

Research Article

Cognitive Reserve Moderates the Predictive Role of Memory Complaints for Subsequent Decline in Executive Functioning

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Keywords

Memory complaints · Decline in executive functioning · Cognitive reserve · Leisure activities

Abstract

Aims: We investigated whether the longitudinal relation between memory complaints and subsequent decline in executive functioning over 6 years differed by leisure activity engagement as major contributor to cognitive reserve in old age. **Methods:** We analyzed longitudinal data from 897 older adults (M = 74.33 years) tested on the Trail Making Test (TMT) in two waves 6 years apart. Participants reported information on memory complaints and leisure activity engagement. **Results:** There was a significant interaction of memory complaints with leisure activity engagement on latent change in executive functioning. Specifically, only for individuals with less (but not those with greater) leisure activity engagement, memory complaints significantly predicted a steeper subsequent decline in executive functioning across 6 years (i.e., increases in TMT completion time). **Conclusion:** The role of memory complaints as an early predictor of decline in executive functioning seems to vary by individuals' cognitive reserve.

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Introduction

Memory complaints are an early indicator of cognitive decline and cognitive impairments in midlife and old age [1–3]. Yet, the predictive role of memory complaints does not always seem to become evident [4] and thus may be dependent on other influencing factors such as the individual's amount of cognitive reserve. In general, the cognitive reserve concept [5] aims to explain individual differences in the course of aging and neurodegenerative development. Cognitive reserve is built up through cognitive stimulation and serves later on as buffer for coping with brain alterations in order to preserve cognitive functioning in aging [5]. In this regard, leisure activity engagement is a major contributor to the buildup of cognitive reserve in old age [5] and has for example found to be related to better executive functioning in healthy older adults [6–8].

Evidence showed that cognitive reserve is related to better cognitive functioning in individuals with memory complaints [9, 10]. Yet, research on the interplay of memory complaints with cognitive reserve to explain the diversity in results regarding the predictive role of memory complaints for subsequent cognitive decline is still in its infancy. For instance, there is no empirical longitudinal investigation to date regarding the role of cognitive reserve in modifying the long-term relation between memory complaints and decline in executive functioning over a broader time frame. Therefore, we investigated whether the longitudinal relation between memory complaints and subsequent decline in executive functioning over 6 years as measured through performance changes in the Trail Making Test (TMT) differed by leisure activity engagement as major contributor to cognitive reserve in old age.

Materials and Methods

Participants

We analyzed data from 897 individuals who participated in the two waves of the Vivre-Leben-Vivere (VLV) survey [11]. Respondents were first interviewed during 2011 (wave 1; W1) and again in 2017 (wave 2; W2) using face-to-face computer-assisted personal interviewing and paper-pencil questionnaires. For further details regarding the rationale, design, recruitment, materials, and procedures of the VLV survey, see [8, 11–14]. Mean age of these respondents in W1 was 74.33 years (SD = 6.50, range 64–96); 51.4% were men.

Materials

In both waves, we administered the TMT parts A and B (TMT A and TMT B, respectively [15]). In W1, participants reported memory complaints as well as current leisure activity engagement at that time (see [8] for further methodological details).

Statistical Analyses

Using latent change score modeling, we modeled latent executive functioning factors of TMT completion time in W1 (constructed from TMT parts A and B in W1) and W2 (constructed from TMT parts A and B in W2) as well as a latent change in executive functioning variable regarding change in TMT completion time from W1 to W2. We included the following covariates to predict latent change: memory complaints in W1, leisure activity engagement in W1, age in W1, sex, and the interaction of memory complaints in W1 with leisure activity engagement in W1 (while taking the dependencies among all covariates into account).

Results

Memory complaints in W1 ($\beta = 0.14$, $p < 0.001$) and older age in W1 ($\beta = 0.26$, $p < 0.001$) significantly predicted a larger increase in TMT completion time from W1 to W2 (i.e., steeper decline in executive functioning). Sex and leisure activity engagement in W1 per se did not predict changes in TMT completion time ($p > 0.05$). Yet, most importantly, there was a significant interaction of memory complaints with leisure activity engagement ($\beta = -0.25$, $p = 0.031$). Specifically, for individuals with less leisure activity engagement in W1 (-1 SD), memory complaints in W1 significantly predicted a larger subsequent increase in TMT completion time from W1 to W2 (i.e., steeper decline in executive functioning, $\beta = 0.21$, $p < 0.001$). In contrast, for individuals with greater leisure activity engagement in W1 ($+1$ SD), this longitudinal relation between memory complaints in W1 and subsequent decline in executive functioning was not significant ($\beta = 0.07$, $p = 0.241$).

Discussion

To explain the diversity in results regarding the predictive role of memory complaints for subsequent cognitive decline [1–4], present longitudinal results have important implications. Using latent change score modeling (extracting measurement-error variance), we demonstrated a substantial interaction of memory complaints with leisure activity engagement on subsequent latent change in executive functioning. Specifically, only for individuals with less (but not those with greater) leisure activity engagement, memory complaints significantly predicted a steeper subsequent decline in executive functioning across 6 years (i.e., indicated by increases in TMT completion time).

Our observations corroborate the key role of leisure activity engagement as major contributor to cognitive reserve for modifying the pathways of cognitive aging [5–8, 16–18] and thereby its public importance [19–21]. In this regard, the present study reveals cognitive reserve as crucial factor moderating the predictive role of memory complaints for subsequent cognitive development. Specifically, our findings suggest that especially in vulnerable populations, such as in those with less cognitive reserve accumulated [22], memory complaints may serve as early indicator of decline in executive functioning, while in less vulnerable individuals, such as in those with greater cognitive reserve accumulated, this predictive role loses its strength.

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Statement of Ethics

All participants gave their written informed consent for inclusion in the study before participating. The present study was conducted in accordance with the Declaration of Helsinki, and the study protocol had been approved by the ethics commission of the Faculty of Psychology and Social Sciences of the University of Geneva (project identification codes: CE_FPSE_14.10.2010 and CE_FPSE_05.04.2017).

Conflict of Interest Statement

The authors have no conflicts of interest to disclose.

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Author Contributions

A.I., E.R.G., and B.R.G. formulated the research question, analyzed the data, and wrote the manuscript. M.K. formulated the research question, conceptualized the study, supervised the data collection, and participated in writing.

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