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Highlighting and Reducing the Impact of Negative Aging Stereotypes During Older Adults' Cognitive Testing --Manuscript Draft--

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TITLE:

Highlighting and Reducing the Impact of Negative Aging Stereotypes During Older Adults' Cognitive Testing

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KEYWORDS:

behavior, stereotype threat, aging, memory, neuropsychological testing, dementia, social cognition

SUMMARY:

Here, we present a protocol designed to show how negative aging stereotypes can impair memory performance of older adults during cognitive testing and how to reduce this deleterious effect. This method can help older people to perform at an optimal level during testing in both lab studies and clinical settings.

ABSTRACT:

As life expectancy increases, aging has become a major health challenge, resulting in a huge effort to better discriminate between normal and pathological cognitive decline. It is thus essential that cognitive tests and their administration are as fair as possible. However, an important source of bias during cognitive testing comes from negative aging stereotypes that can impair the memory performance of older adults and inflate age differences on cognitive tasks. The fear of confirming negative aging stereotypes creates an extra pressure among older adults which interferes with their intellectual functioning and leads them to perform below their true abilities. Here, we present a protocol that highlights simple but efficient interventions to alleviate this age-based stereotype threat effect. The first study showed that simply informing older participants about the presence of younger participants (threat condition) led older adults to underperform on a standardized memory test compared with younger participants, and that this performance difference was eliminated when the test was presented

as age-fair (reduced-threat condition). The second study replicated these findings on short cognitive tests used to screen for predementia in clinical settings and showed that teaching older adults about stereotype threat inoculated them against its effects. These results provide useful recommendations about how to improve older adults' memory assessment both in lab studies and in clinical settings.

INTRODUCTION:

A growing field of laboratory research in social cognition conducted in the healthy population has demonstrated that members of groups whose abilities are negatively stereotyped typically underperform when the negative stereotypes are made relevant to the performance at hand, a phenomenon called stereotype threat (ST). In addition to the normal anxiety associated with taking cognitive tests, the fear of confirming negative stereotypes creates extra pressure that may interfere with cognitive functioning and lead to perform below one's abilities^{1,2}. Many findings demonstrate that negative aging stereotypes (e.g., the culturally shared beliefs that aging inescapably causes severe cognitive decline and diseases such as Alzheimer's disease [AD]) contribute, at least in part, to the differences classically observed in the healthy population between younger and older adults in memory tasks³⁻⁵. Without denying the impact of aging on cognitive functioning, research clearly demonstrates that age-related stereotypes are powerful enough to artificially decrease older adults' performance on memory tests.

Detrimental age-based ST effects are readily observable and fairly easy to produce with instructional manipulations⁶, such as simply emphasizing the memory component of the test⁷⁻⁹, highlighting differences in performance between young and older adults^{10,11}, or implicitly activating negative aging stereotypes^{12,13}. Given the results obtained in laboratory studies, it is very likely that negative aging stereotypes also permeate, at least implicitly, the standard neuropsychological testing settings during the screening for pre-dementia. Indeed, because of the lengthening of life expectancy, more and more people are concerned with the possibility of getting AD or other forms of dementia. Importantly, false-positive errors are quite frequent in the diagnosis of prodromal state of AD¹⁴, which could be explained, at least in part, by transitory impaired performances in older adults due to the age-based ST phenomenon¹⁵.

For these reasons, it is important to provide efficient methods to deactivate the influence of negative aging stereotypes and thereby help older people to perform at their maximum during memory assessment in general and during neuropsychological testing specifically. Some methods, such as de-emphasizing the memory component of the test (e.g., characterizing the task as a vocabulary test), have already proved efficient to eliminate ST effects in older adults on explicit memory tests taken in the context of lab studies^{7,9,16}. However, such instructions are not compatible with the ecological clinical context of the neuropsychological testing, in which older adults come to have their memory abilities assessed. The goal of our articles is to present two methods likely to alleviate age-based ST effects among older adults, either in the lab or in the clinical contexts. The first one, especially suited for the lab context, consists in telling older adults that performance on the ongoing memory tests usually does not differ between younger and older adults (i.e., age-fair instructions). The second method, which can be implemented in both lab and clinical contexts, consists in explaining to older adults (or patients) the negative

impact of aging stereotypes, which may help them reappraise the situation, reduce evaluative pressure, and feel less threatened during the testing.

PROTOCOL:

The present research was carried out in accordance with French standards, each participant provided informed consent and procedures were consistent with the guidelines of the American Psychological Association.

1. Highlighting and reducing age-based stereotype threat on a lab memory test

1.1. Participants screening

1.1.1. Recruit participants in the desired age range (e.g., younger participants: 18–35 years old; older participants: 60–85 years old) for a study on general mental abilities and/or the impact of emotions on various cognitive tasks and questionnaires.

1.1.2. Ensure that participants are native speakers, have normal or corrected-to-normal vision and hearing, are free of neurological and psychiatric disorders, and have no current depression (Geriatric Depression Scale¹⁷) nor abnormal anxiety (State-Trait Anxiety Inventory¹⁸).

1.1.3. Screen older participants for cognitive impairment using the Mini-Mental State Examination (MMSE)¹⁹. Include older adults who meet or exceed a cutoff score corresponding to his/her age and educational level²⁰, and who live at home.

1.2. Conditions and experimental design

1.2.1. Test each participant individually at home or in local community associations' premises by an experimenter trained at neuropsychological testing.

1.2.2. Run the study as a single session, but inform participants there are two separate studies.

1.2.3. Use the "first study" as a baseline measure of participants' working memory capacity. In the "first study", minimize evaluative pressure, informing participants they will perform a cognitive task currently under elaboration. Encourage participants to do their very best²¹.

1.2.4. Use the "second study" to evaluate the impact of stereotype threat on participants' working memory capacity. That is, inform participants that they are going to perform a fully validated and diagnostic test of memory capacity.

1.2.4.1. Randomly assign participants to one of two conditions (threat versus reduced-threat conditions).

NOTE: See **Figure 1** for a visual depiction of the procedure; full details on this research were published in Mazerolle et al.²².

1.2.4.2. In the "threat condition", simply tell participant that both younger and older adults are participating in the study.

1.2.4.3. In the "reduced threat condition", tell participants that both younger and older adults are participating in the study but add that younger and older adults usually obtain the same performances on the ongoing test.

1.3. Memory tests and procedure

1.3.1. Use a validated memory test that is typically used in cognitive lab studies. Because ST effects typically occur on difficult tasks, use a difficult test, such as the reading span test²³.

1.3.2. Use two alternative versions of the reading span test (one for the "first study" and the other one for the "second" study), with different sentences but match them in number of words and in length, frequency, and number of syllables of the last word.

1.3.3. Use a reading span test that contains 42 sentences: 12 series of two to five sentences with 3 series per length.

1.3.4. Present one sentence at a time and instruct participant to read it, at his/her own pace, while memorizing the last word of the sentence.

1.3.5. Ask participant not to interrupt his reading and not to pause between two sentences.

1.3.6. Have participant to recall the words immediately after he/she finished reading the last sentence of the block considered.

1.3.7. Do not require participants' recall being serial but constrain them not to start by recalling the final word of the last sentence read. Do not limit the recall time and invite participants to find as many words as possible.

1.3.8. Do not inform participants of their errors, and do not give them a second chance to answer.

1.3.9. Compute the final score of each participant using the mean proportion of correctly recalled words across the 12 series.

2. Highlighting and reducing age-based stereotype threat on short cognitive tests used to screen for predementia in clinical settings

2.1. Participants screening

2.1.1. Recruit older participants aged 60 to 85 for a study on general mental abilities and/or the impact of emotions on various cognitive tasks and questionnaires.

2.1.2. Ensure that participants live at home, have no history of significant trauma nor chronic illness, have normal or corrected-to-normal vision and hearing, have no current depression (Geriatric Depression Scale¹⁷) nor abnormal anxiety (State-Trait Anxiety Inventory¹⁸).

2.2. Conditions and experimental design

2.2.1. Test each participant individually at home or in local community associations' premises by an experimenter trained at neuropsychological testing.

2.2.2. Have participants taking two short cognitive tests used to screen for predementia (or mild cognitive impairment [MCI]): the MMSE¹⁹ and the Montreal Cognitive Assessment (MoCA²⁴) in a counterbalanced order.

2.2.3. Randomly assign participants to one of the two order (MMSE then MoCA or MoCA then MMSE).

2.2.4. Before taking the first test, randomly assign participants to one of two threat conditions (threat versus reduced-threat conditions).

2.2.5. In the "threat condition", inform participants that both younger and older adults are taking part in the study about memory capacity.

2.2.6. In the "reduced threat condition", inform participants that both younger and older adults are taking part in the study about memory capacity but add that younger and older adults typically obtain the same performances on the ongoing tests.

2.2.7. Before taking the second test, use an educational intervention to debrief all participants (regardless of the threat condition they were previously assigned) about age-based stereotype threat. Tell participants that "Numerous studies demonstrated that negative age-related beliefs, especially about memory capacity decline, trigger anxiety, which in turn prevents older adults from performing optimally. Actually, it is well-known that performance on memory tests may not accurately reflect people's true abilities, because performance can be affected by the testing context. In other words, people's negative reputation in an ability domain may impair their performance on tests that assess this stereotyped ability, for example when older adults complete a memory test. Therefore, if you feel anxious during the subsequent memory test, this does not mean that you are unable to complete the tests. It rather probably means that your feelings are affected by the general negative reputation of older adults regarding memory."

NOTE: See **Figure 2** for a visual depiction of the educational intervention; full details on this research were published in Mazerolle et al.²⁵.

2.3. Short cognitive neuropsychological tests and procedure

2.3.1. Administrate the 8 subtests of the MMSE¹⁹ (orientation, registration, attention and calculation, recall, language, copying) to evaluate memory, orientation to time and place, attention and executive functioning, language and visuospatial abilities. Follow Folstein, Folstein and McHugh's administration guidelines¹⁹ and compute the final score adding the scores of every subtest. Obtain a final score rated on 30-point scale.

2.3.2. Administrate the 8 subtests of the MoCA²⁴ (visuospatial/executive, naming, memory, attention, language, abstraction, delayed recall, orientation) to evaluate memory, orientation to time and place, attention and executive functioning, language and visuospatial abilities. Follow administration guidelines available at www.mocatest.org and compute the final score adding the scores of every subtest. Obtain a final score rated on 30-point scale.

REPRESENTATIVE RESULTS:

We addressed the hypothesis that stereotype threat impairs the working memory performance of older adults and that this effect can be reduced or eliminated by a simple instruction. The expected interaction between age group and threat instructions was significant, $F(1, 214) = 4.85$, $p < 0.03$, $\eta_p^2 = 0.02$, and is depicted in **Figure 3**. In the threat condition, older participants underperformed (mean [M] = 0.73, standard error [SE] = 0.01) relative to younger participants ($M = 0.78$, $SE = 0.01$), $F(1, 214) = 12.87$, $p < 0.001$, $\eta_p^2 = 0.06$, whereas the two age groups performed equally well in the reduced-threat condition ($F < 1$). Moreover, older participants in the reduced-threat condition obtained a better working memory score ($M = 0.77$, $SE = 0.01$) relative to those in the threat condition ($M = 0.73$, $SE = 0.01$), $F(1, 214) = 9.42$, $p < 0.002$, $\eta_p^2 = 0.04$. The performance of younger participants did not differ across the two conditions (threat condition: $M = 0.78$, $SE = 0.01$; reduced-threat condition: $M = 0.78$, $SE = 0.01$; $F < 1$). More details about this research can be found in Mazerolle et al.²². These findings highlight the deleterious impact of very subtle cues in the environment (e.g., mentioning the presence of younger adults in a study about memory) on older adults' performance on a laboratory test. Because stereotype threat seems to be powerful enough to create significant differences between younger and older adults, we went further and tested its impact on brief cognitive tests classically used by primary care clinicians for the diagnosis of predementia.

We tested the impact of stereotype threat on older adults' performance on two brief cognitive tests used to screen for predementia states: the MoCA and the MMSE. As shown in **Figure 4** (left panel), during test 1 (before debriefing), participants' performance was higher in the reduced-threat condition ($M = 28.50$; $SE = 0.47$) than in the threat condition ($M = 26.40$; $SE = 0.43$) on the MMSE, $F(1, 76) = 12.506$, $p = 0.001$, $\eta_p^2 = 0.141$. The same pattern occurred on MoCA, with participants underperforming in the threat condition ($M = 24.80$; $SE = 0.53$) as compared to the reduced-threat condition ($M = 27.45$; $SE = 0.53$), $F(1, 76) = 10.153$, $p = 0.002$, $\eta_p^2 = 0.118$. These results show that the performances of older adults on short cognitive tests are susceptible to stereotype threat effects.

Because these tests are used to screen for predementia state, we also examined the proportion of participants meeting the clinical criteria of MCI on MoCA and MMSE (using a cutoff at 26 for both tests). During test 1, stereotype threat was powerful enough on the MoCA to result in 50% of our sample performing under the cutoff score of 26/30 in the threat condition, versus 15% in the reduced-threat condition ($p = 0.041$, Fischer's exact test). The same pattern occurred on MMSE, with 30% of the participants scoring below 26 in the threat condition, against 5% in reduced-threat condition ($p = 0.038$, Fisher's exact test). More information about this study can be found in Mazerolle et al.²⁵.

We also hypothesized that an educational intervention (debriefing) consisting in informing older adults about the stereotype threat phenomenon and alleviating the evaluative pressure of the test, would reduce the impact of negative aging stereotypes on their performance. As shown in **Figure 4** (right panel), after the educational intervention (debriefing), older adults performed equally well on test 2 (be it MoCA or MMSE), regardless of the administration condition of their previous test 1, threat or reduced-threat. In other words, lower performance of participants at test 1 due to threat instructions was restored at test 2 thanks to the educational intervention. More details about these findings can be found in Mazerolle et al.²⁵.

FIGURE LEGENDS:

Figure 1: Visual depiction of the procedure to test age-based stereotype threat on a lab memory test.

Figure 2: Visual depiction of the educational intervention to reduce age-based stereotype threat effects.

Figure 3: Reading span score (adjusted for covariates) as a function of instructions condition and age group. Error bars indicate standard errors of the mean. This figure has been modified from Mazerolle et al.²².

Figure 4: MMSE and MoCA scores as a function of threat conditions before debriefing and after debriefing participants about the impact of stereotype threat. Error bars represent standard errors of the mean. This figure has been modified from Mazerolle et al.²⁵.

DISCUSSION:

The present studies show that stereotype threat, a neglected source of stress in many testing situations, can lead older adults to perform below their true abilities on memory tests. The method presented here highlights the crucial importance of the instructions given to participants and patients before testing memory. Simply mentioning that younger adults are taking part in the study (without mentioning any expected age-related differences in performance) is sufficient to inflate by 40% (MMSE and MoCA averaged) the number of older adults meeting clinical criteria for predementia on short cognitive tests. The present findings also showed that presenting the memory tests as age fair or explaining to older adults the negative impact of aging stereotypes on their performances are two efficient strategies to help

308 them resist to age-based stereotype threat. Taken together, these results highlight the critical
309 importance of taking into account stereotype threat effects when assessing older adults'
310 memory using short cognitive tests, especially given the current pressure on general
311 practitioners to participate in the screening for predementia^{26,27}. It is also important for
312 experimental studies about cognitive aging because short cognitive tests are used to exclude
313 participants who are suspected to show predementia symptoms only because they scored
314 below a cutoff.

315
316 Some of the critical aspects of the method deserve particular attention. A typical mistake when
317 one discovers stereotype threat research²⁸ consists in assuming that a stereotype threat
318 condition requires the implementation of an extra pressure that does not exist in conventional
319 real-life testing, and that standard real-life testing instructions can be used to operationalize a
320 no-stereotype threat control condition. Actually, it is quite the contrary: The standard real-life
321 testing settings are likely to induce stereotype threat, either implicitly or explicitly, because of
322 the words used to present the tests and/or any environmental cues that are related to negative
323 aging stereotypes (e.g., the presence of flyers or posters on Alzheimer's disease or other
324 dementia). It is much more difficult to find a way to eliminate stereotype threat in a testing
325 situation. Therefore, any modification to the instructions that have been found efficient to
326 reduce stereotype threat should be carefully considered to avoid the belief that one is
327 comparing a threat and a reduced-threat condition while, in fact, one is comparing two
328 stereotype threat conditions.

329
330 Although the present findings were obtained on lab memory tests and short cognitive tests,
331 they raise the question of whether age-based stereotype threat effects can also affect older
332 patients' performances on complete neuropsychological batteries used in memory clinics for
333 the diagnosis of MCI, the prodromal stage of AD. In our view, it seems very likely that age-based
334 stereotype threat effects contribute, at least in part, to the 53% of false positive errors
335 observed in the diagnosis of MCI. Without denying that aging may be associated with cognitive
336 decline and neurodegenerative diseases such as MCI or AD for many people, our findings
337 suggest paying special attention to the influence of negative aging stereotypes that have been
338 largely overlooked in the context of neuropsychological testing.

339
340 Several individual factors can make older adults more or less vulnerable to age-based
341 stereotype threat effects. As indicated by a recent review⁵, these moderators include older
342 adults' level of education, physical and psychological health, subjective age, stigma
343 consciousness, domain identification (i.e., importance attached to memory), and memory self-
344 efficacy. Future research, especially those conducted within the clinical setting where a
345 diagnosis is requested, should thus consider some of these factors to provide fairer evaluation
346 of patients' memory abilities.

347
348 Our experimental design offers new recommendations to healthcare professionals to improve
349 the accuracy of predementia diagnosis. Characterizing the memory tests as age fair or
350 informing older adults about the age-based stereotype threat phenomenon are two simple and
351 easily implementable instructions likely to help older people to perform at an optimal level

during neuropsychological testing. These recommendations may help medical staff to deliver more accurate and potentially less threatening information to the patients and/or their family (thereby significantly improving their well-being and quality of life). It should be noted, however, that these recommendations may need to be adapted to consider other types of threat that could be simultaneously triggered by the clinical context (e.g., the specific threat of AD as a dramatic disease²⁹, the threat of being at hospital³⁰, and the threat of the white coat³¹).

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DISCLOSURES:

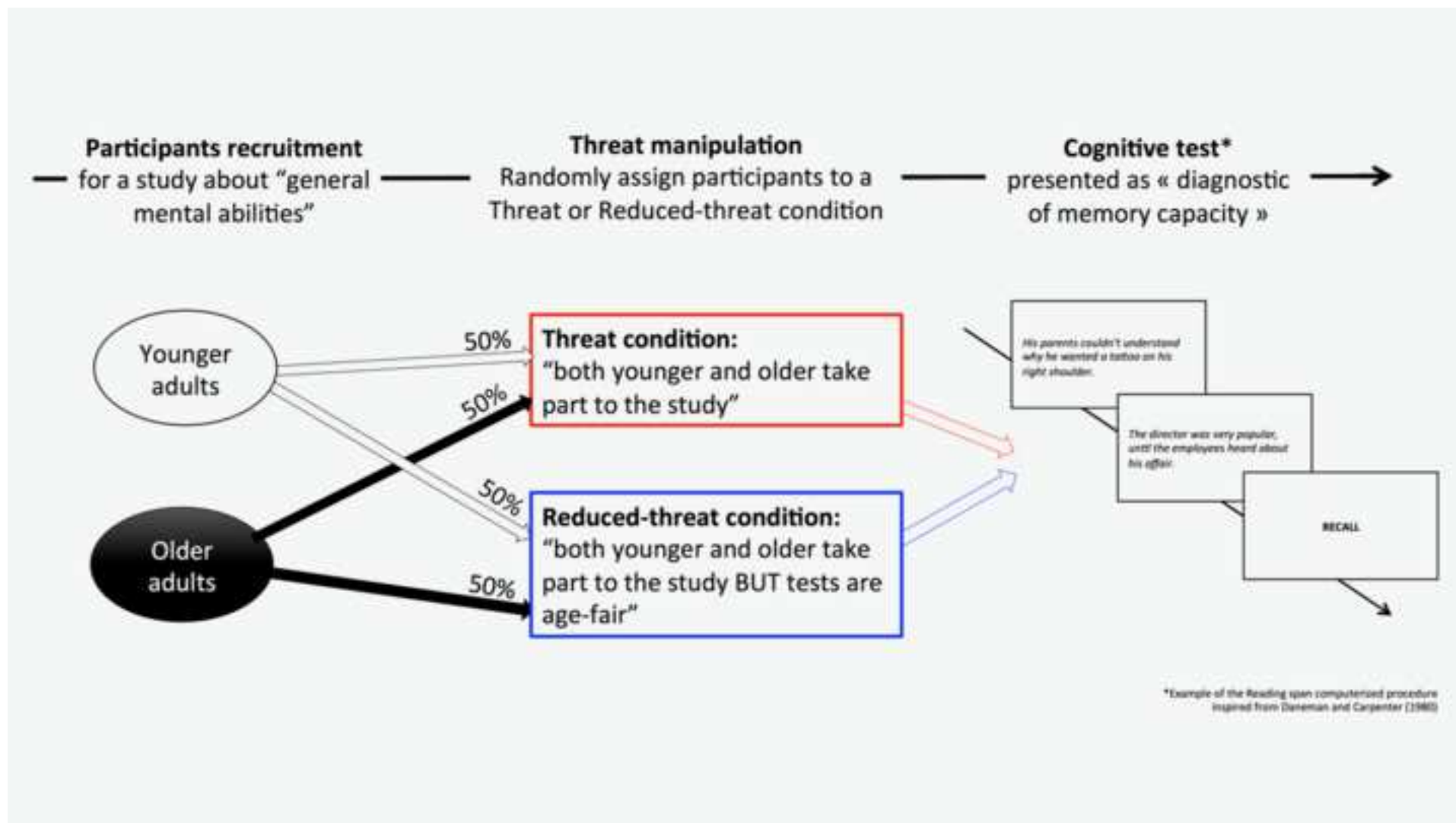
The authors have nothing to disclose.

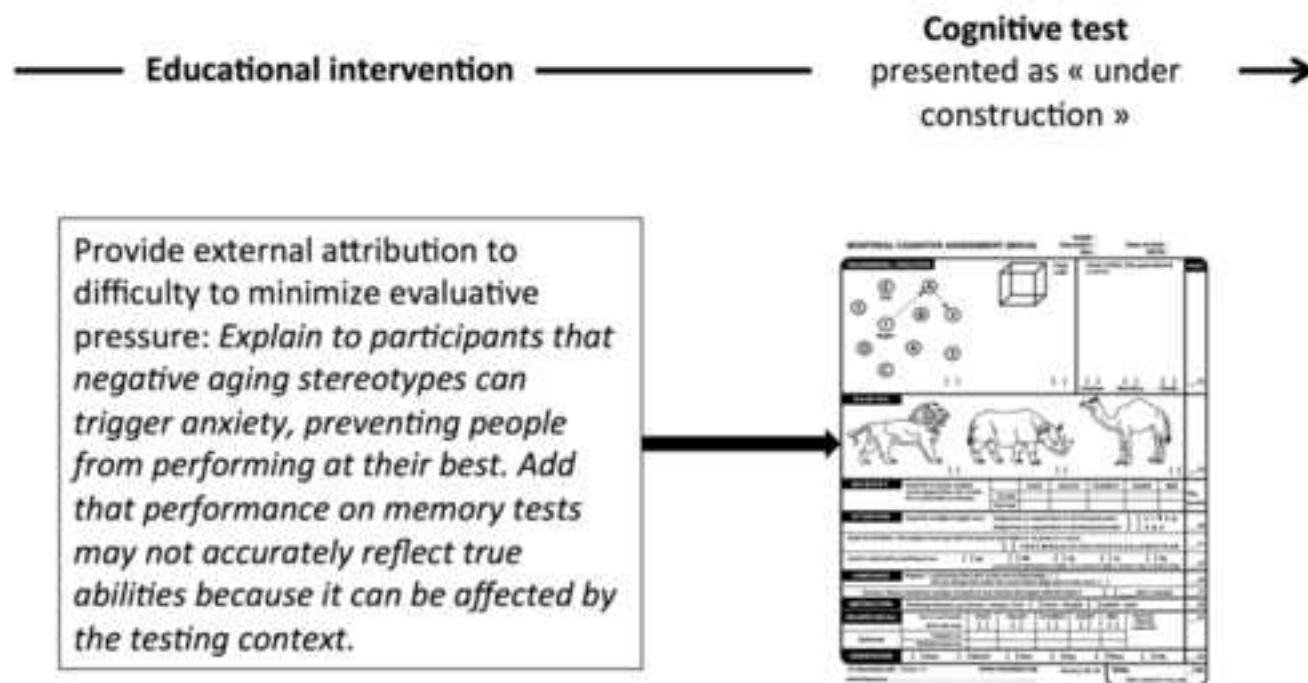
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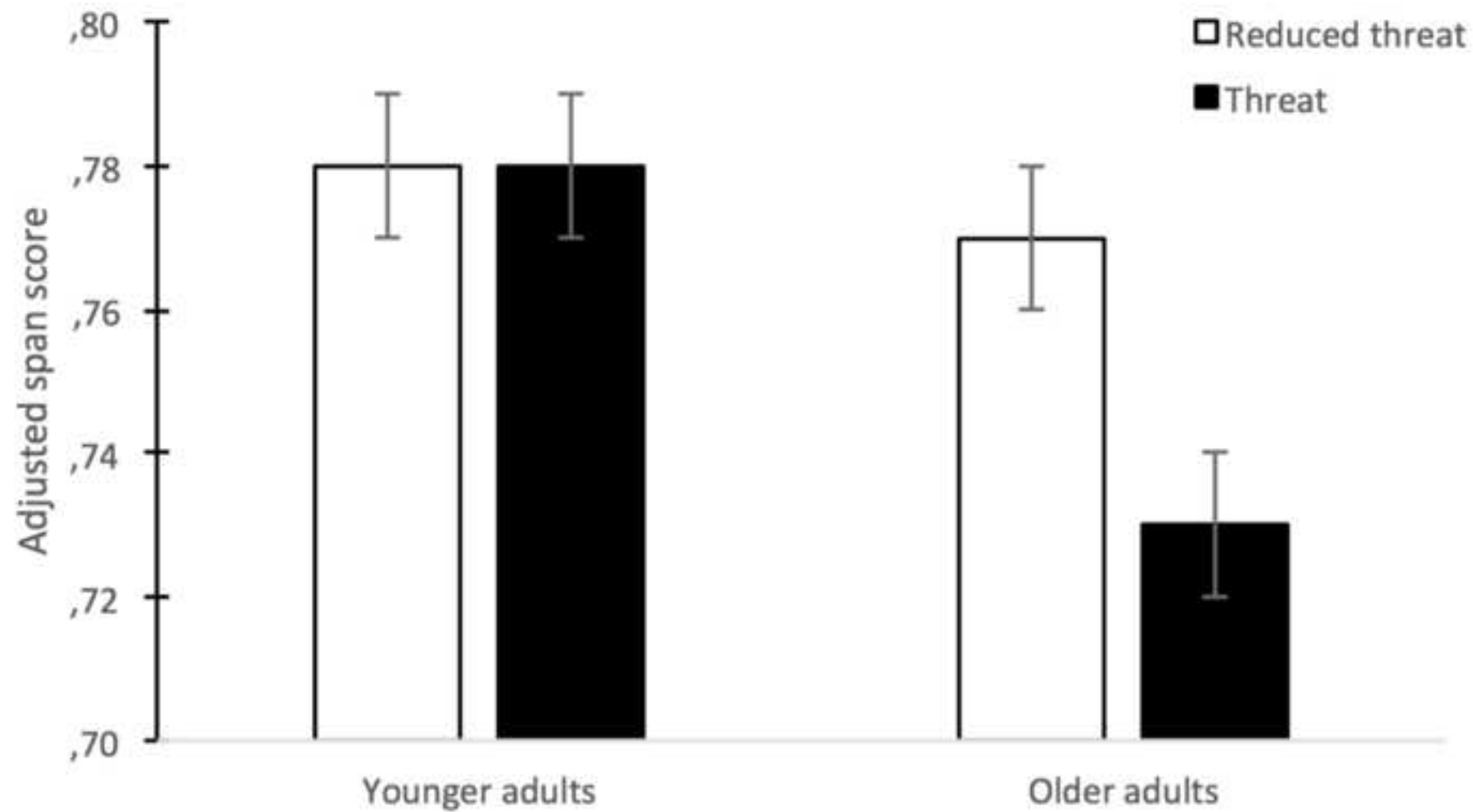
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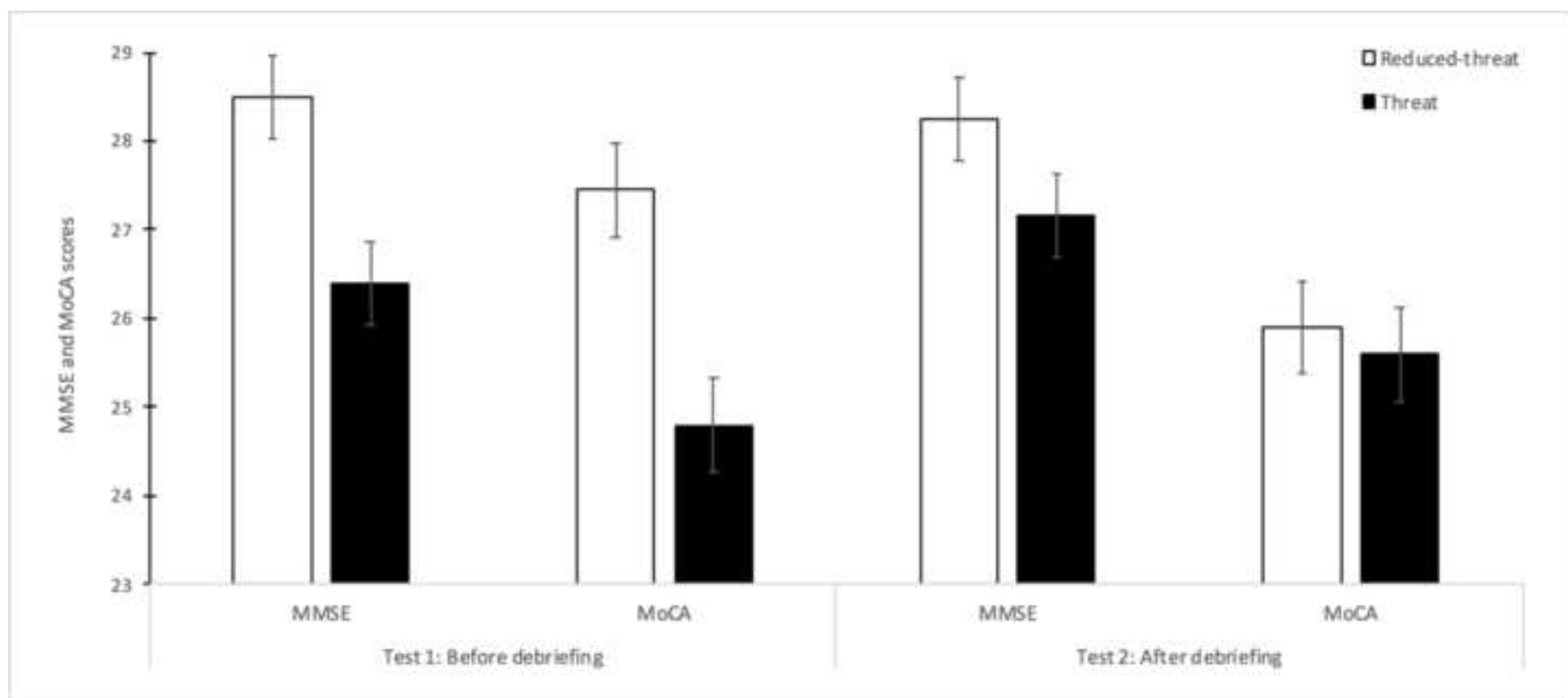
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Name of Material/Equipment	Company	Catalog Number	Comments/Description
Table			
2 chairs (one for the participant and one for experimenter)			
Laptop/computer with Reading span test described in the protocol	Apple iMac (Cupertino, CA)		
Software	Psyscope		http://psy.ck.sissa.it/psy_cmu_edu/index.html
Paper and pencil for MMSE, MoCA, Geriatric depression Scale, State-Trait Anxiety Inventory			
Mini Mental State Examination	Folstein, M. F., Folstein, S. E., McHugh, P. R. “Mini-mental state.” Journal of Psychiatric Research. 12 (3), 189–198 (1975).		

Montreal Cognitive Assessment	Nasreddine, Z. S. et al. The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. Journal of the American Geriatrics Society. 53, 695–699 (2005).
Geriatric depression Scale	Spielberger, C. D. Test Anxiety Inventory. The Corsini Encyclopedia of Psychology. John Wiley & Sons, Inc., Hoboken (2010).

State-Trait Anxiety Inventory

Yesavage, J. A. et al. Development and validation of a geriatric depression screening scale: a preliminary report. Journal of Psychiatric Research. 17 (1), 37–49 (1982).



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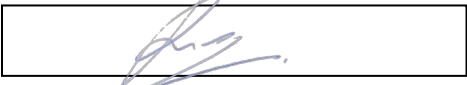
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Signature:		Date: February 25, 2019

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Dear Dr. Xiaoyan Cao,

Thank you for the time and attention to our manuscript submitted for publication to JoVE. We have revised our manuscript taking into account all the editorial and reviewers' comments. The changes are highlighted in blue within the manuscript and we are describing below how we have addressed each point.

Again, we thank you for the opportunity to revise our manuscript and hope the revised version will meet the requirements of academic publishing in JoVE.

Sincerely,
Isabelle Régner

Editorial comments

1. Please take this opportunity to thoroughly proofread the manuscript to ensure that there are no spelling or grammar issues. The JoVE editor will not copy-edit your manuscript and any errors in the submitted revision may be present in the published version.

[Several edits have been corrected.](#)

2. Please revise lines 35-36, 66-68, 125-127, 135-137, 145-147, 161-164, 196-198, 212-215, 220-224, 256-262, and 271-273 to avoid previously published text.

[Previously published sentences have been replaced.](#)

3. Lines 148-149: Please continue the numbering (i.e., 2 followed by 2.1, followed by 2.1.1, etc.).

[It is now numbered accordingly.](#)

4. Please revise the Protocol to contain only action items that direct the reader to do something (e.g., "Do this," "Ensure that," etc.). The actions should be described in the imperative tense in complete sentences wherever possible. Avoid usage of phrases such as "could be," "should be," and "would be" throughout the Protocol. Any text that cannot be written in the imperative tense may be added as a "NOTE."

[We rephrased the protocol and only use action items described in the imperative tense.](#)

5. Please organize the sections/steps properly so that the protocol can be followed in chronological order.

[Protocol is now organized so that it can be followed in a chronological order. In particular, sections 1.2 and 1.3 and section 2.2 and 2.3 have been modified.](#)

6. Please add more details to your protocol steps. There should be enough detail in each step to supplement the actions seen in the video so that viewers can easily replicate the protocol. Please ensure you answer the "how" question, i.e., how is the step performed? Alternatively, add references to published material specifying how to perform the protocol action. See examples below.

[We detailed the Reading span test protocol \(section 1.3\) and referred to published material for both MMSE and MoCA tests \(section 2.3\).](#)

7. Lines 129-147: Please describe how the memory test is actually performed.

[We detailed the Reading span test protocol \(section 1.3\).](#)

8. Lines 176-182: Please describe how the MMSE and MoCA tests are actually done.

[We clearly referred to published material for both MMSE and MoCA tests.](#)

9. JoVE articles are focused on the methods and the protocol, thus the discussion should be similarly focused. Please revise the Discussion to explicitly cover the following in detail in 3-6 paragraphs with citations:

- a) Critical steps within the protocol
- b) Any modifications and troubleshooting of the technique
- c) Any limitations of the technique
- d) The significance with respect to existing methods
- e) Any future applications of the technique

[All these points are now addressed in the discussion section.](#)

10. References: If there are six or more authors, list the first author and then "et al."

[We corrected the references.](#)

11. Table of Materials: Please include relevant supplies, reagents, equipment and software used, especially those mentioned in the Protocol. Please then sort the items in alphabetical order according to the name of material/equipment.

[The table has been completed](#)

Reviewers' comments:

***Reviewer #1: ***

Manuscript Summary:

The submitted paper presents the previously published work of Mazerolle et al. (2012; 2017). It presents two studies in the area of age-based stereotype threat, which is a growing area of interest for social cognition and neuropsychology researchers. The age-based stereotype threat literature has demonstrated that age stereotypes can have detrimental effects on the memory and cognitive assessment of older adults. It is important for researchers to now look towards developing strategies for removing/reducing stereotype threat. With these, the optimal performance of older adults subject to cognitive screening can be facilitated so as to avoid unnecessary medical examination and unwarranted diagnoses of mild cognitive impairment.

In adapting their previous work for publication as a JoVE video, Mazerolle et al. have provided:

- appropriate title and abstract
- good rationale for their chosen strategies for reducing stereotype threat (i.e., not always able to de-emphasise the memory component of a task), and therefore justified for focussing on presenting tests as age-fair and educating older adults with regards to the effects of stereotype threat
- appropriate participant screening process and eligibility criteria provided
- appropriate experimental methods which are in line with other age-based stereotype threat papers
- clear procedure with all important steps included
- highly appropriate references from the stereotype threat literature

As such, the submission seems appropriate for publication as a JoVE video.

Major Concerns:

Nil.

Minor Concerns:

Minor issues with grammar and presentation to resolve at copy-editing stage.

[The manuscript has been checked.](#)

*Reviewer #2: *

Manuscript Summary:

This manuscript provides suggested protocols for use when conducting cognitive testing with older adults to avoid the impact of negative age stereotypes on the performance of the older adult. This is an important area of research and is not often recognised by clinicians in the field as a potential confound on the results they obtain for their clients.

Major Concerns:

I have no major concerns related to this manuscript. It is succinctly presented and covers an important topic given the potential to misdiagnose older adults if their performance on cognitive testing is confounded by such elements as ageing stereotypes.

Minor Concerns:

In terms of replicability, the protocol could have included a little more detail as to the scripts used. However, I also recognise that this could vary across cultural, practice, and other factors.

[We detailed test protocols for Reading Span tests, MMSE and MoCA.](#)

Reviewer #3:

Manuscript Summary:

This is an important area of concern for researchers and clinicians alike who are carrying out cognitive tests. I think highlighting this methodology is important and the authors have two interesting papers to summarise. I have only minor concerns.

Major Concerns:

None

Minor Concerns:

1) It would be worth adding a limitation to discussion of this methodology being applied to the clinic which is that it has not been tested on people who are coming into a clinical setting with concerns about their memory. The educational intervention may not be sufficient in these cases to alleviate threat not caused by anxiety about conforming to a stereotype specifically but by self-perceptions of ageing or ability. It may be difficult to test this, although not impossible, but it should be mentioned that the wording of the educational intervention may need to differ depending on the group of patients.

[This limitation is now added at the end of the discussion.](#)

2) On that note, please include a full description of the information given as part of the educational intervention as this will be of importance for readers wanting to replicate this methodology.

[The information given to participants is clearly included in the method \(point 2.2.6\).](#)

3) The shading in Figure 3 and Figure 4 is not consistent. In one black is reduced-threat and in the other black is threat. If these graphs are being presented in the video the shading should be consistent.

[We reversed Figure 4's shading to have a consistent shading between figures 3 and 4.](#)

4) Figure 4 is difficult to read when split into two graphs. If these graphs are going to be used I recommend presentation on one graph like that in the original paper.

[Results are now presented in one graph, and Figure 4's legend has been updated.](#)