A Meta-Analysis of Positive and Negative Age Stereotype Priming Effects on Behavior Among Older Adults

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Objective. Evidence has shown that age stereotypes influence several behavioral outcomes in later life via stereotype valence-outcome assimilation; however, a direct comparison of positive versus negative age stereotyping effects has not yet been made.

Methods. PsycINFO and Pubmed were used to generate a list of articles (n = 137), of which seven were applicable. From these articles, means, standard errors (SEs), and other relevant data were extracted for 52 dependent measures: 27 involved negative age primes and 25 involved positive age primes. Independent samples analysis of variance tests were used to explore the influence of prime valence and awareness on behavior compared with a neutral referent.

Results. A significant main effect for prime valence was found such that negative age priming elicited a greater effect on behavior than did positive age priming (F(1,48) = 4.32, p = .04). In fact, the effects from negative age priming were almost three times larger than those of positive priming when compared with a neutral baseline. This effect was not influenced by prime awareness, discipline of study, study design, or research group.

Discussion. Findings show that negative age stereotyping has a much stronger influence on important behavioral outcomes among older adults than does positive age stereotyping.

Key Words: Aging—Meta-analysis—Older adults—Priming—Stereotype—Stereotyped behavior.

Of all the self-fulfilling prophecies in our culture, the assumption that aging means decline and poor health is probably the deadliest.

Marilyn Ferguson, The Aquarian Conspiracy, 1980

It is well known that the average individual lives well into later life and that the number of older individuals in the population is increasing with time. However, it is much less known that each of these aging persons will be recipients of the multiple generalizations that are associated with the aging process—whether they (we) are aware of it or not (Levy & Banaji, 2002). What is even lesser known is that these age stereotypes significantly predict health, illness, and behavioral measures in later life such that, generally, positive age stereotypes influence these outcomes in a positive direction, whereas negative age stereotypes influence the effects in a negative direction (O’Brien & Hummert, 2006). To date, there has been no direct comparison of the magnitudes that positive and negative age stereotypes affect behavior, independent of each other. Do negative age stereotypes do more harm than positive age stereotypes help?

BACKGROUND

Effects of Age Stereotypes

Levy’s (2003) review of age stereotypes showed that disease and disablement processes that are associated with aging may be partially explained by the influence of psychosocial constructs of the aging self. Findings from observational and experimental studies have shown that age-related biases can act as significant predictors of an older individual’s well-being and that this process occurs both consciously and unconsciously. For example, longitudinal research has shown that older adults with positive age self-perceptions practice significantly more preventive health behaviors over 20 subsequent years than do older adults with negative age self-perceptions (Levy & Myers, 2004). Considering this finding, it is no wonder that older adults with positive age self-perceptions have better functional health (Levy, Slade, & Kasl, 2002), recover faster from disease and trauma (Levy & Myers, 2005; Levy, Slade, May, & Caracciolo, 2006), and have a longer life span (Levy, Slade, Kunkel, & Kasl, 2002), all compared to those with negative age self-perceptions.

Experimental studies have found that older adults who are exposed to negative implicit age primes display a number of negative outcomes such as greater autonomic responses to stress (Levy, Hausdorff, Hencke, & Wei, 2000), notable attenuations in walking speed and swing time (Hausdorff, Levy, & Wei, 1999), significant decrements in numerous types of memory recall (Hess & Hinson, 2006; Hess, Hinson, & Statham, 2004; Levy, 1996; O’Brien & Hummert, 2006; Stein, Blanchard-Fields, & Hertzog, 2002), and a willingness to refuse life-prolonging interventions in hypothetical life-threatening medical scenarios (Levy, Ashman, & Dror, 1999–2000).
Some Unanswered Questions

From the previous research, it is becoming clear that positive and negative age stereotypes and age stereotyping play an important role in health, disease, and disablement processes associated with aging. Overall, negative age stereotypes appear to damage well-being and exacerbate disease and disability, whereas positive age stereotypes appear to support health and prevent decline. However, a direct examination of effects sizes that arise due to positive and negative age stereotype priming has not yet been established. To date, most research compares the effects of positive age stereotyping relative to the effects of negative age stereotyping, or vice versa, and few studies have included a neutral comparison group. As a result of these statistical and research design methods, it is currently unknown whether positive and negative stereotypes are equivalent in their effects on behavior or whether negative stereotypes have stronger effects.

In addition, there is a lack of consensus on whether implicit age primes are equivalent to explicit age primes and whether they interact with age stereotype valence (positive vs negative). For example, although damaging effects of negative age stereotyping on memory are found for both negative implicit and explicit age primes (Levy, 1996; Hess, Auman, Colcombe, & Rahhal, 2003), it has been suggested that implicit primes may elicit greater effects than explicit primes as awareness may allow an older individual opportunity to consciously counterbalance the effects of negative age stereotyping (Hess et al., 2004).

To respond to these questions, the objectives of this meta-analysis were to (a) compare the magnitude in which positive and negative age stereotypes influence overall behavior independently from one another, (b) investigate the influence of age prime awareness on behavior, and (c) determine whether age prime valence and awareness interact when predicting behavior.

Methods

Overview

To achieve the above objectives, the literature was systematically reviewed for relevant experimental work. In order to generate a list of in-print or in-press articles on age stereotyping (as of April, 2010), PsycINFO (key words: “age, aging, ageing, elderly, old, or older” and “stereotype, stereotyping, self-stereotype, or self-stereotyping”) and Pubmed (Medical Subject Headings [MeSH]; “Aged” and Major Topics [MAJR] “aged/psychology” and “stereotyping”) were used. Keywords were searched within abstracts and 137 articles emerged. Each of these articles’ abstract was read to determine its relevance to the current meta-analysis. If the information given in the abstract was insufficient to determine its relevance, the article was read in full. Articles were excluded if they (a) were written in a language other than English or French (n = 10), (b) had a young or middle-aged adult sample only (i.e., below the age of 60 years; n = 45), (c) had a nonexperimental design (n = 62), and (d) did not manipulate a general age prime, as memory- or health-related age primes result in stronger effects in these domain-specific outcomes (Levy & Leifheit-Limson, 2009; n = 8). From the remaining articles (n = 12), the reference lists were checked in order to discover additional articles (n = 5). Due to the specific nature of the current review where a neutral referent group is essential, articles that did not employ a control group for between-group analyses were also excluded (n = 10). This final and necessary criterion resulted in seven remaining articles. Each was read and reread meticulously. These papers are marked with an asterisk in the reference section.

Quality Assessment

The quality of each study was assessed according to the Downs and Black (1998) quality index. This scoring system is a validated checklist for evaluating methodological strengths and weaknesses in the following domains: quality of reporting, internal validity (i.e., bias and confounding), power, and external validity. All seven articles had very similar methodologies (e.g., randomized group assignment); however, the only notable difference among them was the level of experimental blindness: two were double blind (Levy, 1996, 2000), two were single blind (Hausdorff et al., 1999; Levy et al., 2000), and three were not blind (Hess et al., 2003; Pinquart, 2002; Stein, Blanchard-Fields & Hertzog, 2002). Nevertheless, according to the overall scores, each study was highly ranked, and data from all seven articles were extracted.

Data Extraction

The following data were extracted (a) authorship and publication year, (b) both focal and secondary dependent measures, (c) experimental study design (i.e., within-subject or between-conditions analyses), (d) group means of these dependent measures (i.e., pre- and postprime groups for within-subject design or experimental and control groups for between-group design), (e) whether the prime was positive or negative (i.e., prime valence), (f) whether the prime was implicit or explicit (i.e., prime awareness), and (g) whether the prime intervention had a significant impact on the dependent measure (i.e., p < .05). The seven articles encompassed data on 52 dependent measures, 27 of which were exposed to negative age primes and 25 by positive age primes.

Dependent Variable

The seven studies included behavioral outcomes in four research domains: (a) memory domain (i.e., free word recall, visual–spatial immediate, learned, and delayed recall, auditory recall, match-pairing recall, metamemory, and adjusted
ratio of clustering from Hess et al., 2003; Levy, 1996; Stein et al., 2002); (b) psychomotor domain (i.e., gross and fine motor skills such as walking time, gait speed, and swing time, as well as characteristics of handwriting from Hausdorff et al., 1999; Levy, 2000); (c) physiological domain (i.e., systolic and diastolic blood pressures, skin conductance, and heart rate from Levy et al., 2000); and (d) social domain (i.e., self-perceptions and peer-perceptions from Pinquart, 2002).

Prime-related changes (within-subject design) or differences (between-group design) in behavior were calculated using symmetrized percent change (SPC). SPC is a preferred technique over general percent change as it is more representative of the absolute change between means as it is bound between –100 and +100 (Berry, 1990). This technique is particularly useful for pooling across various dependent measures measured on different scales, which requires standardization. SPC was calculated using the following formula: SPC = \[ \frac{(Y - X)/(Y + X)} \times 100 \], where X represents the pre-prime or control group mean and Y represents the post-prime or experimental group mean. SPC scores were calculated for each dependent measure based on reported group means (X_{SPC}). A number of dependent variables were reverse scored so that increasing levels of each dependent measure were associated with positive outcomes.

Independent Variables
Prime valence, prime awareness, and study design (i.e., within subject or between conditions) were used as reported in the original articles. In order to examine potential associations between age priming and specific types of behavior, data were qualitatively grouped into the four aforementioned research domains based on the general discipline of study (i.e., memory, psychomotor, physiological, and social).

Quantitative Analysis
To examine whether positive and negative age priming and awareness level affects mean behavior differentially, a 2 (prime valence: positive, negative) × 2 (prime awareness: implicit, explicit) independent samples analysis of variance (ANOVA) was used to investigate these main effects and their interaction. Overall effect size was determined by partial \( \eta^2 \) and adjusted \( R^2 \). To ensure a reliable analysis of overall effects of positive and negative age stereotyping, the independence of effects for a number of variables was assessed with one-way ANOVA tests. All tests were employed with \( X_{SPC} \) as the dependent variable using a critical alpha level of .05.

RESULTS

Independence of Effects
First, as this meta-analysis combines data on memory, psychomotor, physiological, and social outcomes, there may be notable differences of age stereotype priming effects among the four research domains; however, a one-way ANOVA test determined no statistical differences \( F(3,48) = .21, p = .89 \). Not only does this null effect indicate that the effects of age stereotype priming are equivalent across domains, but it also provides support for pooling the dependent measures, giving statistical reliability to the latent construct of “behavior.” Second, as multiple dependent variables were taken from each same study, it may be possible that effects observed in one study, using the same sample of older adults, may not be statistically independent from one another, compared with effects of a different study or sample. To examine this potential source of bias, another one-way ANOVA test was used to determine whether a significant main effect existed among the effects across the seven individual studies. The result was not significant \( F(6,45) = 1.11, p = .37 \), indicating the independence of the dependent variables’ effects across the seven studies. Third, given that 54% of these data came from two studies (Levy, 1996, 2000) and that 81% were extracted from the work of Levy and her colleagues, these potential confounding effects were also evaluated. Compared with the results of others, there were no statistical differences between the results from the two most contributing studies \( F(1,50) = .03, p = .87 \) or from the studies by Levy et al. \( F(1,50) = 1.57, p = .22 \). Finally, no differences were found for the effects between within-subject and between-conditions analyses \( F(1,50) = .35, p = .56 \).

Age Priming Effects on Behavior
A significant main effect for prime valence was found such that negative age priming elicited a greater effect on behavior from a neutral comparison than did positive age priming \( M = −6.72 \) and \( M = 2.54 \), respectively; \( F(1,48) = 4.32, p = .04 \). As illustrated in Figure 1, negative age priming influenced mean behavior 2.6 times more in the negative
direction than did positive age priming in the positive direction. Neither the main effect for prime awareness \((F(1,48) = .01, p = .92)\) nor the interaction between prime valence and prime awareness \((F(1,48) = .93, p = .34)\) were statistically significant. The overall corrected model was significant \((F(3,48) = 7.67, p < .001)\) with a moderate effect size (partial \(\eta^2 = .32\), adjusted \(R^2 = .28\)). \(X_{SPC}\) means and SEs for age stereotyping effects on behavior, stratified by prime valence and awareness, are found in Table 1.

**DISCUSSION**

Findings from the current analysis showed that negative and positive age stereotyping influences behavior in opposite ways such that negative age stereotyping impaired overall behavior, whereas positive age stereotyping promoted it. This finding is well supported in the literature (e.g., Hess et al., 2003; Levy, 2003; O’Brien & Hummert, 2006). This result suggests that positive age stereotypes may be an appropriate agent to offset the harmful effects of negative age stereotypes. However, the current investigation discovered that the influences of negative and positive age stereotyping on behavior (i.e., measures of performance and perception) are unequal, such that negative effects were almost three times larger than positive effects, compared with a neutral referent. The differences between positive and negative age stereotype effects were independent of the effects on behavior across research domains and individual studies as well as the effects from research teams and experimental design.

The finding that negative age stereotyping elicits effects almost three times larger than positive age stereotyping is, unfortunately, not surprising. Evidence has shown that negative age stereotypes are omnipresent, persistent, and rigid, and they outnumber positive age stereotypes (Cuddy, Norton, & Fiske, 2005; Levy, 2008; Levy & Banaji, 2002; Nelson, 2005). Due to the stronger qualities and greater availability of negative age stereotypes, their relative influence may relate to chronic activation among older individuals (Levy, 2003), which may increase the ease or decrease the threshold to which these stereotypes are activated and applied to behavior. Furthermore, the findings and implications of the current study indicate that although both positive and negative age stereotypes coexist (Kite, Stockdale, Whiteley, & Johnson, 2005), negative outcomes of age stereotyping appear to outweigh and may possibly negate, positive outcomes.

Although a secondary finding, the current analysis found a nonsignificant main effect for prime awareness on behavior, suggesting that implicit and explicit age prime effects are similar. This result contradicts previous studies that have found implicit prime effects to be larger than explicit prime effects (Hess et al., 2004). Few studies have investigated implicit and explicit primes together, and the influence of prime awareness on behavior warrants further investigation.

There are some limitations to the current study. First, due to the specific nature of this meta-analysis, only studies with a neutral comparison group were applicable, which unavoidably reduced the number of relevant studies. Although relatively few studies were included, 52 dependent measures were available allowing sufficient statistical power. Second, only six dependent measures were manipulated with explicit age primes. Despite the fact that the these particular data represented 108 older adults in the original studies, the null main effect found between implicit and explicit primes should be interpreted with some caution due to low sample size. Third, as with any meta-analysis using only published papers, it is possible that the current findings may not represent the entire body of research in this area (i.e., published and unpublished). Publication bias may result from editors, reviewers, and/or researchers not publishing or reporting research findings that are statistically nonsignificant, inconclusive, or unexpected. Unfortunately, this study lacks a sufficient number of studies to reliably detect and correct for publication bias. Lastly, this study is restricted by the context of the reviewed articles themselves. For example, six of the seven included studies were conducted within the United States, from very few research laboratories, since 1996. As a result, the findings may not be generalizable beyond these qualities. To remedy these limitations, more studies involving age stereotype priming are required. Future experimental research from different countries, cultures, languages, and institutions would certainly add to the understanding of age stereotypes and their effects on the behavior of older adults. Furthermore, these potential studies should be double blinded and use a neutral control group, thereby allowing a reliable comparison of the absolute effects found for negative and positive age stereotype primes.

To summarize, this analysis examined the degree to which positive and negative age stereotype priming influences behavior in later life. Pooling results across seven studies with 52 dependent measures, both negative and positive age stereotypes, were found to reliably influence behavior; however, the detrimental effects of negative age stereotyping were nearly three times greater than the promoting effects of positive stereotypes. Considering the strong detrimental effects of negative age stereotyping, the presence, activation, and application of negative age stereotypes can be considered a critical biopsychosocial issue in later life—from personal to population levels. Future research on strategies for countering negative age stereotypes, in addition to promoting positive age stereotypes,
needed in order to encourage optimal performance and optimistic perceptions among older individuals.

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**Conflict of Interest**
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