype embodiment model help clarify the mechanisms used and point toward avenues for intervention. We highlighted evidence for two main mechanisms potentially leading to the cascade of negative consequences of negative PoA. First explaining the short term impact of stereotype threat. We focused particularly on the Psychological pathway and the cognitive processes underlying it.

The psychological pathway is characterized by the cognitive impact of stereotype threat, specifically working memory interference, as shown by poorer performance under threat in tasks relying on working memory (Ferris, 2013). Attention is also impacted, with difficulty in maintaining focus (Lambert et al., 2015) and, possibly, difficulty in inhibiting irrelevant stimuli. In parallel, a more conservative regulatory focus can lead the older individual to become more prevention focused, therefore performing poorly when the task focus is on promotion (regulatory mismatch; Gaillard et al., 2011). Decreased self-efficacy can also lead older adults to increase their dependence on care when exposed to negative PoA (Coudin & Alexopoulos, 2010).

These psychological processes lead to poorer performance. Poorer performance is in turn associated with further withdrawal of effort (Strough,

de Bruin, & Peters, 2015) and normalization of decline. Normalization of decline with aging is potentially associated with poorer health choices in older adults (Huy et al., 2010; Sarkisian et al., 2002). Research suggests that negative PoA are correlated with future loneliness and isolation (Pikhartova et al., 2015). The short-term effect on performance by stereotype threat, as well as the effect of stereotype threat on self-appraisal (Barber & Lee, 2015) could lead older adults to avoid "threatening" social situations although more research is needed to understand this link. Social withdrawal and poor health choices potentially are associated with long term poorer physical, cognitive and mental health feeding the negative cycle of poor performance, withdrawal of effort and poor self-efficacy (see Figure 1).

This shows how the short term stereotype threat or psychological pathway leads into the long term behavioral changes, which, in turn, feed into the negative mechanisms illustrated in the psychological pathway. This model lays out testable hypotheses for future PoA and stereotype threat research. Research testing this model then gives clear directions for interventions to be more targeted as the area has suffered from a lack of successful interventions. These interventions could be based on training sustained attention, changing default regulatory fit in older adults, and integrating these approaches into interventions that have shown promise already.

There are still many unanswered questions around negative PoA. The links between threat, short term negative consequences of threatening situations and internalization of negative PoA needs to be clarified. In addition, long term cognitive effects have only started to be analyzed (Robertson et al., 2015) as well as neural correlates of withdrawal of attention in older individuals with negative PoA. Longitudinal studies, such as The Irish Longitudinal Study on Aging (Donoghue et al., 2014), that include a wide range of psychological and cognitive measures, and measures of negative PoA will allow to provide prevalence data and longitudinal data on the negative impacts of negative PoA. The mediating role of factors such as educational attainment (Lindsay et al., 2002) or social networks (Fratiglioni, Paillard-Borg, & Winblad, 2004; Seeman, Lusignolo, Albert, & Berkman, 2001) also deserve further investigation in light of their role in cognitive decline.

The model proposed here contributes in specifying the cognitive and psychological processes through which negative PoA may act on the individual to produce negative outcomes. This in turn can inform remediation strategies as well as interventions. Researchers have had some success in short term interventions (Donlon et al., 2005; Levy et al., 2000a) operating on modifying the negative views of older adults, however a more precise definition of the cognitive mechanisms operating opens the possibility to utilize cognitive training as remediation or compensation, especially in individuals more resilient to change their negative views. Potentially, providing older adults with cognitive strategies to better focus and regulate their attention may allow them to better stay 'on task,' with positive consequences on performance. This could in turn contribute to instigate a virtuous cycle, including resilience to threat and, possibly, reduction of negative PoA. Considering that stereotype threat encourages a loss-prevention focus, which is associated with poorer self-efficacy (Tudoran, Scholderer, & Brunsø, 2012), more research is needed on the specific links among stereotype threat in older adults, decision making, and regulatory focus and its real-world implications, such as financial and health decision making.

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