Aging stereotypes must be taken into account for the diagnosis of prodromal and early Alzheimer's disease

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Corresponding author:

Isabelle Régner

Aix Marseille Université, CNRS, LPC UMR 7290

3 Place Victor Hugo, Case D

CS 80249

13331 Marseille cedex 03, France

e-mail: isabelle.regner@univ-amu.fr

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INTRODUCTION

Because of the lengthening of life expectancy, older people are more concerned with the effects of aging and the possibility of getting Alzheimer's Disease (AD). Such a concern already results in a growing demand for standardized neuropsychological testing, which raises the still challenging issue of accurate early diagnosis of AD.[1] Although under-diagnosis is frequently presented as the main problem, the opposite error—over-diagnosis—is also likely. Many individuals diagnosed with amnestic Mild Cognitive Impairment (aMCI)—the prodromal state of AD, do not convert to AD, some patients remaining stable and others even reversing back to normal.[2,3] A recent meta-analysis estimated that general practitioners wrongly identify dementia in 20% of their patients.[4] The resulting overdiagnosis has dramatic consequences such as unnecessary patient and family stress, risk of side effects from implementation of ineffective therapies, and undue financial costs.[1]

Here, we argue that an important source of bias during neuropsychological screening comes from negative aging stereotypes (e.g., the culturally shared beliefs that aging inescapably causes severe cognitive decline and diseases). It is noteworthy that we are not talking about stereotypes from the perpetrator's perspective, but instead from the target's perspective, that is, from older adults themselves, be they healthy or patients diagnosed with aMCI or early AD. In addition to the normal anxiety associated with taking cognitive tests, the fear of confirming negative stereotypes may create an extra pressure that interferes with intellectual functioning and leads to perform below one's abilities. Many studies show that stigmatized people underperform when the negative stereotypes about their group are made relevant to the performance at hand, a phenomenon called "stereotype threat".[5]

PAST RESEARCH ON STEREOTYPE THREAT IN HEALTHY OLDER ADULTS

Since 1995, stereotype threat effects have been largely demonstrated for many stigmatized groups in various domains of ability through more than 500 scientific publications (PsychInfo, PsychArticle, and Psychology and Behavioral Sciences Collection databases): women in math and science domains, ethnic minorities in intellectual domains, white males in athletics, students from lower socioeconomic status in intellectual domains, and healthy older adults in memory domain. In previous research among healthy older adults, stereotype threat significantly impaired their memory performance (on free, cued and/or recognition-based recall) when performance differences between younger and older adults were highlighted, or when the aging stereotype about memory was implicitly activated using priming techniques.[6] Ironically, the effects of stereotype threat on older adults' memory performances are fairly easy to produce with the instructions typically used in clinics to prepare a person for memory testing.[7] For instance, there is evidence that simply emphasizing the memory component of the test may produce performance differences between older and younger adults. These differences are indeed eliminated when the memory component of the test is de-emphasized or when the test is presented as age-fair.

In all these studies, reduced threat was associated with reduced difference in performance between older and younger participants, with sometimes no difference at all, indicating how powerful aging stereotypes can be. These stereotype threat effects have proved more likely in "young-old" adults (60 to 70 years of age) compared with "old-old" adults (above 70), possibly reflecting the greater salience of membership in the stereotyped category of older adults in those who just entered this category. Likewise, young-old adults seem to be more susceptible to stereotype threat effects when they are highly educated, high in stigma consciousness or perceived stereotype threat, and when they value memory ability. Age group identification also proved to be an important factor, with older adults strongly identified to their age group

performing worse than those weakly identified. Thus, there is today little doubt that stereotype threat may account for age-related differences in memory tasks.

Recently, Mazerolle et al.[8,9] showed that simply informing older adults about the presence of younger participants (threat condition) decreased older adults' controlled access to memory and simultaneously intensified automatic response tendencies. Reduced control under threat is consistent with numerous studies indicating that stereotype threat taxes executive resources required for successful performance on complex tasks.[10] Likewise, increased reliance on automatic processes under threat is consistent with the alternative view that stereotype threat strengthens dominant or familiar responses, which are often incorrect on complex tasks.[11] Without denying that normal aging can be associated with cognitive decline, all these studies indicate that negative aging stereotypes may produce inflated age differences in memory tasks through relatively distinct yet not necessarily antagonistic mechanisms (since impaired controlled processes may coexist with increased automatic response tendencies).

Although all these previous studies offer important and interesting findings, they are limited in several ways. First, they are all lab studies that were conducted among healthy older adults. Additionally, no study to date has examined the potential contribution of stereotype threat to the diagnosis of aMCI and AD in a clinical setting during real neuropsychological testing.

PROSPECTS FOR FUTURE RESEARCH

Future research should address when and how stereotype threat can bias the neuropsychological testing used for the diagnosis of aMCI and early AD, and how to prevent such a bias (if any). We see at least three grand challenges in this area.

Challenge #1: *Stereotype Threat biases during neuropsychological testing*

We suspect that the standardized neuropsychological tests that are commonly used for the diagnoses of aMCI and AD are self-threatening and thus damaging for neuropsychological

performances due to the negative aging stereotypes they activate. If our suggestion is correct, then performance on the same neuropsychological tests should be better, in average, in a condition where instructions for tests administration remove stereotype threat. This hypothesis could be tested among three populations of older adults: 1) older adults judged "at risk" based on epidemiological criteria or by their physician based on subjective cognitive impairment/SCI; 2) patients with aMCI; and 3) patients with early AD. The performance of these three groups should be tested on neuropsychological tests commonly used for the diagnoses of aMCI and AD, under stereotype threat condition (standard instructions) and reduced-stereotype threat condition. Easily implementable psychological interventions (that proved efficient in healthy populations) can be used to reduce stereotype threat, such as de-emphasizing the memory component of the tests, or having participants write down their potential worries about the upcoming tests (i.e., expressive writing). Studies should be conducted in clinical settings (memory centers and hospitals), with neuropsychologists in charge of the screening using either the standard instructions (stereotype threat condition) or the reduced threat interventions during tests administration. If stereotype threat effects do implicitly permeate the standard neuropsychological testing and make older adults perform below their true cognitive abilities, these effects may have different consequences for the three populations of older adults considered here. First, concerning older adults at risk coming for testing for the first time, impaired performance due to stereotype threat effects could be wrongly taken as a sign of abnormal cognitive decline, hence resulting in wrongly categorizing healthy people as aMCI patients. Second, aMCI patients obtaining performance back to (or close to) normal when stereotype treat is removed would be suggestive of over-diagnosis during prior standard testing. Finally, concerning early AD patients, stereotype threat effects (if any) would be much smaller than for the two other groups. The AD diagnosis is indeed complemented by biological and neurological tests. The question is thus whether early AD patients may look more impaired

than they really are due to the threat of being reduced to the negative stereotype of AD.[12]

Challenge #2: *Vulnerability factors to Stereotype Threat*

A second challenge could be to highlight some of the main individual factors likely to make older adults, aMCI patients and AD patients more or less susceptible to stereotype threat effects during neuropsychological testing. An important factor is stereotype endorsement, that is, the degree to which the individuals endorse the beliefs that older people inescapably suffer from severe cognitive deficits and finally from AD. Another factor is related to the spontaneous demands for AD screening. The increased public awareness of AD (and other dementias) has given rise to a growing concern among middle aged and older adults about forgetfulness, occasional disorientation, or any other signs that they might interpret as reflecting abnormal decline. As a result, many older adults expressing memory complaints spontaneously (subjective cognitive impairement—SCI) search for medical screening. However, the very fact that those who want memory testing do so because they fear to have AD or other dementia, makes them particularly at risk for stereotype threat effects (and may be even more if their memory complaints are not corroborated by family members). These measures of vulnerability factors could be used as potential moderators in statistical analyses to test whether older adults/patients who endorse negative aging stereotypes, express greater aging anxiety and/or memory complaints (not corroborated by an informant) are more susceptible to experience stereotype threat during neuropsychological testing.

Challenge #3: *Identifying Neural Correlates of Stereotype Threat*

A third challenge could be to investigate the neural correlates underlying stereotype threat in older adults' performance on neuropsychological tests. The recent introduction of neuroscience methods like functional Magnetic Resonance Imaging (fMRI) to stereotype threat research has yielded promising results to deeply understand how stereotype threat affects brain activity and, in turn, cognitive performance. To date, only two stereotype threat studies have

used fMRI and were conducted among women in math[13] and visuospatial abilities (3D mental rotation[14]). Both revealed that, compared with women in the reduced threat condition, those under stereotype threat exhibited increased activation of brain regions typically involved in social and emotional processing, which coexisted with a lower activation of brain regions associated with math and mental rotation processing. These results suggest that the heightened activation of emotion regulation areas may occur at the expense of successfully recruiting task-relevant neural networks. However, no research has tested whether this differential pattern of brain regions activation reflects causality or simply covariance. Therefore, it is crucial to examine whether such a pattern of brain activation characterizes older adults under stereotype threat and causes their lower test scores during MCI or AD's screening. This neural causality issue could be further examined by investigating the functional connectivity of the emotion-regulation and task-relevant brain regions. The idea is to test whether experiencing stereotype threat leads to heightened activation of emotion-regulation brain regions among older adults, which in turn may prevent from efficient activation of task-relevant brain regions, resulting in poorer performances. This possibility could be tested again among healthy older adults, aMCI patients, and early AD patients.

CONCLUSION

Given the ample evidence that stereotype threat can lead older adults to perform below their memory abilities, the impact of negative aging stereotypes should not be neglected during formal neuropsychological screening. The three challenges described above imply research combining knowledge and techniques from experimental social psychology, cognitive psychology, and cognitive neuroscience to address medical issues through studies on healthy older adults as well as aMCI and AD patients. These studies are needed to know whether stereotype threat impairs older adults' cognitive performances during formal screening of aMCI and early AD, thereby leading to false-positive diagnosis of aMCI and, perhaps, amplification

of AD's neuropsychological symptoms. These studies may help identify individual characteristics that can make older adults more or less susceptible to stereotype threat effects during standard neuropsychological testing. They are also likely to suggest efficient methods to deactivate the influence of aging stereotypes and thereby help older people to perform at an optimal level during neuropsychological testing. Discovering that stereotype threat effects could be responsible for the 20% of false positives evidenced by the meta-analysis cited in the present introduction, [4] would be of particular importance. The ultimate stake is to offer new recommendations to healthcare professionals to improve MCI and early AD's diagnosis, which is an integral part of the current ethical debate on AD.[1]

REFERENCES

1. Le Couteur DG, Doust J, Creasey H, et al. Political drive to screen for pre-dementia: not evidence based and ignores the harms of diagnosis. *BMJ.* 2013;347:f5125
2. Ewers M, Walsh C, Trojanowski JQ, et al. Prediction of conversion from mild cognitive impairment to Alzheimer's disease dementia based upon biomarkers and neuropsychological test performance. *Neurobiol Aging.* 2012;33:1203-1214.
3. Han JW, Kim TH, Lee SB, et al. Predictive validity and diagnostic stability of mild cognitive impairment subtypes. *Alzheimers Dement.* 2012;8:553-559.
4. Mitchell AJ, Meader N, Pentzek M. Clinical recognition of dementia and cognitive impairment in primary care: a meta-analysis of physician accuracy. *Acta Psychiatr Scand.* 2011;124:165-83.
5. Steele CM. (2010). Whistling Vivaldi: And other clues to how stereotypes affect us (Issues of our time). New York, NY: Norton.
6. Lamont RA, Swift HJ, Abrams D. A Review and Meta-Analysis of Age-Based Stereotype Threat: Negative Stereotypes, Not Facts, Do the Damage. *Psychol Aging.* 2015; 30:180-193.
7. Haslam C, Morton TA, Haslam SA, et al. "When the Age Is In, the Wit Is Out": Age-Related Self-Categorization and Deficit Expectations Reduce Performance on Clinical Tests Used in Dementia Assessment. *Psychol Aging.* 2012;27:778-784.
8. Mazerolle M, Régner I, Morisset P, et al. Stereotype threat strengthens automatic recall and undermines controlled processes in older adults. *Psychol Sci.* 2012;23:723-727.
9. Mazerolle M, Régner I, Rigalleau F, et al. Stereotype Threat Alters the Subjective Experience of Memory. *Exp Psychol.* In Press.
10. Schmader T, Johns M, Forbes C. An integrated process model of stereotype threat effects on performance. *Psychol Rev.* 2008;115:336-356.

11. Jamieson JP, Harkins SG. Mere effort and stereotype threat performance effects. *J Pers Soc Psychol.* 2007;93:544-564.

12. Scholl JM, Sabat SR. Stereotypes, stereotype threat and ageing: Implications for the understanding and treatment of people with Alzheimer's disease. *Ageing Soc.* 2008;28:103-130.

13. Krendl AC, Richeson JA, Kelley WM, et al. The negative consequences of threat: An fMRI investigation of the neural mechanisms underlying women's underperformance in math. *Psychol Sci.* 2008;19:168-175.

14. Wraga M, Helt M, Jacobs E, et al. Neural basis of stereotype-induced shifts in women's mental rotation performance. *Soc Cogn Affect Neurosci.* 2007;2:12-19.