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## Will to live in older people's medical decisions: immediate and delayed effects of aging stereotypes

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### Abstract

This research explores the duration of age stereotype priming effects on individuals' will to live when faced with a medical terminal illness decision. Study 1 established the content of the stereotype of the older age group in Portugal. Study 2 tested the effects of priming positive or negative age stereotypes on older and younger individuals' will to live, immediately after priming or after a delay. Results showed significant effects of stereotype valence on older people's will to live. As expected, immediate and delayed will-to-live scores were both lower in the negative than in the positive condition. In contrast, among younger people there were no significant effects of stereotype valence. These findings demonstrate the robustness of these types of unconscious influences on older people's fundamental decisions.

### Introduction

Population aging is undoubtedly one of the biggest challenges of this century. By 2045, the number of people older than 65 is expected to exceed the number of children in the world (World Health Organization [WHO], 2002). An important issue that has been raised is the potential burden on health care posed by aging populations. Health promotion has thus become a major focus of active aging policies in order to help people live longer and more active lives (WHO, 2002). Adherence to medical treatment is a fundamental issue with major implications for the way older people cope with illness and disability and, at the extreme, whether older people will decide to continue their own existence.

Studies suggest that the *will to live* is a psychological construct that can be affected by several kinds of beliefs. For example, older people are more likely to die after an important religious celebration (e.g., Passover for Jewish individuals and Harvest Moon Festival for Chinese American) than before (Phillips & King, 1988; Phillips & Smith, 1990). In one important study, Levy, Ashman, and Dror (1999–2000) showed that will to live could be directly affected by aging stereotypes. When faced with a hypothetical terminal illness, older people who were subliminally primed with negative age stereotypes were less accepting of a medical treatment than those primed with positive age stereotypes. These findings are interesting because they

show that basic survival outcomes in older people may be affected by subtle manipulations of the social context. This is important because it is plausible that in situations when older people make health decisions, these types of subtly caused effects could significantly affect fundamental outcomes. The use of subliminal primes is useful as a research technique because it clearly exposes the possible automatic character of these types of effects, and reveals how age stereotypes may affect older people even without their conscious awareness (Levy, 2009). Moreover, these subtle effects seem especially meaningful given other evidence regarding medical decision making among older people. Studies show that this age group seems to systematically use a heuristic mode of decision making in natural medical contexts, making them more susceptible to subliminal or subtle influences (Liu & Gonzalez, 2007; Meyer, Talbot, & Ranalli, 2007).

According to Levy (2003), these findings demonstrate implicit *self-stereotyping* processes. Negative and positive aging stereotypes are internalized during childhood, are reinforced throughout life, and then become self-stereotypes at old age. These can be activated automatically by subtle contextual cues, which thereby influence performance and the situational self-concept. The assumption that findings reflect a process of implicit *self-stereotyping* of aging is supported by the fact that these priming effects do not seem to occur in people for whom the older stereotype is not relevant.

Specifically, Levy et al. (1999–2000) did not find any significant differences between younger people's will-to-live scores as a function of positive or negative aging stereotype primes.

In the present paper, we explore Levy et al.'s (1999–2000) self-relevance proposition in more detail. Specifically, we are interested in examining the durability of these types of effects. Does the automatic activation of negative age stereotypes necessarily reduce, and can the automatic activation of positive age stereotypes sustainably increase, older people's willingness to accept a medical treatment when their survival is at stake?

Some studies suggest that aging stereotypes may have important long-lasting effects on fundamental outcomes. Findings based on the Ohio Longitudinal Study of Aging showed that participants with more positive self-perceptions of aging at baseline had better functional health over the course of the study and lived an average of 7.5 years longer than those with more negative self-perceptions of aging (Levy, Slade, Kunkel, & Kasl, 2002). This is consistent with the idea that age stereotypes internalized at earlier ages may have significant effects in the long run.

The present paper complements longitudinal studies and earlier priming studies by examining some potential temporal limits of the unconscious situational activation of aging stereotypes (Levy, 2009). It is conceivable that subliminal priming only has immediate and short-term effects. Hence, we are interested in understanding whether stereotype priming effects on will to live persist even after an intervening task. As far as we are aware, this is the first time a test such as this has been conducted within the aging stereotype priming research.

Research in other domains shows that temporal delay reduces the likelihood that a primed construct will affect processing of a subsequent stimulus (Higgins & King, 1981; Wyer & Srull, 1981). For example, Bargh, Lombardi, and Higgins (1988) showed that a delay of 180s can be sufficient for a prime to dissipate, particularly if individuals engage in a secondary distracting task. Similar results have been found in the priming literature using race or national identity stereotypes in younger participants (Lepore & Brown, 1997, 1999). This evidence raises a question regarding the scope of Levy et al.'s (1999–2000) findings. Specifically, while priming of age stereotypes may affect older people's immediate responses, it is unknown whether this has any lasting consequences or is only a very brief, immediate effect. This issue is important because real-life situations involve multiple cues that compete for attention (Bargh, 2006). Therefore, the question remains as to whether unconscious stereotype activation can affect older people's performances once their attention is directed somewhere else. We examine the durability of stereotype automatic activation by exploring the effects of aging stereotypes on older people's medical decisions, either immediately after the priming episode (e.g., Levy, 1996) or after a significant delay.

In line with Levy et al. (1999–2000), we test both older and younger participants, thus allowing us to explore the role of self-relevance. Some authors (Dijksterhuis, Chartrand, & Aarts, 2007) suggest that although it is possible to demonstrate old age stereotype priming effects in younger people in some situations, effects should be stronger and last longer in targets for whom the prime is more self-relevant and chronic (i.e., older people). In fact, targets should show a lower threshold of activation for self-relevant primes and these effects should be more sustained over time than in nontargets. The rationale behind this idea is that for targets the self-relevant category should be more frequently used and hence should share a stronger associative strength making it responsive and more enduring following subtle activation (Shih, Ambady, Richeson, Fujita, & Gray, 2002).

## Overview of present studies

The present research extends the study by Levy et al. (1999–2000). We expect a differential effect of old age primes in older and younger individuals' will-to-live scores in the immediate context and after the delay. In line with previous findings, immediately after priming, older people should show lower will to live when stereotype primes are negative than when they are positive. Moreover, since the old age stereotype is chronically relevant for older people, we expect these effects to persist regardless of a delay. On the other hand, for younger people the aging stereotype is not so meaningful, and should not be affected by the valence of the priming in either immediate context or after the delay.

To test these propositions, Study 1 established the relevant stereotypic content for positive and negatively valenced primes. Study 2 tested our hypotheses experimentally.

## Study 1

Levy (1996) used stereotypic traits elicited from a relatively small sample of participants ( $N = 20$  distributed across the younger and older age groups) as primes. The sample size used to pretest stereotypical contents associated with older people may have been justified given the existence of previous research on North American age stereotypes (Brewer, Dull, & Lui, 1981; Schmidt & Boland, 1986). However, the present research was conducted in Portugal, and although there is reason to believe that ageism against older people is widespread and a meaningful phenomenon in the Portuguese culture (Marques, 2011), just as it is in North America, there is only limited evidence regarding Portuguese age stereotypes (Neto, 1992; Paúl, 2002). For instance, data collected in the "Experiences and Expression of Ageism" module included in the 2009 European Social Survey revealed that in Portugal, 20.8% of individuals between 65 and 79 years and 31.6% of

individuals aged 80 and over experienced age discrimination during the previous year (Abrams, Russell, Vauclair, & Swift, 2011). In addition, results of the 2009 Eurobarometer revealed that 53% of the Portuguese think that age discrimination is a serious problem in their society and 57% believe that it is more serious now than 5 years ago (European Commission, 2009). Therefore, for the present research an opportunity was taken to establish a more robust basis for stereotype priming that attended both to the content and valence of aging stereotypes. Study 1 was also designed to take into account age stereotype differences associated with gender, as advocated by Kite, Stockdale, Whitley, and Johnson (2005). Matlin's (2004) evidence suggests that when people refer to a general social category such as "older person," they tend to consider only older men as a default representation of the category. Hence, it is important to ensure that stereotype priming studies should account for this by ensuring that the stereotype content is similarly self-relevant for both older men and women. As described in more detail below, we addressed this issue by asking groups of older and younger individuals to evaluate older and younger men and women in a preliminary exploratory phase. In a subsequent phase in which traits were rated for typicality and valence, we only included traits that were characteristic of both older men and women on one hand, and younger men and women on the other.

## Method

### Participants

Younger participants were college students from universities in the Lisbon area who were invited to participate in the study. Older people were recruited through personal contacts. Participants were 62 younger individuals ( $M_{\text{age}} = 21.6$  years;  $SD = 2.0$ ) and 62 older individuals ( $M_{\text{age}} = 70.4$  years;  $SD = 4.7$ ). Among younger participants, a small majority were female (64.5%), single (95.1%), students (90.3%), had at least 12 years of education (100%), and lived in urban neighborhoods (91.9%). Among older participants, most were also female (64.5%), almost were married (68.3%), widows (16.7%) or single (11.7%), had at least 12 years of education (66.1%), and lived in urban neighborhoods (96.7%).

### Materials and procedure

A questionnaire was devised to examine the typicality and valence of the attributes associated with the categories "young" and "old" following a procedure based on Brazão and Garcia-Marques (2004). The questionnaire assessed: (1) the degree to which each attribute was associated with each group; and (2) the degree to which they were perceived as positive or negative. The items consisted of 56 attributes

drawn from the age stereotypes in the United States (Levy, 1996; Levy et al., 1999–2000) together with attributes referred to in the most representative study regarding age stereotypes in Portugal (Neto, 1992), and attributes from pilot work in which 67 younger individuals ( $M_{\text{age}} = 19$  years;  $SD = 0.7$ ) and 85 older individuals ( $M_{\text{age}} = 76$  years;  $SD = 0.6$ ) answered a "free-response task" regarding the stereotypical traits associated with older men and women and younger men and women.

The stereotypical attributes were coded by two independent judges with agreement index of at least 85% in the coding of attributes for the four groups. Disagreements were resolved through open discussion. We included in the 56 traits used for Study 1 those that both younger and older participants indicated would be common to both the male and female gender of each age group.

To evaluate typicality, the list of attributes was presented twice, once for each age group (younger and older) in a random order. Participants were asked to evaluate, on an 11-point scale, the degree to which they thought that people in Portuguese society associated each characteristic with the groups of younger and older people (0 = *not at all*, 10 = *completely*). Next, we presented the same list of attributes and asked participants to evaluate the degree to which they thought that people in Portuguese society considered each attribute as positive or negative when evaluating people in general (0 = *totally negative*, 10 = *totally positive*).

Younger participants answered the questionnaire by themselves in a university laboratory. Older participants answered the questionnaires at their homes and returned the questionnaires to the researchers either personally or by mail.

## Results and discussion

Table 1 summarizes the attributes that were considered stereotypic of the older age target group by both groups of participants. We considered an attribute to be stereotypic if the mean score was significantly above the midpoint (5) on the typicality scale. We considered an attribute to be positive if the mean score was significantly above 5 on the valence scale, and negative if it was significantly below 5 on the valence scale.

### Typicality

For the older stereotype, it was interesting to see that this list included only 9 of the 24 attributes originally used in Levy (1996) and Levy et al. (1999–2000) (positive traits: wise, sage, insightful, counselor, calm; negative traits: dependent, decline, ill, forgetful). The remaining attributes were specific to the content of age stereotypes in Portugal. This evidence has important implications for future research on age stereotypes as it highlights that North American stereotypes of

**Table 1** Attributes that Younger ( $n = 62$ ) and Older Participants ( $n = 62$ ) Consider to be Associated with the Older Age Group (by Decreasing Values of Typicality)

Stereotypical attributes of the older age group	Typicality		Valence	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Grandparents	8.6	1.7	6.4	2.6
Retired	8.4	2.3	4.3	2.1
Experienced	8.1	1.7	7.9	1.8
Mature	8.0	1.5	7.7	1.9
Conservative	8.0	1.6	4.6	2.3
Advise	7.8	1.8	7.0	2.0
Wise	7.4	1.8	7.6	2.1
Old	7.4	2.6	3.5	2.4
Lonely	7.3	2.3	2.9	2.2
Forgetful	7.2	2.2	2.7	1.9
Dependent	6.8	2.2	3.1	2.2
Superstitious	6.8	2.2	3.7	2.1
Decline	6.8	2.4	2.1	2.0
Diseased	6.7	2.3	2.4	2.2
Slow	6.7	2.2	3.0	1.6
Grumpy	6.4	2.3	2.5	1.9
Calm	6.2	2.0	7.1	1.9
Boring	6.2	2.4	2.3	2.0
Sociable	6.1	1.9	7.0	2.0
Sage	6.0	2.1	6.4	2.1
Unable	5.9	2.5	1.9	1.9
Confused	5.8	2.3	2.6	1.8
Insightful	5.8	2.4	6.4	2.1
Astute	5.6	2.0	6.8	1.9
Non-excited	5.6	2.5	3.0	2.1
Mentors	5.5	2.2	6.7	1.8
Workers	5.4	2.4	7.8	1.9
Accomplished	5.4	2.0	7.5	2.0
Alzheimer	5.3	2.8	1.5	2.0
Educated	5.2	2.2	8.0	1.9
Pitiful	5.2	3.1	1.7	1.8
Enlighten	5.1	2.1	7.4	2.0
Fun	5.0	2.0	7.9	1.7

older people should not be assumed to generalize internationally or cross-culturally.

### Valence

In line with North American studies (Brewer et al., 1981; Schmidt & Boland, 1986), Portuguese aging stereotypes are mixed, including both positive (e.g., mature, wise) and negative (e.g., ill, dependent, forgetful) traits.

## Study 2

Study 2 was an experiment designed to explore the differences in will to live in younger and older participants in two conditions: immediately after stereotype priming and after a delay. The design was factorial between subjects with 2 (stereotype valence: negative and positive stereotypical attributes)  $\times$  2

(age group: younger and older individuals)  $\times$  2 (delay: immediately after the prime [i.e., non-delay] or after 180s [i.e., delay]).

We expected differences between will-to-live scores in older and younger people. Older people, for whom the aging stereotype is self-relevant and more chronic, should show lower will to live in the negative than in the positive stereotype condition immediately after priming and after the delay. On the other hand, younger people, for whom the aging stereotype is not self-relevant, should not be affected by the valence of old age stereotype priming neither in the immediate context nor after the delay.

## Method

### Participants

This study included 115 participants: 54 older adults ( $M_{age} = 71.1$  years;  $SD = 5.9$ ) and 61 younger adults ( $M_{age} = 20.1$  years;  $SD = 3.3$ ). Within the older adults group, 35.9% were female and 64.1% were male. Within the younger adults group, 61.8% were female and 38.2% were male. As we explain in more detail, ten individuals of each age group were included in a condition to evaluate perception without awareness. Younger adults participated in this study as part of a Research Methods course in the 1st year of a Psychology degree, and received credits for it. Older adults were recruited by word of mouth by these students and agreed to participate voluntarily in the study. The majority of older adults were living independently in the community with their families (55.7%) or by themselves (37.7%).

The two criteria for inclusion in the study were being native Portuguese speakers, they had the ability to read and write in Portuguese, and inability to consciously recognize any of the words that were flashed on the computer screen during the priming task. Five young participants and three old participants were removed from the initial sample because they indicated that they could read the words being primed.

The older and younger participants differed in gender,  $\chi^2(1, N = 115) = 6.96, p = .008$ , Cramér's  $V = 0.25$ , and years of education,  $t(112) = 5.40, p < .001$ , 95% CI (2.16, 4.67),  $d = 1.02$ . There was a lower proportion of men among the younger participants, and they also had significantly more years of formal education ( $M = 12.00$ ;  $SD = 0.00$ ) than did older participants ( $M = 8.50$ ;  $SD = 4.91$ ). A preliminary analysis revealed that gender did not significantly affect will-to-live scores,  $F(1, 93) = 1.42, p = .231, \eta^2_p = .02$ . In the same vein, years of education were unrelated to the will-to-live scores of older participants,  $r(42) = -.33, p = .252$ . This analysis was not performed for younger participants given that there was no variability in younger participants' years of education.

There was more variability in the ages of older participants ( $M_{\text{age}} = 71.1$  years;  $SD = 5.9$ ) than younger participants ( $M_{\text{age}} = 20.1$  years;  $SD = 3.3$ ), therefore we tested whether age was related to will-to-live scores among older participants, and found a marginal negative relationship,  $r(42) = -.18$ ,  $p < .053$ . Therefore, when appropriate we controlled for age in subsequent analyses.

## Apparatus and materials

### Development of the implicit stereotyping paradigm

Following Levy et al.'s procedures (e.g., Levy et al., 1999–2000), individuals completed a visual detection task on the computer, requiring them to indicate whether a pattern appeared above or below a bull's-eye. The patterns were presented in a random order and masked for words that flashed sufficiently quickly on the computer to ensure only subliminal perception: Participants may see "something" flashing in the computer but they cannot see the actual words. We present only the details regarding the adaptation of the self-stereotyping paradigm to the Portuguese cultural context. For a detailed description, see Levy (1996).

The elderly priming words were selected from Study 1 according to the requirements of the priming stereotype paradigm. The English translations of the 12 positive words are *wise, sage, accomplished, advise, insightful, astute, calm, mature, experienced, grandparents, sociable, and fun*. The 12 negative words are *decline, dependent, forgetful, confused, diseased, superstitious, lonely, slow, grumpy, pitiful, boring, and unable*. Taking into consideration the ratings of the two age groups, the positive and negative words matched in degree of stereotypicality, word length (mean of eight letters per word), and mean level of frequency in Portuguese language (Nascimento, Casteleiro, Marques, Barreto, & Amaro, 1995). Furthermore, the mean typicality of the traits used in the positive and negative priming condition was significantly and consistently rated above 5 for both age groups,  $p < .01$ , demonstrating that, for both older and younger participants, the primes should be activating stereotypic representations of the old age stereotype.

Selection of proper speed for test trials that allowed perception without awareness was based on Levy et al. (1999–2000) and adapted to the properties of the computer. Prime speed was adjusted for each older participant to guarantee perception-without-awareness conditions. Every older individual started at 50 ms. If in the first block they said they could not see anything flashing on the computer screen, the prime speed was adjusted to 67 ms. Prime speeds were slowed in steps until individuals stated that they could see something flashing on the computer. Individual adjustments were as follows: 50 ms (4.5%), 67 ms (45.5%), 83 ms (30.5%), 100 ms (8.1%), and 133 ms (11.4%). All older participants

included in the analysis reported that they could only see flashes and blurs. Priming speeds did not have a significant influence on will-to-live scores.

The use of a standard speed that guarantees "perception without awareness" is much better established for younger participants. In line with Levy (1996), for younger participants we used the speed of 33 ms. Previous pretests have revealed that this speed allowed young participants to see the flash without recognizing the actual words. All young participants included in the analysis reported they had only seen flashes and blurs. Priming speeds for older participants are more complex to establish because, as Levy points out, with age there is greater variation in processing speed and visual abilities. This visual variability makes it challenging to find a proper speed to allow subliminal priming. Therefore, for older participants it is important to make individual adjustments in order to guarantee "perception without awareness."

The two priming conditions consisted of five blocks, each containing 20 words. Each block began with one of two category words: either *old* or *senior*. After the category word, the next 19 words (including the other category word) were presented randomly. Following the ratios proposed by Levy et al. (1996, 1999–2000), 80.0% of the words were stereotype related, and 20.0% were neutral or non-stereotype-related. The neutral words consisted of high-frequency words matched in length to the stereotype-related words (Nascimento et al., 1995). The same neutral words were presented in the positive and negative conditions. Those words were: *also, number, some, and different*. To increase priming power (Devine, 1989), two words were repeated within blocks (positive condition: *wise* and *experienced*; negative condition: *pitiful* and *unable*).

We conducted two  $2$  (positive vs. negative prime)  $\times$   $2$  (older vs. younger participants) factorial analyses of variance (ANOVAs) with reaction time and accuracy as dependent variables. Younger participants were faster to respond to the computer task than older participants,  $F(1, 104) = 92.05$ ,  $p < .001$ ,  $\eta^2_p = .47$ . However, younger adults were also marginally less accurate than older participants,  $F(1, 104) = 3.17$ ,  $p = .078$ ,  $\eta^2_p = .03$ . We did not find any significant effects of stereotypical valence.

### Perception-without-awareness control conditions

To ensure that the primes were activated subliminally, we included a perception-without-awareness control condition. Ten older and ten younger participants individually participated in the guess and recognition tasks, similar to the ones used by Levy (1996).

The hit rates for the guess condition were higher than those obtained by Levy (1996), although still significantly below the chance level. The hit rates were as follows: overall for older

(15.2%) and younger (5.2%); stereotype for older (16.0%) and younger (4.7%); neutral for older (13.3%) and younger (5.3%). Hit rates in the recognition task were comparable to those obtained by Levy and also close to chance level: overall hit rate for older (42.7%) and younger (22.7%); stereotype hit rate for older (35.7%) and younger (22.1%); neutral hit rate for older (55.0%) and younger (25.0%).

In line with Levy (1996), the combined results from the guess and recognition task suggest that older and younger participants were not aware of the prime content and that the priming paradigm successfully allowed perception without awareness.

### *Non-delay/delay condition*

In line with Lepore and Brown (1999) in the condition without delay, participants answered the questionnaire with the dependent variables immediately after the computer priming task. In the delay condition, participants answered the questionnaire 180s after the computer priming task. During these 180s, participants were required to count backward starting with a designated number (i.e., 380). The purpose of this interference task was to completely clear working memory after the conclusion of the priming task (Peterson & Peterson, 1959; Reitman, 1974). The choice of the 180s period as the delay condition was based on the recommendations by Bargh et al. (1988) and seems to be the maximum amount of time that the counting-backward task is still effective in maintaining subject's motivation (Higgins, Bargh, & Lombardi, 1985).

### *Will to live*

The will-to-live measure asked participants if they would accept a medical treatment if they were diagnosed with terminal illness (adapted from Levy et al., 1999–2000). Participants were instructed to think of a hypothetical situation in which the treatment was very expensive and required most of their savings and a considerable portion of their family's savings. Three items addressed will to live given a 25%, 50%, and 75% chance of recovery. Participant responded to each item on a 7-point scale (1 = *refusal of life-prolonging treatment* to 7 = *acceptance of the treatment*;  $\alpha = .89$ ). A summary score was calculated by averaging scores across the three items.

### *Procedure*

Participants were tested individually in a quiet room of the psychology laboratory. Participants first answered background questions and were informed that they were to participate in two separate and unrelated studies. The first study was said to be a measure of visual perception and memory, whereas the second was said to be a validation of a translation of an English questionnaire.

In the "first" study, participants performed the computer priming task (half in the positive condition and half in the negative condition). After this task, participants in the non-delay condition directly proceeded to the "second" study, while participants in the delay condition performed what was said to be a "memory task" that consisted of counting backward from 380 until the experimenter told them to stop (i.e., during 180s) before proceeding to the second study. In the "second study," participants completed the will-to-live questionnaire.

At the end of each session, participants answered a post-experimental questionnaire regarding what they thought these studies were about and whether they had recognized anything in the computer screen during the first study. Finally, they were fully debriefed.

## **Results and discussion**

### *Effect of stereotype priming and delay on will to live*

To analyze the effects of stereotype valence and delay on will to live, we conducted a  $2 \times 2 \times 2$  factorial ANOVA with age group, stereotype valence, and delay as between-subjects factors and will to live as the dependent variable. The data revealed some degree of heterogeneity of variance between conditions (the largest to smallest cell variance [ $F_{max}$ ] was 9.76). To adopt a conservative approach for meeting ANOVA assumptions, we transformed the will-to-live measure to reduce heterogeneity. Since our data revealed a moderate negative skew, we performed a square root transformation of the reflected will-to-live variable as suggested by Tabachnick and Fidell (2001). Specifically, this was a square root transformation of the reverse variable ( $\text{SQRT}(K - X)$ ), with  $K$  being a constant from which each score is subtracted so that the smallest score is 1. This substantially improved variance homogeneity across conditions with  $F_{max} = 6.28$ , well below the advised limit of 10.0 (Tabachnick & Fidell, 2001).

There was a main effect of stereotype valence,  $F(1, 87) = 8.73$ ,  $p = .004$ ,  $\eta^2_p = .09$ , showing that will to live was higher following positive primes ( $M = 5.99$ ;  $SD = 1.13$ ) than following negative primes ( $M = 5.14$ ;  $SD = 1.76$ ). There were no other significant main effects. The ANOVA also revealed a marginal stereotype valence by age group interaction,  $F(1, 87) = 3.53$ ,  $p = .063$ ,  $\eta^2_p = .04$ .<sup>1</sup> Because we specifically

<sup>1</sup>Homogeneity of variance was still acceptable according to the criterion threshold advocated by Tabachnick and Fidell (2001) as  $F_{max} < 10$ . As our  $F_{max}$  was close to this, we took the precaution of conducting the analyses with both untransformed and transformed data. With untransformed data, the stereotype valence by age group interaction reached statistical significance,  $F(1, 87) = 4.26$ ,  $p = .042$ ,  $\eta^2_p = .05$ . To ease interpretation of the actual pattern of data, the means in Table 2 correspond to the analysis on the untransformed data.

**Table 2** Means and Standard Deviations for Will to Live as a Function of Age Group, Stereotype Valence, and Delay

Age group	Non-delay				Delay			
	Positive		Negative		Positive		Negative	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Older participants	6.57	0.72	5.36	2.25	6.09	1.05	4.25	2.06
Younger participants	5.54	1.17	4.97	1.19	5.89	1.34	5.88	1.17

Note. Higher values indicate higher will-to-live scores (untransformed scores).

predicted that valence should affect older but not younger people, based on Levy et al. (1999–2000), we examined simple effects within age groups. Consistent with Levy et al., the simple effect of prime among older participants revealed that will-to-live scores were higher when they were primed with positive stereotypic traits ( $M = 6.32$ ;  $SD = .92$ ) than when they were primed with negative stereotypic traits ( $M = 4.78$ ;  $SD = 2.18$ ),  $F(1, 87) = 10.88$ ,  $p < .001$ ,  $\eta^2_p = .11$ . In line with previous findings, the younger participants' will-to-live scores did not differ in the positive ( $M = 5.70$ ;  $SD = 1.24$ ) and negative stereotype priming conditions ( $M = 5.46$ ;  $SD = 1.24$ ),  $F(1, 87) = .62$ ,  $p = .216$ ,  $\eta^2_p = .00$ .

There was also an age group by delay interaction,  $F(1, 87) = 6.99$ ,  $p = .009$ ,  $\eta^2_p = .07$ . Older participants' will-to-live scores decreased after delay (non-delay:  $M = 5.94$ ,  $SD = 1.78$ ; delay:  $M = 5.13$ ,  $SD = 1.88$ ),  $F(1, 87) = 3.97$ ,  $p = .051$ ,  $\eta^2_p = .04$ . Younger participants' will-to-live scores showed a nonsignificant tendency to increase after delay (non-delay:  $M = 5.26$ ,  $SD = 1.19$ ; delay:  $M = 5.88$ ,  $SD = 1.23$ ),  $F(1, 87) = 3.03$ ,  $p = .092$ ,  $\eta^2_p = .03$ .

The three-way interaction among stereotype valence, age group, and delay was not significant,  $F(1, 87) = .981$ ,  $p = .321$ ,  $\eta^2_p = .01$  (Table 2). In accordance with this result, posterior analyses showed that valence effects were significant only for the older group and both in the non-delay and delay conditions.

To account for the higher age variation among older participants, and the fact that the preliminary analyses revealed age was significantly negatively related to older participants' will-to-live scores, we decided to repeat the analysis for the older age sample including age as a covariate. The analysis of covariance revealed that age was not a significant covariate,  $F(1, 39) = 2.70$ ,  $p = .108$ ,  $\eta^2_p = .06$ , and that the expected effect of stereotype valence remained significant,  $F(1, 39) = 8.30$ ,  $p = .006$ ,  $\eta^2_p = .18$ .

## General discussion

The main objective of this study was to examine the persistence of automatic stereotype activation on older people's will to live in a medical terminal illness condition. We hypothesized that because old age is a chronic and self-relevant category for participants, valence effects should persist even

after a delay in time while performing a distracting task. Moreover, we also expected these effects to be specific to older people because we did not expect stereotype valence effects to occur at all in younger participants.

The results support these hypotheses. Older people showed lower will-to-live scores after they had been primed with the negative than with the positive stereotype primes both immediately after priming and after the delay. This finding is interesting and extends the insights from Levy's earlier work in a number of ways.

First, this study has established the stereotype valence effect on older people in a new cultural context within which the specific content of the older stereotype was somewhat different from the original research (Levy et al., 1999–2000). While Study 1 highlights that it is important not to assume there will be cross-cultural or international invariance in the content of age stereotypes, Study 2 shows that the underlying processes and impact of age stereotype priming on will to live are likely to be generalizable.

Second, the present research shows that stereotype valence effects may have more *lasting* consequences on older people's engagement with life and death medical decisions. Recently, there has been some debate in the literature regarding the external validity of priming paradigms and the replicability of priming effects (Doyen, Klein, Pichon, & Cleeremans, 2012). It has been argued that these types of paradigms involve very simple manipulations that do not reflect the multiple contextual constraints present in real-life situations (Bargh, 2006). We believe that by showing that old age stereotype priming affects older people's will to live even after a delay and an interference task, this research presents compelling evidence of the power of unconscious activation of stereotypes to affect older people's decision making and behaviors in more complex real-life situations.

The literature on medical decision making in older people shows that this age group is especially prone to use a more heuristic mode of processing and making relatively quicker decisions than younger people (Leventhal, Leventhal, Schaefer, & Easterling, 1993; Liu & Gonzalez, 2007). Among the suggested reasons for this are that older people may lack cognitive resources that allow for a more elaborated decision (Park et al., 1996; Salthouse & Babcock,

1991), or that they already have more expertise on the matter the decision is quicker and easier to make (Hershey, Walsh, Read, & Chulef, 1990; Klein, 1997), or that they adopt a more passive doctor–patient mode of interaction (Cassileth, Zupkis, Sutton-Smith, & March, 1980). However, the present evidence also suggests that there may be more subtle influences at work, such as the unconscious activation of aging stereotypes within the time frame that older people typically take to make these kinds of decisions. Even if they do not decide instantly after a question is posed, many health decisions are made within or during the time limits of a medical consultation. Therefore, it is important that the effects of aging stereotypes may persist even after other cognitive demands have arisen, which emphasizes their pervasive influence.

Finally, our findings are consistent with the view that self-relevance is likely to play an important role in the way the automatic activation of aging stereotypes affects older people's medical decisions. Indeed, there are no valence effects among younger people either in the immediate situation following priming or after the delay. Hence, these findings are consistent with prior evidence from the aging priming literature (Levy, 1996; Levy et al., 1999–2000).

It is also important to note the unexpected effects that delay had on older and younger people's responses. The significant interaction between age group and delay suggests that the primes had differential effects on both age groups as a function of delay. The delay manipulation in this study was used previously to ensure prime decay among younger participants (Higgins et al., 1985). In the case of younger participants in our study, however, the results of the delay manipulation were only marginally significant, thus suggesting that neither stereotype valence nor delay was having a significant effect on will to live. However, the pattern of results was different in older people, showing a decrease in will to live after delay. One possibility is that the delay task might have had additional effects on older participants. The pattern of results suggests that this effect seemed to be particularly strong in the negative stereotype condition,  $F(1, 87) = 3.89, p = .051, \eta^2_p = .05$  (the effect of delay on the positive condition was nonsignificant,  $F(1, 87) = .76, p = .386, \eta^2_p = .00$ ). Hence, being subliminally primed with the negative stereotype condition *and* then performing a stereotype relevant task may have perpetuated the effect of the subliminal negative prime. One possibility is that the counting-backward tasks acted as a stereotype threat stimulus (Steele & Aronson, 1995), increasing the power of the negative priming. Specifically, the subliminal activation of stereotypic traits increased the accessibility of age stereotype traits, and the backward counting “memory” task might have activated more negative representations of aging through stereotype threat. Previous research has shown that numerical and memory performance are domains in which

older people are vulnerable to stereotype threat (Abrams et al., 2008; Hehman & Bugental, 2013; Hess, Hinson, & Statham, 2004; Swift, Lamont, & Abrams, 2012). Interestingly, however, engaging in the potential threatening task did not seem to have an effect if older people had first been primed with positive stereotypes.

The present findings suggest important new avenues for future research. One question of interest for researchers concerned with cognitive aging is whether different lengths of delay moderate the prime continuation differently. It would be interesting to see whether the effect of stereotype threat on older people might differ when they have been primed with positive versus negative traits. The present evidence is consistent with the idea that breaking the link between self and negative age stereotypes can eliminate a potential threat (Abrams, Eller, & Bryant, 2006; Abrams et al., 2008; Swift et al., 2012)—a finding with implications for older people's well-being.

Finally, we believe it is also important to further consider the implications of responses to the will-to-live measure. First, one may question whether the scenario measure is a valid way to evaluate this concept. The new policies of privatization of public health services (Observatório Português dos Sistemas de Saúde, 2003) seem to suggest that these are the type of dilemmas that older people will have to face in the future where much more treatments will have to be covered by them or by their families. In this sense, we think that this measure is useful and resembles possible future real-life situations.

Second, it may be useful to devise a version of the will-to-live measure that would be simpler and easier to answer. For instance, Carmel's (2011) studies with older people, the use of a measure asking participants directly how much they desire to live longer (a single item ranging from 1 to 5), were a very good predictor of important outcomes such as subjective well-being and survival among older people. Given the relative ease of this measure, it might provide a valid alternative for future experimental studies.

In conclusion, we believe that the present research makes important contributions both to the priming literature and the literature on older people's medical decisions. The evidence shows that the subtle activation of aging stereotypes can affect older people's will to live beyond just the immediate context. It also clarifies the role played by self-relevance in stereotype priming by showing that its effects are limited to specific target groups for which there is greater self-relevance, in this case, older participants. The positive finding from an intervention perspective is that not only negative but also positive stereotype activation tends to persist over time. This is consistent with other evidence that stereotypes can also be deployed positively to “boost” older people's performances and motivation in a more long-lasting manner (Swift, Abrams, & Marques, 2013).

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