HHS Public Access

Author manuscript

J Am Geriatr Soc. Author manuscript; available in PMC 2017 November 01.

Published in final edited form as:

J Am Geriatr Soc. 2016 November ; 64(11): e228–e230. doi:10.1111/jgs.14452.

Negative age stereotypes' association with accelerated cellular aging: Evidence from two cohorts of older adults

Robert H. Pietrzak, PhD, MPH[1,2], **Yong Zhu, PhD**[3], **Martin D. Slade, MPH**[4], **Qiaochu Qi, MPH**[3], **John H. Krystal, MD**[1,2], **Steven M. Southwick, MD**[1,2], and **Becca R. Levy, PhD**[3]

[1]U.S. Department of Veterans Affairs National Center for Posttraumatic Stress Disorder, Clinical Neurosciences Division, VA Connecticut Healthcare System, West Haven, CT, USA

[2]Department of Psychiatry, Yale University School of Medicine, New Haven, CT, USA

[3]Yale School of Public Health, New Haven, CT, USA

[4]Department of Internal Medicine, Yale University School of Medicine, New Haven, CT

Introduction

Negative age stereotypes, which are defined as disparaging beliefs about older persons as a category, have been linked to increased rates of physical and cognitive decline, and mortality in older adults.[1–5] To date, however, no known study has evaluated whether these stereotypes are associated with shorter telomere length, a marker of accelerated cellular aging that provides a cumulative measure of cell divisions, and exposures to genotoxic and cytotoxic processes such as oxidation and inflammation.[6] Characterization of this association may provide insight into a possible molecular mechanism linking negative age stereotypes to accelerated functional decline and mortality, and inform prevention and treatment strategies designed to mitigate functional decline and preserve quality of life in older persons.

We evaluated the hypothesis that negative age stereotypes would be associated with shorter telomere length in two diverse cohorts of older adults at elevated risk of stress compared to their same-aged peers: older U.S. military veterans, who have higher rates of exposure to traumatic life events such as combat; and older adults who recently experienced an acute myocardial infarction (AMI).

Corresponding author: Robert H. Pietrzak, PhD, MPH, U.S. Department of Veterans Affairs National Center for Posttraumatic Stress Disorder, Clinical Neurosciences Division, VA Connecticut Healthcare System; Department of Psychiatry, Yale University School of Medicine, 950 Campbell Avenue 151E, West Haven, CT, Tel: 860-638-7467; Fax: 203-937-3481; robert.pietrzak@yale.edu.

Author Contributions: Drs. Pietrzak and Levy conceptualized and designed the study and wrote the first draft of the manuscript. Drs. Pietrzak, Levy, Krystal, and Southwick and Ms. Qi acquired the data, interpreted the data, and revised the manuscript. Dr. Pietrzak and Mr. Slade conducted the statistical analyses.

Methods

Participants

Two cohorts of community-dwelling individuals, 60 years and older, were included in this study. The first sample (n=335) participated in the National Health and Resilience in Veterans Study (NHRVS), a nationally representative, prospective cohort study of U.S. military veterans. Post-stratification weights were applied in analyses to ensure generalizability of results to the U.S. veteran population. The second sample (n=148) experienced an AMI in the preceding two weeks and was recruited from four hospitals in two major Connecticut cities. Inclusion criteria included meeting the Enhancing Recovery in Coronary Heart Disease study definition, and a score of at least six on the Short Portable Mental Status Questionnaire. Local institutional review boards approved both studies and all participants provided informed consent.

At the baseline assessment of both studies, age stereotypes were assessed using a three-item version of the Expectations Regarding Aging-12 Survey,[7] which assesses age stereotypes in physical, mental health, and cognitive domains. These items (i.e., “Every year that people age, their energy levels go down a little more” [physical aging stereotype]; “It’s normal to be depressed when you are old” [mental health aging stereotype]; “Forgetfulness is a natural occurrence just from growing old” [cognitive aging stereotype]), which had the highest magnitude loadings with respective factors assessing physical, mental, and cognitive age stereotypes,[7] were summed to yield a measure of negative age stereotypes (range=0–9). Oragene DNA (OG-250) kits were used to collect saliva samples at a four-year follow-up in the veteran sample and one-year follow-up in the AMI sample; telomere length was determined using a fluorescence-based quantitative polymerase chain reaction assay.[8] A ratio between the Ct values of each experimental sample and the Ct values of the reference gene standards was established. The final relative Ct ratio was determined by dividing the Ct telomere value by the Ct reference gene value for each sample. Ratios <1 were coded as shorter telomere length and ratios ≥ 1 were coded as normal length.

Data analysis

Descriptive statistics were computed to summarize demographic and clinical characteristics of both samples. Binary logistic regression analyses were then conducted to evaluate predictors of telomere length. ERA scores were entered as an independent variable and telomere length (classified as ≥1 [normal length] or <1 Ct ratio [short length] in sample DNA relative to a human commercial DNA comparator) was entered as the dependent variable. Covariates are shown in the Table 1 footnote.

Results

Table 1 shows sample characteristics and results of analyses of predictors of short telomere length in the veteran and AMI samples. After adjustment for covariates, greater ERA scores were independently associated with short telomere length in both samples (odds ratio=1.30 in the Veteran sample and 1.33 in the Heart Attack sample).

Discussion

As hypothesized, negative age stereotypes predicted shorter telomere length. This association emerged in two diverse cohorts and was independent of sociodemographic characteristics as well as a broad range of physical and mental-health indicators. Specifically, each point increase on the negative-age-stereotype measure (range=0–9 points) was associated with a 30–33% increased likelihood of having shorter telomeres.

In this study, we were not able to examine the direction of the association between negative age stereotypes and telomere shortening; however, previous research suggests that age stereotypes, which tend to be established early in life, precede changes in health outcomes and functioning.[1–5, 10] Further research is needed to examine interrelationships between serial measures of negative age stereotypes and telomere length; determine mechanisms linking age stereotypes to reduced telomere length; and evaluate the benefits of age-stereotype interventions for telomere length, other markers of physiological aging, and overall health and functioning.

Possible mechanisms, suggested by previous research, that may explain our findings include increased stress reactivity, lower self-efficacy, and reduced engagement in healthy behaviors.[1, 2, 10] Given that negative age stereotypes can be modified with exposure to implicit age stereotypes,[9] such interventions may help prevent premature cellular aging as well as age-related functional decline.[1–3, 10]

Acknowledgments

Funding Sources: The U.S. Department of Veterans Affairs National Center for Posttraumatic Stress Disorder supported The National Health and Resilience in Veterans Study. Grants from the National Institute on Aging (AGR01AG032284) and the National Heart, Lung and Blood Institute (R01HL089314) supported the cardiovascular study.

Sponsor's Role: None of the sponsors had a role in the design, methods, subject recruitment, data collections, analysis or preparation of the paper.

Appendix

Conflict of Interest Disclosures: Below is a checklist for all authors to complete and attach to their papers during submission.

Elements of Financial/Personal Conflicts	Pietrzak		Zhu		Slade		Krystal	
	Yes	No	Yes	No	Yes	No	Yes	No
Employment or Affiliation		X		X		X		X
Grants/Funds		X		X		X		X
Honoraria		X		X		X		X
Speaker Forum		X		X		X		X
Consultant		X		X		X		X

Elements of Financial/Personal Conflicts	Pietrzak		Zhu		Slade		Krystal	
	Yes	No	Yes	No	Yes	No	Yes	No
Stocks		X		X		X		X
Royalties		X		X		X		X
Expert Testimony		X		X		X		X
Board Member		X		X		X		X
Patents		X		X		X		X
Personal Relationship		X		X		X		X

*Authors can be listed by abbreviations of their names.

For "yes" x mark(s): give brief explanation below:

Elements of Financial/Personal Conflicts	Southwick		Levy		Qi			
	Yes	No	Yes	No	Yes	No	Yes	No
Employment or Affiliation		X		X		X		
Grants/Funds		X		X		X		
Honoraria		X		X		X		
Speaker Forum		X		X		X		
Consultant		X		X		X		
Stocks		X		X		X		
Royalties		X		X		X		
Expert Testimony		X		X		X		
Board Member		X		X		X		
Patents		X		X		X		
Personal Relationship		X		X		X		

*Authors can be listed by abbreviations of their names.

For "yes" x mark(s): give brief explanation below:

References

1. Levy BR. Mind matters: cognitive and physical effects of aging self-stereotypes. The Journal of Gerontology Series B, Psychological Sciences and Social Sciences. 2003; 58:P203–P211.
2. Levy BR, Ferrucci L, Zonderman AB, Slade MD, Troncoso J, Resnick SM. A culture-brain link: Negative age stereotypes predict Alzheimer's disease biomarkers. Psychology and Aging. 2016; 31:82–88. [PubMed: 26641877]
3. Levy BR, Slade MD, Kunkel SR, Kasl SV. Longevity increased by positive self-perceptions of aging. Journal of Personality and Social Psychology. 2002; 83:261–270. [PubMed: 12150226]
4. Levy BR, Zonderman AB, Slade MD, Ferrucci L. Age stereotypes held earlier in life predict cardiovascular events in later life. Psychological Science. 2009; 20:296–298. [PubMed: 19222809]
5. Allen JO. Ageism as a Risk Factor for Chronic Disease. The Gerontologist. 2015

6. Blackburn EH, Epel ES, Lin J. Human telomere biology: A contributory and interactive factor in aging, disease risks, and protection. Science. 2015; 350:1193–1198. [PubMed: 26785477]
7. Sarkisian CA, Steers WN, Hays RD, Mangione CM. Development of the 12-item Expectations Regarding Aging Survey. The Gerontologist. 2005; 45:240–248. [PubMed: 15799989]
8. Cawthon RM. Telomere measurement by quantitative PCR. Nucleic Acids Research. 2002; 30:e47. [PubMed: 12000852]
9. Levy BR, Pilver C, Chung PH, Slade MD. Subliminal strengthening: improving older individuals' physical function over time with an implicit-age-stereotype intervention. Psychological Science. 2014; 25:2127–2135. [PubMed: 25326508]
10. Levy B. Stereotype embodiment: A psychosocial approach to aging. Current Directions in Psychological Science. 2009; 18:332–336. [PubMed: 20802838]

Table 1

Association of Negative Age Stereotypes with Shorter Telomere Length In Adjusted Binary Logistic Regression Model with American Military Veterans (n=335) and Older Adults who Recently Experienced a Heart Attack (n=148)

American Military Veterans (n=335)		
	Mean (SD) or n (weighted %)	**Odds Ratio (95%CI)**
Negative age stereotypes	**4.8 (1.6)**	**1.30 (1.08–1.57)****
Age	70.6 (6.7)	1.01 (0.97–1.04)
Male sex	328 (96%)	2.36 (0.63–8.87)
White race	298 (84%)	1.02 (0.40–2.56)
Hispanic ethnicity	13 (7%)	1.78 (0.54–5.89)
Some college or higher education	288 (66%)	0.79 (0.43–1.45)
Married/cohabiting	275 (81%)	1.11 (0.56–2.21)
Combat veteran	128 (33%)	1.20 (0.65–2.23)
Number of years in military	6.6 (7.8)	1.03 (1.00–1.07)
Number of traumas	4.8 (3.8)	1.01 (0.93–1.09)
Lifetime PTSD or depression	44 (11%)	2.02 (0.84–4.87)
Lifetime alcohol or drug use disorder	**61 (20%)**	**2.23 (1.03–4.85)***
Lifetime nicotine dependence	**74 (21%)**	**2.35 (1.23–4.50)***
Current depression symptoms	0.2 (0.8)	0.86 (0.65–1.13)
Body mass index	**28.5 (4.8)**	**0.93 (0.88–0.99)***
Charlson Comorbidity Index	4.2 (1.7)	1.04 (0.87–1.23)
Heart Attack Survivors (n=148)		
	Mean (SD) or n (%)	Odds Ratio (95%CI)
Negative age stereotypes	**7.3 (1.9)**	**1.33 (1.01–1.77)***
Age	70.1 (7.1)	0.98 (0.89–1.08)
Male sex	92 (62%)	1.49 (0.41–5.26)
White race	134 (90%)	2.33 (0.29–20.00)
Hispanic ethnicity	17 (11%)	1.26 (0.22–7.29)
Some college or higher education	83 (56%)	0.68 (0.21–2.18)
Married/cohabiting	85 (57%)	0.25 (0.05–1.15)
Lifetime depression history	10 (7%)	0.16 (0.02–1.05)
Elevated alcohol use	8 (5%)	2.45 (0.01–453.31)
Ever smoked cigarettes	**96 (65%)**	**4.16 (1.34–12.91)***
Body mass index	**29.9 (6.6)**	**0.91 (0.84–0.99)***
Charlson Comorbidity Index	5.2 (2.1)	1.24(0.87–1.75)
STEMI score	66 (45%)	2.58 (0.80–8.28)

Note. Variables that were significantly associated with shorter telomere length are highlighted in bold:

*p<0.05,

**p<0.01;

95%CI=95% confidence interval. A total 18% (n=85) of the veteran sample and 84% (n=124) of the AMI sample had short telomeres. Negative age stereotypes score range=0–9. In the Veteran sample, The Trauma History Screen, Mini Neuropsychiatric Interview, Fagerström Test for Nicotine Dependence, and PTSD Checklist were used to assess traumatic life events and lifetime psychiatric comorbidities. Charlson Comorbidity Index was derived from endorsement of lifetime medical conditions (range 0–20) that were diagnosed by a healthcare professional (e.g., diabetes). Current depressive symptoms were assessed using the Patient Health Questionnaire-2 (score range 0–6). In the Heart Attack sample, trained nurses ascertained lifetime depression history, alcohol use, smoking history, and ST Segment Elevation Myocardial Infarction (STEMI) from medical records.