“Feeling Younger, Being Stronger”: An Experimental Study of Subjective Age and Physical Functioning Among Older Adults

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Objectives. The present study is an attempt to experimentally induce a younger subjective age among older adults and to test whether they show better physical functioning when they are induced to feel younger.

Method. Participants were 49 older adults aged between 52 and 91 years. Following an initial measure of handgrip performance as an indicator of physical functioning, participants in the experimental condition received positive feedback regarding their performance compared with their same-aged peers, whereas participants in the control condition did not receive any information. Participants in both groups then completed a second handgrip measure. Subjective age was assessed before the initial handgrip task and after the experimental manipulation.

Results. Participants in the experimental group felt younger than their age and showed a significant increase in grip strength, whereas no changes in subjective age and grip strength were observed in the control condition.

Discussion. This study is among the first to induce a younger subjective age. It supports the notion that redirecting older adults’ attention to downward social comparison with same-aged peers is a promising strategy to maintain a sense of feeling younger. In addition, our results provide an initial positive answer to the question of whether feeling younger translates into better physical functioning.

Key Words: Physical function—Social comparison—Subjective age.

A growing body of research considers that subjective age, or how young or old individuals experience themselves to be, is an important marker of development (Montepare, 2009). Previous studies consistently found that on average, older adults feel younger than they actually are, even in the face of increased risk of losses in a wide range of domains (Gana, Alaphilippe, & Bailly, 2004; Kleinspehn-Ammerlahn, Kotter-Grühn, & Smith, 2008; Montepare & Lachman, 1989; Rubin & Berntsen, 2006). Although most research has focused on the predictors of subjective age (Barrett, 2003; Hubley & Russell, 2009; Westerhof & Barrett, 2005), a growing interest has been directed toward the beneficial effects of a youthful subjective age for well-being (Stephan, Caudroit, & Chalabaev, 2011; Westerhof & Barrett, 2005) and health-related outcomes (Boehmer, 2007; Demakakos, Gjonca, & Nazroo, 2007; Stephan et al., 2011), including lower mortality risk (Kotter-Grühn, Kleinspehn-Ammerlahn, Gerstorf, & Smith, 2009). Interestingly, in most of these studies, subjective age rivaled or outperformed chronological age as a predictor of psychological and health-related outcomes (Kotter-Grühn et al., 2009; Stephan et al., 2011; Westerhof & Barrett, 2005). Thus, it appears that finding ways to support a sense of feeling younger among older adults is of crucial importance given that it might indirectly lead to better health and quality of life (Kotter-Grühn et al., 2009). Therefore, in line with this assumption, the present study aims to test whether older people can be experimentally induced to feel younger, and whether such manipulation is associated with changes in their physical functioning.

Experimental Manipulation of Subjective Age

A first step of the present study was to find a means to experimentally induce a younger subjective age among older adults. Although researchers have called for experimental designs (Hubley & Russell, 2009; Montepare, 2009), only a few studies have attempted to manipulate subjective age. For instance, Eibach, Mock, and Courtney (2010) found that middle-aged and older adults can be induced to feel older by manipulating two different kinds of aging-related phenomena: vision decline and generation gap. More precisely, participants feel significantly older when they receive no explanation of the source of a visual disfluency, and when they experience a gap between their cohort and younger ones, manipulated by varying information participants received about a list of unfamiliar symbols. However, this study focused only on the induction of an older subjective age and did not consider how to generate a younger subjective age. Furthermore, subjective age was not measured before the experimental manipulation of
aging-related phenomenology. Given that a between-group design was used, it is therefore not clear whether the between-group differences found in subjective age were already present at baseline or whether they were attributable to the experimental manipulation per se. In other words, it is difficult to conclude whether the manipulation used by Eibach and colleagues really induced changes in subjective age. A recent study by Kotter-Grühn and Hess (2012) addressed some of the previously mentioned shortcomings, with subjective age measured before and after an experimental manipulation (specifically, the induction of positive, negative, or no age stereotypes). However, whereas the induction of negative age stereotypes generated older subjective ages, the induction of positive age stereotypes did not generate younger subjective ages.

Social Comparison and Subjective Age

In this study, we reasoned that a manipulation of information reflecting social comparison with same-aged peers may be a useful means to induce a youthful subjective age. In the context of aging, social comparison with same-aged peers serves a crucial self-enhancing function (Cheng, Fung, & Chan, 2007; Frieswijk, Buunk, Steverink, & Slaets, 2004). When older adults are faced with negative age-related changes in important domains such as health, they are more likely to compare themselves with others who are worse off through downward social comparisons, resulting in higher life satisfaction (Frieswijk et al., 2004) and self-rated health (Cheng et al., 2007). For example, Cheng and colleagues (2007) found that a decrease in self-rated health gives rise to a greater use of social comparison to enhance the physical self, which partially buffers against the negative effect of physical symptoms on self-rated health. With regard to subjective age, and using a cross-sectional design, Barrett (2003) reported that more favorable assessments of one’s health compared with peers are related to more youthful age identities. In the same vein, and drawing upon the same design, analyses conducted by Infurna, Gerstorf, Robertson, Berg, and Zarit (2010) revealed that among individuals who believe that their health is better than that of other people of their age, a large majority said they felt younger than their age. Taken together, these studies suggest that an experimental manipulation of information reflecting social comparison with same-aged peers is likely to be associated with changes in older individuals’ subjective age.

Subjective Age and Physical Functioning

A complementary purpose of the present study was to fill a gap in existing literature by examining whether older individuals show better physical functioning, as assessed by a physical performance measure, when they are experimentally induced to feel younger. Despite existing evidence that subjective age is related to indicators of successful aging, the extent to which feeling younger or older than one’s age translates into physical functioning has not been yet investigated (Kleinspehn-Ammerlahn et al., 2008; Montepare, 2009). In addition, to date, the bulk of existing research has been correlational and cross-sectional in nature, which limits the understanding of the consequences of subjective age. However, there are reasons to expect that an experimental manipulation inducing people to feel younger may result in better physical functioning. Indeed, individuals who feel younger than their chronological age experience better health-related outcomes, including lower mortality risk (Kotter-Grühn et al., 2009). In addition, younger subjective ages can counteract negative aging stereotypes, which are known to have adverse effects on physical outcomes (Eibach et al., 2010; Levy, 2003). Furthermore, a youthful subjective age is related to higher self-efficacy (Stephan et al., 2011), which protects against functional limitations (Rejeski, Miller, Foy, Messier, & Rapp, 2001).

The Present Research

The present study is an attempt to experimentally induce a younger subjective age among older adults and to test whether they show better physical functioning, illustrated by the performance on a handgrip task, when they are induced to feel younger. Handgrip strength is a surrogate measurement of overall physical functioning, which consistently predicts health-related outcomes such as premature mortality, disability, and other health-related complications among middle-aged and older adults (Ling et al., 2010; Rantanen et al., 2000). In line with the self-enhancing function of social comparison processes among older adults (e.g., Cheng et al., 2007; Frieswijk et al., 2004), we hypothesized that the manipulation of social comparison information according to which one is stronger than others is associated with older individuals’ tendency to feel younger than their chronological age. In addition, drawing upon the positive health-related outcomes associated with a younger subjective age (e.g., Kotter-Grühn et al., 2009) and its protective role from the influence of negative aging stereotypes (e.g., Eibach et al., 2010), it was expected that individuals induced to feel younger through the social comparison information would demonstrate a stronger grip than at baseline.

Method

Participants

Participants were recruited through advertisements and flyers in community centers and senior clubs in the Grenoble area, France. Forty-nine older adults (75.5% women) aged 52–91 years (Mage = 74.43, SD = 9.70) living independently in the community agreed to participate. No compensation was offered for participating in the study. Given that the handgrip task requires an intense physical and potentially...
painful effort, only individuals with medical approval for physical exercise, free from severe shoulder, elbow, and hand pathologies, and free from complete or partial hemiplegia were eligible to participate. Volunteers were first asked whether a doctor ever told them that they had any of the previously mentioned conditions, or any other health condition, and whether they had medical disapproval for physical exercise. Although most participants reported common age-related conditions (e.g., arthritis, hypertension, heart condition), none suffered from pathologies, disease, or problems preventing them from performing the handgrip task. In addition, none had medical disapproval for physical exercise. Therefore, all volunteers were considered as being eligible to participate in the study.

Measures

Background variables.—Age (in years), sex, and education rated on a scale from 1 (did not finish school) to 5 (graduated from university) were assessed. In addition, level of self-rated health was assessed at baseline to control for potential differences between the experimental and the control groups. In line with existing research (e.g., Benyamini, Leventhal, & Leventhal, 2003), self-rated health was assessed with a single item: “As a whole, how do you rate your current health?” with a Likert-type answering scale ranging from 1 (poor) to 6 (excellent).

Subjective age.—Felt age was assessed twice, namely at baseline and following the first handgrip test. Drawing upon existing research (Kleinspehn-Ammerlahn et al., 2008; Kotter-Grühn et al., 2009; Rubin & Berntsen, 2006; Westerhof & Barrett, 2005), participants were asked to indicate how old they feel on an age scale ranging from 0 to 120 years. There were slight differences in item formulation between the two assessments, with participants being asked to indicate the age they feel most of the time at baseline, and the age they feel at this moment following the first test. In line with prior studies (Eibach et al., 2010; Kotter-Grühn & Hess, 2012; Rubin & Berntsen, 2006), subjective age was measured by age discrepancy as a proportion of chronological age: Participants’ felt age was subtracted from their chronological age, and these difference scores were divided by chronological age. A positive value denotes a youthful subjective age, and a negative value represents an older subjective age.

Handgrip strength.—A Takei Grip Strength Dynamometer (TK-200, Takei Co. Ltd., Tokyo) was used to measure muscular strength. In both trials, participants stood in an upright position with the arm of interest unsupported and parallel to the body. They were instructed to squeeze the handgrip as hard as they could using their dominant hand and were informed that they were free to stop whenever they wanted. Performance was indicated by maximal voluntary contraction recorded in kilograms.

Procedure

The research procedure was approved by the University of Grenoble’s research ethics board. Participants were assessed individually in quiet rooms in senior clubs. They were told that the study was interested in the development of an instrument for health evaluation, and that their anonymity would be guaranteed. Participants were further informed that their performance would be measured twice. After giving informed consent, they were randomly assigned to one of two experimental conditions: social comparison or control condition.

Firstly, participants filled out a background questionnaire, including the baseline subjective age question. Next, they read a paper providing background information about the study. The first part of that paper highlighted the importance of screening tool development in medical research and described the handgrip task measure. More specifically, participants read that the grip strength test, which evaluates overall muscle strength, is a reliable indicator of individual level of fitness, and as such it may help identify people at increased risk of health deterioration. The second part of the paper explained that scientific evidence supports a relationship between low handgrip strength and premature mortality, disability, and other health-related complications among various samples of middle-aged and older people. Given that the self-enhancement function of social comparison is more likely for attributes that are considered important to the self (Cheng et al., 2007; Heckhausen & Brim, 1997), the purpose of this description was to increase the value of the handgrip task by emphasizing the importance of performing well for one’s health. Indeed, research shows that health becomes an increasingly important life goal with advancing age (Freund, 2006; Heckhausen, 1997), and as a result self-enhancement through social comparison is strengthened among older adults when it concerns health-related domains (e.g., Cheng et al., 2007; Heckhausen & Brim, 1997). Subjective age was assessed before reading the paper to avoid any influence of the instructions on this baseline measure (e.g., stereotype-threat or self-stereotyping, O’Brien & Hummert, 2006).

Participants then performed the handgrip task (baseline performance) without knowing what their actual performance was. Following this task, participants in the experimental condition were informed that the study assessed the average grip strength in the general population. Then, drawing upon previous social comparison studies (e.g., Heckhausen & Brim, 1997; Zell & Aliche, 2009), social comparison was introduced verbally by the experimenter by telling participants that their test performance was higher than the performance of 80% of same-aged peers, and that they were stronger than most people their age. This feedback emphasized a comparison with same-aged peers given...
that older individuals rely on age stereotypes in their assessments of themselves (Heckhausen & Brim, 1997). Participants in the control condition did not receive any feedback, nor any information or comment about their performance.

Next, they were asked to provide their impressions on the test. The questionnaire included filler items about the perceived difficulty and pain of the assessment and their opinion about medical research. A second subjective age question was inserted in this questionnaire (postmanipulation subjective age). Manipulation check items required participants to recall how well they performed relative to people their age and to indicate whether they personally thought the handgrip task is an important tool for screening health problems. This last item was used to identify whether the task was perceived as intended: diagnostic of health and important. Moreover, it allowed screening for potential suspicion about the task and the real purpose of the research.

After completing the questionnaire, participants performed the handgrip task for the second time (postmanipulation performance). Time elapsed between the first and second trial was recorded in seconds in order to control for time of recovery. Finally, participants were debriefed. They were informed about the true purpose of the research, the broad area of research, and the stakes associated with such research. We also provided explanations for the use of the specific study design. Any questions were answered.

**Results**

**Manipulation Check**

All participants in the experimental condition reported that their performance on the handgrip test was higher than the performance of most people of their age, indicating that the manipulation of social comparison was successful. In the whole sample, six participants were excluded from further analysis because they did not think that the dynamometer was important for screening health problems. Thus, data from 43 participants, 22 (73% women) in the experimental group and 21 (76% women) in the control condition, were analyzed. The small number of men in both experimental group and 21 (76% women) in the control further analysis because they did not think that the dynamometer was important for screening health problems. This last item was used to identify whether the task was perceived as intended: diagnostic of health and important. Moreover, it allowed screening for potential suspicion about the task and the real purpose of the research.

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**Preliminary Analysis**

Descriptive statistics are presented in Table 1. Independent sample t tests revealed no significant differences between the experimental and control groups for age, t(41) = -0.96, p = .34, education, t(41) = .73, p = .47, and self-rated health, t(41) = -0.38, p = .70. More importantly, groups did not differ in their baseline proportional age discrepancy, t(41) = 0.13, p = .89, nor in their baseline grip strength, t(41) = 0.31, p = .76. Taken together, these results indicate that the random assignment was correctly carried out. In addition, the experimental and control groups did not differ in terms of time elapsed between the two trials, t(41) = -0.14, p = .88. At baseline, only self-rated health was related to subjective age (r = 0.42, p < .01), and only chronological age was significantly related to grip strength (r = -0.35, p < .05).

**Main Analyses**

The influence of social comparison information on subjective age was tested using a Mixed Measures Analysis of Variance (ANOVA) with Group (experimental vs. control) as the between-participant factor and Time (baseline vs. postmanipulation) as the within-participant factor. Results revealed a significant Group-by-Time interaction, F(1, 41) = 5.54, p = .02, η² = 0.12. Follow-up Newman–Keuls comparisons showed that, as predicted, the proportional age discrepancy significantly increased from baseline to postmanipulation assessment in the experimental group (p < .01), whereas it remained stable in the control group (p = .98; see Figure 1). More specifically, participants exposed to a

Table 1. Descriptive Statistics for the Control and Experimental Group

<table>
<thead>
<tr>
<th></th>
<th>Control group (n = 21)</th>
<th>Experimental group (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years)</td>
<td>M = 24.21 SD = 8.71</td>
<td>M = 24.98 SD = 7.62</td>
</tr>
<tr>
<td>Education</td>
<td>M = 2.62 SD = 1.02</td>
<td>M = 2.86 SD = 1.17</td>
</tr>
<tr>
<td>Self-rated health</td>
<td>M = 4.38 SD = 0.74</td>
<td>M = 4.27 SD = 1.08</td>
</tr>
<tr>
<td>T1 proportional age discrepancy</td>
<td>M = 0.075 SD = 0.07</td>
<td>M = 0.079 SD = 0.08</td>
</tr>
<tr>
<td>T2 proportional age discrepancy</td>
<td>M = 0.076 SD = 0.07</td>
<td>M = 0.110 SD = 0.08</td>
</tr>
<tr>
<td>T1 grip strength (in Kilograms)</td>
<td>M = 24.21 SD = 8.71</td>
<td>M = 24.98 SD = 7.62</td>
</tr>
<tr>
<td>T2 grip strength (in Kilograms)</td>
<td>M = 23.53 SD = 9.22</td>
<td>M = 26.02 SD = 7.64</td>
</tr>
<tr>
<td>Time elapsed (in seconds)</td>
<td>M = 228.40 SD = 70.20</td>
<td>M = 224.95 SD = 79.83</td>
</tr>
</tbody>
</table>

*Notes. T1 = Baseline assessment; T2 = Postmanipulation assessment.

Proportional age discrepancy = (chronological age – subjective age)/chronological age. A positive value denotes a younger subjective age. For instance, a value of 0.110 means that participants feel 11% younger than they actually are.

![Figure 1. Change in proportional age discrepancy in the experimental and control conditions.](http://psychologicalscience.org/article/10.1016/j.psci.2016.07.004)
favorable social comparison feedback presented on average a 3% increase in their proportional age discrepancy. Thus, consistent with our hypothesis, the experimental manipulation of social comparison led them to feel younger.

Next, analysis of the grip strength showed a significant Group-by-Time interaction, $F(1, 41) = 8.61, p = .005, \eta^2_p = 0.17$. As expected, post hoc Newman–Keuls test revealed that grip strength significantly increased between the first and second trial for participants in the experimental group ($p < .05$), whereas no significant change was observed in the control group ($p = .10$; see Figure 2). This result supports our hypothesis according to which an experimental manipulation inducing people to feel younger leads to an increase in grip strength.

**Discussion**

In line with a growing interest for the implications of subjective age (e.g., Kotter-Grühn et al., 2009; Montepare, 2009), the purpose of the present study was to experimentally induce a younger subjective age and to test whether older adults show better physical functioning as measured by the performance on a handgrip task, when they are induced to feel younger. Results confirmed our hypothesis and revealed that people felt younger after the induction of social comparison through positive performance feedback than before the manipulation. As a whole, this study contributes to existing knowledge, given that it is among the first research to induce a younger subjective age. Furthermore, in contrast to Eibach and colleagues (2010), baseline subjective age, measured before the experimental manipulation, was investigated to obtain a more accurate picture of change in this dimension resulting from social comparison feedback. This result suggests that seeing oneself as stronger than same-aged peers on a handgrip task has an enhancing effect on subjective age. This is consistent with existing research on the positive effects of social comparison among older adults (Cheng et al., 2007; Frieswijk et al., 2004) and with previous studies on the relationships between youthful subjective age and favorable comparisons of one’s health with the health of peers (Barrett, 2003; Infurna et al., 2010).

In addition, our finding supports the assumption that redirecting older adults’ attention to downward social comparison with same-aged peers may be a promising strategy to maintain a sense of feeling younger (e.g., Kotter-Grühn et al., 2009).

Consistent with the second hypothesis, results revealed a significant increase in grip strength when older individuals were induced to feel younger. This finding provides an initial positive answer to the question of whether feeling younger translates into better physical functioning (e.g., Kleinspehn-Ammerlahn et al., 2008). Furthermore, it adds to the existing finding that holding a youthful subjective age is associated with indicators of successful aging (Demakakos et al., 2007; Kotter-Grühn et al., 2009). There are several potential explanatory pathways for this relation, and each of them deserves attention in future research. Firstly, increases in self-efficacy and effort may explain why an increase in grip strength was observed among older adults induced to feel younger. More precisely, a youthful subjective age has been positively associated with both general and specific self-efficacy (Boehmer, 2007; Stephan et al., 2011). Therefore, older people induced to feel younger may experience higher self-efficacy and invest more effort in the task, leading to higher performance. In addition, previous research has found that positive and negative age stereotypes tended to have a beneficial or adverse effect, respectively, on a variety of physical and cognitive outcomes (Levy, 2009; Levy & Leifheit-Limson, 2009). Given that identifying oneself with a younger subjective age protects against the deleterious effects of negative aging stereotypes (Eibach et al., 2010; Westerhof & Barrett, 2005), it is likely that individuals induced to feel younger may also reject these stereotypes and adopt counter-stereotypical behavior. Future experimental studies are needed to test whether a youthful subjective age may mitigate the deleterious influence of negative aging stereotypes and amplify the positive impact of positive aging stereotypes on older adults’ behavior and functioning. As a whole, further research is needed to replicate the present findings and to test for these hypothesized processes explaining why inducing older people to feel younger may lead to better physical functioning.

Contribution to the literature notwithstanding, the current study has several limitations that should be considered in future research. Firstly, the small sample size prevents us from using more detailed analyses. In particular, we cannot rule out that the increase in grip strength is attributable to the manipulation of favorable social comparison information. Thus, further research with larger samples is needed to disentangle the effects of social comparison from the effects of the changes in subjective age and to allow a complete test of the causal chain linking the experimental manipulation, changes in subjective age, and changes in physical functioning. In addition, a positive social comparison with same-aged peers may have a number of effects that might...
account for the results. More precisely, we cannot rule out that the increase in grip strength is attributable to an increase in perception of one’s strength resulting from the manipulation of favorable social comparison information. In other words, the manipulation of a social comparison information according to which one is stronger than others may lead participants to perceive themselves as stronger than at baseline, leading them to invest higher effort in the task, resulting in a stronger grip. Future studies must control for changes in this variable to identify more precisely whether changes in subjective age are related to changes in physical functioning. In addition, these studies may test whether individuals induced to feel younger exert more effort in the task, assessed through time spent squeezing the handgrip.

Given that our sample was mainly composed of women, this study did not allow for gender comparisons. Although previous studies have reported that subjective age did not differ between men and women (Infurna et al., 2010; Rubin & Berntsen, 2006), one important issue would be to test for gender differences in the extent to which subjective age changes as a result of social comparison processes. The between-group design used in this study involved only one experimental group, exposed to an extremely positive social comparative feedback, and a control group, without feedback exposure. It would be interesting to also expose participants to a moderately positive social comparative feedback (i.e., performing better than 50% of same-aged peers) to provide an in-depth identification of the enhancing effects of social comparison on subjective age. Consistent with existing evidence (e.g., Gana et al., 2004; Rubin & Berntsen, 2006; Uotinen, Rantanen, Suutama, & Ruoppila, 2006), the majority of participants in the present study already harbor a youthful subjective age at baseline, certainly because the sample was composed of relatively healthy individuals, living independently in the community and free from severe functional and cognitive impairment. Future research must test whether results generalize to individuals with older subjective ages and to unhealthy older people. Furthermore, an important avenue of research lies on the generalization of the present findings to other indicators of physical functioning, such as walking speed (Tolea et al., 2010), and to cognitive functioning, illustrated by memory performance. Finally, the negative implications of manipulating subjective age if the manipulation is not aligned with reality need further exploration. Indeed, one must be cautious about the danger associated with telling individuals that they performed better than most of their same-aged peers in a domain in which they objectively encounter difficulties and/or display low performances.

Despite these limitations, the present study adds to the growing interest in gerontological research regarding the implications of subjective age for behavioral and physical functioning (e.g., Eibach et al., 2010; Montepare, 2009). From a practical point of view, it suggests that interventions that promote a younger subjective age, through positive performance feedback and support, may be promising strategies to enhance physical functioning and health-related outcomes among older adults. The findings that subjective age can vary experimentally (cf. Kotter-Grühn & Hess, 2012) and that individuals show higher physical functioning when they are induced to feel younger pave the way for future research interested in manipulating the age older adults feel and demonstrating that subjective age may be a strong predictor of successful aging.

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that promote a younger subjective age, through positive implications of subjective age for behavioral and physical or display low performances.


