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Using a sample of 131 adults aged 55 to 70 years, researchers employed a 2 x 2 between-subject design to investigate whether cognitive prompts would counteract the negative effect of stereotype threat on older adults' training outcomes. As hypothesized, stereotype threat negatively affected training outcomes. Contrary to expectations, cognitive prompts also negatively affected training outcomes, worsening the negative impact of stereotype threat. Results are discussed within the framework of cognitive load theory.

INTRODUCTION

Training Older Workers is Increasingly Important for the Success of American Businesses

Training older workers is becoming an increasingly important necessity for American businesses. According to the Bureau of Labor Statistics (BLS), in 2014 there were over 32 million workers aged 55 and over employed in the American workforce (U. S. Department of Labor, 2015). The BLS projects that by 2022, 67.5% of all Americans aged 55-64 and almost a quarter (23%) of all individuals aged 65 and over will be involved in the workforce (U.S. Department of Labor, 2013). In addition, workers aged 55 and over represent the only age group in the American workforce projected to have a positive annual growth rate between 2012 and 2022 (U.S. Department of Labor, 2013). As older workers become a larger portion of the workforce, American businesses will want to tap the special talents, extensive knowledge, and relevant experience of older workers in order to stay competitive. Because many older workers plan on finding new jobs or careers, understanding the unique challenges of training older workers is an especially important area of research (Alley & Crimmins, 2007; Kubeck, Delp, Haslett, & McDaniel, 1996; Maurer, Barbeite, Weiss, & Lippstreu, 2008).

Older Workers Are Often Stereotyped as Less Trainable

Despite the importance of training older workers, they are often stereotyped as having difficulty learning and remembering new information. The belief that age leads to cognitive decline is ubiquitous in Western samples (Hertzog & Hultsch, 2000). Results from several lines of research show that older adults are stereotyped as less intelligent than younger adults and less competent at job-related tasks (Cuddy &

Fiske, 2002; Posthuma & Campion, 2009). While there are different age stereotypes for different jobs (Perry, Kulik, & Bourhis, 1996), a large sample of personnel managers from a wide range of job sectors expressed the belief that older workers are more suited to jobs that are less cognitively demanding (Warr & Pennington, 1994). Research shows that, although middle-aged and elderly people have more complex age stereotypes than younger participants, all three groups hold negative stereotypes about older adults' cognitive ability, including viewing them as "forgetful," "slow thinking," "incompetent," and "senile" (Hummert, Garstka, Shaner, & Strahm, 1994; Posthuma & Campion, 2009). Similarly, a diverse sample of senior workers endorsed stereotypical beliefs about older adults' mental impairment, and these beliefs significantly correlated with self-concept, interest in learning, and attitudes about retirement (Maurer et al., 2008). Taken together, this research shows that older workers are perceived as less interested in and capable of meaningful workplace development (Finkelstein, 2015).

Negative Stereotypes about Older Workers' Trainability Impacts Their Training Performance

These stereotypes about older workers' cognitive ability can negatively affect training opportunities provided to older adults (Warr, 1993; Warr & Birdi, 1998), as well as their performance in training (e.g., Hess, Auman, Colcombe & Rahhal, 2003). Specifically, they can negatively impact their training performance through the phenomenon of stereotype threat. Stereotype threat occurs when people feel that, through their own behavior, they are at risk of confirming a negative stereotype about a group to which they belong (Steele & Aronson, 1995).

Research provides evidence for the negative effect of stereotype threat on a broad array of social groups performing a variety of tasks (Spencer, Logel, & Davies, 2016). When stereotypes about African-Americans' poor academic performance are made salient to Black students, for example, their scores on scholastic tests suffer (Steele & Aronson, 1995). The same is true in regard to women and math performance (Spencer, Steele, & Quinn, 1999) and Whites and athletic feats (Stone, Lynch, Sjomeling, & Darley, 1999).

Because older workers are stereotyped as having problems with learning and memory, they are susceptible to stereotype threat on any cognitively demanding task. Although we were unable to find any studies researching the impact of stereotype threat on older workers' performance specifically on training tasks, there is ample evidence that stereotype threat negatively impacts older adults' performance on various cognitive and memory tasks, which are similar to training tasks (Cox, 2014).

For example, Hess et al. (2003) tested the memory performance of 28 older adults (M_{age}=70.8 years) and 28 younger adults (M_{age}=19.3 years). Before performing a free-recall task, negative older-adult stereotypes were activated by informing participants of recent research that either confirmed (stereotype threat condition) or contradicted (no stereotype threat condition) the traditional view that memory performance decreases with age. A control condition was given no information about memory performance and age. A significant main effect was found for age, with younger adults outperforming older adults in every condition. More importantly, a main effect was also found for threat within the older participant group: older adults in the stereotype threat condition performed significantly worse than older adults in no stereotype threat condition.

Similarly, Rahhal, Hasher, and Colcombe (2001) induced stereotype threat by emphasizing the importance of memory when teaching younger (M_{age} = 19.5) and older (M_{age} = 69.4 years) adults 60 pieces of trivia. Younger participants performed significantly better than older adults when tested on the accuracy of each piece of trivia, but only when the memory component of the task was emphasized in the instructions. When the memory component of the task was not emphasized in the instructions, age group differences in performance were non-significant.

Although research shows that stereotype threat can negatively impact performance on memory tasks in general, as of yet this research has not extended these findings specifically to the impact of stereotype threat on older adults' training performance (Cox, 2014). Therefore, one goal of this study is to contribute to the organizational psychology literature by testing the impact of stereotype threat specifically on older adults' training performance. We wanted to create a task that required participants to respond in ways other than recall of lists of words.

Accordingly, we hypothesize that:

H1: Stereotype threat will negatively impact older adults' performance on a training task.

Stereotype Threat Negatively Impacts Performance by Pilfering Cognitive Resources Away from Task Completion

Some researchers hypothesize that stereotype threat negatively impacts performance by usurping working memory resources away from task performance and towards intrusive thoughts stemming from anxiety concerning confirming the negative stereotype (Cadinu, Maass, Rosabianca, & Kesner, 2005).

Empirical data support this proposition. For example, women exposed to a negative stereotype about women's math ability performed more poorly than a control group on a math test (Schmader & Johns, 2003). Interestingly, however, the female participants exposed to stereotype threat also showed reduced working memory capacity, and reduced working memory capacity mediated the effect of stereotype threat on performance, implying that exposure to stereotype threat reduces working memory capacity which in turn harms performance (Schamder & Johns, 2003).

In another study, both psychology and hard science students completed a purported intelligence test. Prior to the testing, the psychology students were exposed to the stereotype that they are less intelligent than their hard science cohorts. Those psychology students exposed to this stereotype performed more poorly than a control group on the intelligence test, while showing higher heart rate variability (a measure that significantly correlates with mental workload; Croizet et al., 2004). The authors interpret the findings as evidence that stereotype threat drains mental resources that otherwise could be applied to performance. Thus, there is evidence that stereotype threat negatively impacts performance by pilfering working memory capacity away from the stereotyped task that is being performed.

Cognitive Load Theory Explains the Impact of Stereotype Threat on Performance

Cognitive load theory (CLT; Sweller, 1988) offers a framework with which to understand the negative impact of stereotype threat on performance. Cognitive load theory postulates how training can be designed to maximize effective usage of trainees' cognitive capacity. CLT states that the goal of training is for trainees to construct cognitive schemas in working memory and transfer them to long-term memory (Paas, van Gog, & Sweller, 2010). Schemas are defined as cognitive constructs that incorporate interacting pieces of information into a single functional unit (Paas, Renkl, & Sweller, 2003). Schema development is limited by working memory, a temporary store of information that includes everything we are consciously experiencing (Paas et al., 2003). Working memory is severely limited in both capacity and duration (Paas et al., 2010).

In the context of CLT, the amount of information that can be processed at any given time in working memory is referred to as cognitive capacity (Paas et al., 2010). Training creates load on this cognitive capacity. According to CLT, there are three distinct types of cognitive load (Paas et al., 2010). *Intrinsic load* is the load inherent to developing a certain schema, and is determined by the complexity of the interacting elements of that schema; e.g., the inherent difficulty of the training content. *Germane load* is load that is utilized to develop schema within working memory. *Extraneous load* is any load placed upon the trainee that is unnecessary for schema acquisition, e.g., through poorly designed training interfaces. For training to be effective, it should be designed to maximize germane load and minimize extraneous load in order to facilitate schema acquisition.

Applying CLT to stereotype threat, we can conceptualize stereotype threat as a form of extraneous load. That is, stereotype threat causes anxiety and increases extraneous load, and thus decreases the amount of cognitive capacity available for germane load and schema acquisition, impeding schema acquisition and thus training performance. The negative impact of stereotype threat, then, might be mitigated by an intervention designed to increase germane load to facilitate schema acquisition. That is, by increasing germane load, the cognitive prompts will increase cognitive resources related directly to schema acquisition, offsetting the cognitive capacity pilfered away by the extraneous load caused by stereotype threat.

Cognitive Prompts Offer a Potential Solution to the Negative Effects of Stereotype Threat

We believe that one solution to the negative effects of stereotype threat would be to increase germane load. One way to do so is to insert cognitive prompts into the training interface. Cognitive prompts are questions that, while not providing any new substantive information about training material, encourage trainees to focus on relevant information, by asking, for example, "Which examples can you think of that illustrate, confirm, or conflict with the learning contents?" or "Which main points have I already understood well?" (Berthold, Nückles, & Renkl, 2007). Cognitive prompts do not add intrinsic load; they are incidental to the training content. Nor should they add extraneous load as they are not intended to increase learner effort unrelated to training content. Instead, they increase germane load by facilitating processing of training content.

Cognitive prompts are effective at increasing training outcomes. For example, in a study conducted by Berthold, Nückles, and Renkl (2007), undergraduate students were shown a 45-minute video on developmental psychology and then given a writing task with or without prompts. Participants in the prompts condition performed significantly better on the writing task than those in the no prompt condition. Similarly, using a sample of working adults, Sitzmann, Bell, Kraiger, and Kanar (2009) tested the effects of periodic prompts inserted into a three hour online training course designed to train participants on how to use Blackboard, a type of classroom management software. Participants in the prompts condition performed significantly better on training assessments than those in the no prompts condition. Because the inclusion of cognitive prompts should facilitate learning, we hypothesize:

> *H2: Older adults will show superior training outcomes when the training interface includes cognitive prompts.*

While research shows that cognitive prompts should help improvement performance in general, we believe cognitive prompts will specifically help to overcome the negative effect of stereotype threat by increasing germane load and thus schema development, buffering the negative impact of the cognitive resources usurped by stereotype threat. Accordingly, we hypothesize:

> *H3: Cognitive prompts will moderate the effect of stereotype threat on training performance.*

METHOD

Sample

The sample consisted of 131 individuals aged 55 to 70 years. Fifty-five was chosen as the lower cutoff point because age related cognitive declines should be noticeable in most of the population by age 55 (Park & Payer, 2006). Seventy was chosen as the upper cutoff point to minimize the number of participants suffering from dementia (Kawas, Gray, Brookmeyer, Frozard, Zonderman, 2000). Participants in the sample had a mean age of 59.7 years (*SD* = 4.3) and the majority of them were employed (64.9%) or retired (26.7%).

Recruitment

Participants were recruited through several methods, including recruiting older relatives of introductory psychology students, sharing recruitment materials with senior centers across the United States, and posting recruitment materials on message boards likely to be frequented by older adults (e.g., AARP).

Materials

Training

The training presentation consisted of a six-minute narrated, animated video describing the basic principles of how a four-stroke, internal combustion engine functions. The video was embedded in an online survey (Qualtrics) that included all demographic and training outcome questions, as well. This

presentation, though of different subject matter, was designed to be as si milar as p ossible to training materials used in previous research on m ultimedia training (e.g., Mayer, Heiser, & Lonn, 2001). The training task differed from stimuli in prior training stimuli used in age-stereotype threat studies (Hess et al. 2003; Rahhal et al., 2001) in that it used multimedia delivery (sound, picture, animation) and it required participants to learn how an actual system works, rather than simply memorizing a list of words.

Prior Knowledge

Before beginning training, participants were asked to indicate, on a scale of 1-5 (1 indicating no prior knowledge and 5 indicating extensive prior knowledge), their understanding of how a four-stroke, internal combustion engine functions. Single item measures of prior knowledge have been shown to correlate highly with multiple-item measures of the same knowledge, and are easier than multiple item measures to administer and to complete (Towler et al., 2008).

Stereotype Threat

For the stereotype threat group, the training began with a brief description of the experiment designed to activate stereotype threat by presenting scientific evidence supporting common stereotypes that older workers are more difficult to train, accompanied by pictures depicting older adults in a stereotyped fashion (e.g., in wheelchairs). The no stereotype threat condition received a d escription of the study designed to minimize threat activation by presenting evidence contrary to common stereotypes about older workers' training ability, accompanied by pictures depicting older adults in an astereotypical fashion (e.g., involved in healthy outdoor activities). These materials were adopted from previous studies that successfully initiated stereotype threat in participants (e.g., Hess et al., 2003; Hess, Emory, & Queen, 2009; Nguyen & Ryan, 2008).

Cognitive Prompts

For the cognitive prompt group, slides encouraging participants to utilize cognitive load for processing training materials (e.g., "which are the main points in your opinion?") were presented for 30 seconds within the training presentation. These prompts were adapted from previous studies that successfully used cognitive prompts to increase training performance (e.g., Berthold et al., 2007).

The no cognitive prompt control group was presented with slides located in the same place during the presentation, however the slides simply said, "Please wait for the presentation to continue" and remained for the same duration as did the cognitive prompts.

Training Outcomes

Participants' training performance was assessed using six questions assessing knowledge presented in the training. Each question was wo rth one to three points, which participants received for referencing specific information within the training.

Procedure

Once recruited, participants followed a l ink to a website (qualtrics.com) to access the training presentation and experimental materials. Upon arrival at the website they were randomly assigned to one of four conditions: no stereotype threat/ no cognitive prompt; stereotype threat/ no cognitive prompt; no stereotype threat/ cognitive prompt; and, finally, stereotype threat/ cognitive prompt.

After consenting to participate, participants were given the single previous knowledge item. Participants then watched the training video, with either the stereotype threat/ no stereotype threat and cognitive prompt/ no cognitive prompt manipulations. Participants in all conditions were then presented questions to assess training outcomes, given a demographic questionnaire, and debriefed.

RESULTS

Correlations among study variables revealed that both prior knowledge and participants' education levels were significantly correlated with training outcomes. Accordingly, a two-way ANCOVA with an alpha level of .05 was conducted to compare training performance between no stereotype threat/ stereotype threat conditions and the no cognitive prompt/ cognitive prompt conditions, controlling for previous knowledge of internal combustion engines and education level (see Table 1). Older adults were divided into two stereotype threat conditions: "no stereotype threat" and "stereotype threat". Additionally, they were divided into two cognitive prompt conditions: "no cognitive prompts" and "cognitive prompts."

TABLE 1
2 X 2 ANCOVA RESULTS FOR THE IMPACT OF STEREOTYPE THREAT AND
COGNITIVE PROMPT CONDITIONS ON TRAINING PERFORMANCE,
**CONTROLLING FOR PREVIOUS KNOWLEDGE AND EDUCATION**

	df	F	p	η^2
Corrected Model	5	13.750	.000	.362
Intercept	1	2.165	.144	
Previous knowledge	1	27.111	.000	.143
Education	1	19.615	.000	.103
Stereotype threat	1	4.787	.031	.111
Cognitive prompt	1	21.057	.000	.025
Stereotype threat* Cognitive prompt	1	4.530	.035	.024
Error	113			
Total	119			

The ANOVA results indicated a significant main effect for stereotype threat $F(1, 113) = 4.787$, $p = .031$, $\eta^2 = 0.025$. Older adults in the stereotype threat conditions ($M = 7.71$, $SD = 3.32$) performed significantly worse on the training task than those in the no stereotype threat conditions ($M = 8.51$, $SD = 3.27$), supporting hypothesis 1.

A significant main effect was also found for cognitive prompts $F(1, 113) = 21.057$, $p < .001$, $\eta^2 = 0.111$, though in the opposite direction as hypothesized. Older adults in the cognitive prompt conditions ($M = 6.93$, $SD = 3.03$) performed significantly worse on the training task than those in the no prompts condition ($M = 9.14$, $SD = 3.21$); thus hypothesis 2 was not supported.

Finally, results revealed a significant interaction effect between stereotype threat and cognitive prompts $F(1, 113) = 4.530$, $p = .035$, $\eta^2 = 0.024$, again in the opposite direction as hypothesized (see Figure 1). Cognitive prompts increased the negative impact of stereotype threat on training performance, thus hypothesis 3 was not supported.

FIGURE 1
INTERACTION EFFECT BETWEEN STEREOTYPE THREAT AND PROMPT CONDITIONS
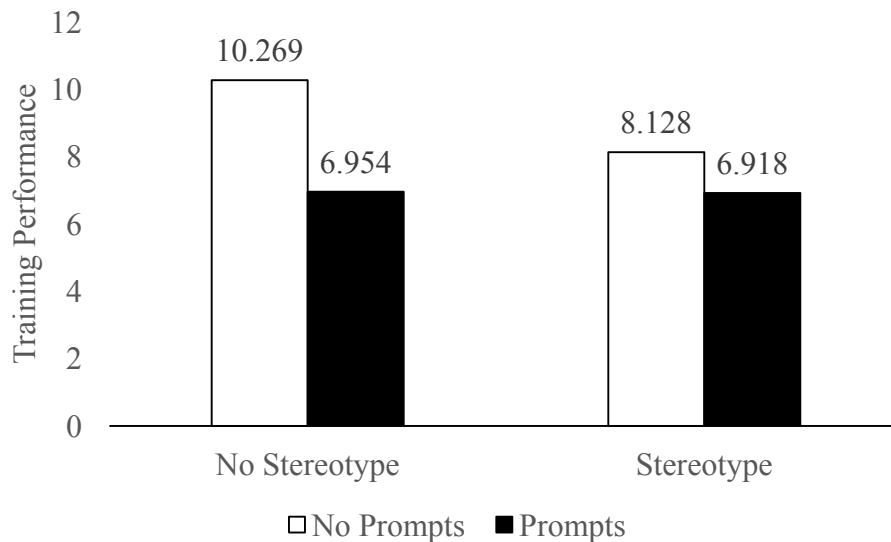
Because significant effects were found using the two-way ANCOVA, t tests were conducted to investigate the effect of cognitive prompts within each stereotype threat condition. In the "no stereotype threat" condition, a significant difference was found between the "no prompts" group ($M = 10.10$, $SD = 2.55$) and the "prompts" group ($M = 6.97$, $SD = 3.18$), $t(59) = 4.24$, $p < .001$. In the "stereotype threat" condition, no significant difference was found between the "no prompts" group ($n = 34$, $M = 8.29$, $SD = 3.52$) and the "prompts" group ($n = 24$, $M = 6.88$, $SD = 2.89$), $t(56) = 1.62$, $p = .110$. Cognitive prompts had no effect on training performance in the stereotype threat condition, but resulted in significantly lower scores in the no stereotype threat condition.

Estimated means for each experimental condition, controlling for previous knowledge and education, are shown in Table 2.

TABLE 2
ESTIMATED MEANS FOR EACH EXPERIMENTAL GROUP, CONTROLLING
FOR PREVIOUS KNOWLEDGE AND EDUCATION

	No Stereotype		Stereotype	
	M	*SE*	*M*	*SE*
No Prompts	10.27	0.49	8.13	0.46
Prompts	6.95	0.48	6.92	0.54

DISCUSSION

The purpose of the study was to investigate whether cognitive prompts would moderate the negative effects of stereotype threat on older adults' training performance. Consistent with prior research with simpler learning tasks, the results provided evidence that stereotype threat has a detrimental effect on older adults' training outcomes. Contrary to expectations, cognitive prompts also had a detrimental effect on training outcomes, and did not moderate the negative effects of stereotype threat.

The detrimental effects of the prompts found in this study are contrary to several prior studies showing cognitive prompts in training to be effective (Bannert, Hildebrand, & Mengelkamp, 2009; Berthold et al., 2007; Sitzmann et al., 2009). The results of this study raise an interesting question: if previous research has shown that cognitive prompts can help individuals perform better on training, why in this experiment did cognitive prompts have a negative effect?

Let us return to cognitive load theory. The purpose of the cognitive prompts was to increase germane load, thereby devoting more of participants' cognitive capacity to learning the training material. Unfortunately, the exact opposite may have occurred. The cognitive prompts may have required older adults to "task switch," shifting cognitive resources from one cognitive task (learning new material) to another (meta-cognition). The effectiveness of task switching is based efficiencies gained by maintaining two alternating task sets in working memory relative to the costs such as information loss and latency effects (Gilbert & Shallice, 2002). It is has been demonstrated the costs associated with task switches with age (Cepeda, Kramer, & Gonzalez de Sather, 2001; Kray & Lindenberger, 2000; Kray & Lindenberger, 2002). Thus, we can speculate that any inherent advantages with respect to facilitatory effects of cognitive prompts (germane load) were over-ridden by the costs of task switching. Thus, the cognitive prompts may have instead increased extraneous load, stealing cognitive resources away from the training task and thus hurting training performance. This effect may have been exacerbated by the fact that participants came from a population (i.e., older adults) who, on average, lower levels of fluid intelligence and the deleterious effects of task switching are negatively correlated with fluid intelligence (Kray & Lindenberger, 2000).

Berthold, Roder, Knorzer, Kessler, and Renkl (2010) provided recent empirical support for the argument that prompts can actually impede performance by consuming cognitive resources. Berthold et al. investigated whether or not prompts (similar to the ones used in the current study) could actually inhibit performance on a learning task, and found support for their hypothesis that prompts can facilitate performance on the task the prompt is targeting, while simultaneously inhibiting performance on other tasks (compared to groups that received no prompts). The researchers explained their findings using cognitive load theory: the prompts increased the cognitive load placed on learners, facilitating performance on the tasks targeted by the prompts, but directing cognitive resources away from other tasks, thus inhibiting performance. A similar effect may have occurred in this study. Participants expended working memory capacity processing the prompts, stealing cognitive resources away from the training task itself, thus hurting performance.

Research and Practical Implications

The current study contributes two important results to the literature on older workers and training. First, the simple main effect for stereotype threat provides evidence that older workers are susceptible to stereotype threat in training scenarios, extending the findings from learning and memory tasks into the organizational psychology domain. When designing training programs for older workers, trainers should be aware of the possibility that stereotyping older workers can lead to poor performance, and trainers should avoid mentioning common stereotypes associated with aging, making older workers feel as if they are being compared to younger workers, or collecting demographic information prior to training.

The second contribution of the current study is to show that cognitive prompts are not always beneficial to training outcomes. Although cognitive prompts can lead to improved training outcomes, researchers and practitioners alike need to be aware that prompts can, in certain situations, actually impede performance. The reasons for this effect still need to be more thoroughly researched, but for now the results of the current study provide a warning against designing a training program with a cognitive prompts and expecting to facilitate performance. Instructional designers and trainers should consider piloting cognitive prompts rather than just assuming they work, especially with older trainees.

Limitations

There are several limitations to this study. The fidelity of the training program and the artificiality of the task may limit generalizability to work settings. Participants completed the task at a time and location

of their own choosing. This may be very different than how workplace tasks are usually completed (except for telecommuters). Furthermore, participants had no particular motivation to seriously apply themselves to the training task, or to answering the questions accurately. Unlike job performance, their performance on the experimental tasks provided no meaningful consequences (e.g., being fired). Though it's difficult to say how these aspects of the task may have affected the results, practitioners should keep these limitations in mind when applying these findings to a field setting.

Future Directions

The goal of this study was to design an intervention to help overcome the negative effect of stereotype threat on older workers. While the results of this study confirm that stereotype threat can hurt training outcomes with older workers, unfortunately cognitive prompts did not moderate this impact. Additional research is needed to confirm why cognitive prompts had a negative affect for older adults. Future research should focus on testing other possible solutions to this important threat to older adults' training outcomes.

CONCLUSION

In conclusion, this study provided evidence that stereotype threat can negatively affect the performance of older adults on a training task. Contrary to expectations, cognitive prompts also negatively affected the performance of older adults on learning tasks. These results highlight the importance of investigating stereotype threat as a possible cause of age differences in training performance. Future research must continue in order to find ways to mitigate the harm of stereotype threat on older adults' training performance.

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