



# Self-assessments of memory correlate with neuroticism and conscientiousness, not memory span performance

Tom Buchanan

Department of Psychology, University of Westminster, 115 New Cavendish St, London W1W 6UW, United Kingdom

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## ABSTRACT

Self-report measures of cognitive problems may have value, but there are indications that scores on such measures are influenced by other factors such as personality. In an online correlational study, 523 non-clinical volunteers completed measures of personality, digit span, and the Prospective and Retrospective Memory Questionnaire. Self-reported prospective and retrospective memory failures were associated positively with neuroticism and negatively with conscientiousness, but not with digit span performance. These findings are consistent with other indications that conscientiousness and neuroticism may underpin self-reports of cognitive problems.

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## 1. Introduction

A number of self-report questionnaires have been developed to assess everyday experience of different types of cognitive problems. They provide a convenient way to investigate cognitive function and failures in everyday life, and may also have a role to play in clinical practice (Crawford, Smith, Maylor, Della Sala, & Logie, 2003; Thompson, Henry, Rendell, Withall, & Brodaty, 2015). However, questions have been raised as to whether such self-report questionnaires genuinely do assess cognitive failures, or are rather influenced by other variables such as personality. For example, Buchanan (2016) found evidence that self-report measures of problems with executive function appeared to be influenced by personality (neuroticism and conscientiousness) rather than objectively measured cognitive tasks. There are indications that the same may be true of other aspects of cognitive function.

The Prospective and Retrospective Memory Questionnaire (PRMQ; Smith, Della Sala, Logie, & Maylor, 2000) is a popular measure of two different aspects of memory: Prospective Memory, the ability to remember things one needs to do at the appropriate point; and Retrospective Memory, which is the ability to remember things that have happened in the past. Using this questionnaire, Thompson et al. (2015) found that self-rated prospective memory problems did not correlate with objectively measured prospective memory. Nor did self-ratings of prospective and retrospective memory differ across groups of participants with diagnoses of dementia, mild cognitive impairment, or no diagnoses.

Uttl and Kibreab (2011), in an article focused on the validity of self-report questionnaires of prospective memory, examined correlations of several self-report prospective memory scales with objective memory tests in a sample of 240 students. Their general conclusion was that correlations between self-assessments and objective measures of memory were typically weak, leading them to challenge the validity of self-report measures of prospective memory. While Uttl and Kibreab focused primarily on prospective memory, one of the measures they used was the PRMQ which also includes a retrospective memory scale. Among their objective measures, they included a retrospective memory test: A verbal learning measure that involves remembering word lists. PRMQ retrospective memory scores did not correlate at all with the verbal learning measure, again undermining the notion that self-assessments reflected real ability level. In addition to the memory measures, Uttl and Kibreab's respondents completed Costa and McCrae's (1992) NEO FFI personality inventory. They noted that substantive variance in scores was associated with the personality dimensions neuroticism and conscientiousness. These findings are reminiscent of those reported by Buchanan (2016) for self-report measures of executive function.

Taken together, these findings suggest that the amount of variance in self-reports of prospective and retrospective memory that is accounted for by actual memory problems may be limited. Instead, they may be influenced by the personalities of respondents.

This project set out to address the question of whether self-reports of memory problems are associated with personality. The specific aims were to assess the extent to which scores on the PRMQ were associated with personality and with objectively-measured retrospective memory. This will extend the work of Uttl and Kibreab (2011) by

E-mail address: [T.Buchanan@westminster.ac.uk](mailto:T.Buchanan@westminster.ac.uk)

using a different retrospective memory task, and a larger and more diverse sample. It is hypothesized that PRMQ self-reports of prospective memory problems will be associated positively with neuroticism (H1) and negatively with conscientiousness (H2). Similarly, PRMQ self-reports of retrospective memory problems will be associated positively with neuroticism (H3) and negatively with conscientiousness (H4).

## 2. Method

### 2.1. Materials

This study was conducted wholly online. Ethical approval came from the host University's Psychology Research Ethics Committee. Participants were recruited, and personality and demographic data acquired, using the long-established personality testing website [www.personalitytest.org.uk](http://www.personalitytest.org.uk).

Personality was measured with an online Five Factor personality inventory providing indices of Extraversion, Neuroticism, Openness to Experience, Agreeableness and Conscientiousness, as operationalized in the Five Factor Model of *Costa and McCrae (1992)*. This 41-item inventory was derived from an International Personality Item Pool measure (IPIP; *Goldberg, Mervielde, Deary, De Fruyt, & O., 1999*) that correlates well with Costa and McCrae's domains. It has been validated for use on the internet (*Buchanan, Johnson, & Goldberg, 2005*). In this inventory, Extraversion is assessed by 9 items such as "Am skilled in handling social situations". Agreeableness is assessed by 7 items such as "Have a good word for everyone". Conscientiousness is assessed by 10 items such as "Pay attention to details". Neuroticism is assessed by 8 items such as "Have frequent mood swings". Openness to Experience is assessed by 7 items such as "Believe in the importance of art". Participants rate the accuracy of statements about their typical behavior on a 5-point scale from 1 "very inaccurate" to 5 "very accurate". The website was attracting over three thousand users per week at the time the study was conducted. No attempt is made to recruit respondents or otherwise attract them to the site—they are referred by other sites or find it through search engines. Many complete the test as part of some class, being asked to do so by their teacher or professor.

Self-reports of memory problems were obtained using the 16-item Prospective and Retrospective Memory Questionnaire (PRMQ, *Smith et al., 2000*). This is a brief measure of the extent to which people experience problems with different aspects of memory, responded to using a 5-point scale from "very often" to "never". Retrospective memory (ability to remember things that have happened in the past) is measured by 8 items such as "Do you fail to recognize a place you have visited before?", while prospective memory (ability to remember things one needs to do in the future) is measured by 8 items such as "Do you decide to do something in a few minutes' time and then forget to do it?". This measure was hosted on the Qualtrics online survey platform.

Digit span tasks assess participants' ability to reproduce strings of digits presented to them, normally in either forward or reverse order. Increasingly longer spans are presented, until participants are unable to reproduce them. *Maylor, Smith, Della Sala, and Logie (2002)* consider forward span to address retrospective memory, while reverse span is argued to involve additional cognitive processes. A computerized version of the digit span task was implemented on the Qualtrics online survey platform, as previously used by *Buchanan (2016)*. *Buchanan (2016)* had noted that an unexpectedly high proportion of respondents had zero scores (12.2% for forward span, 13% for reverse span). In the current study, the task was modified to include a practice trial at the beginning of the task (if participants failed at it, the practice trial was repeated up to two more times). This led to much lower rates of zero scores: 1.3% for forward, and 3.1% for reverse span.

Prior to each trial, participants saw the words "Ready" and then "Go" for 0.5 s each. They then saw a series of digits between 1 and 9, one at a time, for one second each. At the end of the series, they saw a cue reading either 'FORWARD' or 'BACKWARD'. They then typed the numbers

they had seen, in either forward or backward sequence as instructed, putting an 'x' in the place of any number they could not recall. The trials began with forwards recall, starting with two and rising to a maximum of 9 digits. There were two trials at each sequence length. The forward trials terminated when either all had been successfully completed, or the participant had failed twice at a given sequence length. The reverse recall trials that followed these again began with two digits and rose to a maximum sequence length of 8 digits. Participant scores were the total number of correct responses across each of the forward and reverse sets of trials. This is the same scoring method as used by the WAIS IV implementation of the task (*Wechsler, 2008*).

### 2.2. Procedure

Participants first saw a page describing the inventory, and details of the ethical approval of the research project. Clicking a button to indicate that they consented to participate led them to a second page with brief instructions and the 41 items of the inventory. Radio button response formats on a 5-point scale ('Very Inaccurate - Very Accurate') were used for the personality items. Participants then responded to a series of other items using drop-down menus: age group (in 5-year increments); current location (a comprehensive list of nations); gender; highest level of education; main occupational status. Following this, participants were asked how they came to be taking the test (e.g. as part of a class). Finally, participants were asked whether their data could be used in analyses (they were instructed to answer 'no' if they had not answered the questions seriously, or did not give consent). Those who had completed all the personality items then saw a debriefing page thanking them for their participation, and providing their scores on each of the scales (those who had not were sent back to complete the missing items). They were also shown information to help interpret the scores, including a brief description of the meaning of each of the scales, and normative information about their scores relative to others who had completed the inventory to date (top third, middle, bottom third). Links were provided to contact the researcher, and to information about personality research elsewhere on the internet.

Respondents who had indicated that their data could be used for research purposes then saw an invitation to take part in the second part of the study, described as involving a memory questionnaire and recall task. People who followed the link to the second part, which was hosted on the Qualtrics online research platform, saw a further participant information / consent page outlining the second phase. Those who indicated they wished to participate then saw the items of the PRMQ, responded to using radio button format. On completing the PRMQ items, participants then moved on to the digit span tasks. Finally, they saw a debriefing page telling them what their scores were and outlining the purpose of the project.

### 2.3. Data screening and processing

Over a period of five weeks, 15,320 data submissions were recorded where people completed the online personality inventory, indicated their data could be used, and were shown the invitation to participate in the second part of this study. Of these, 532 went on to fully complete the PRMQ and digit span tasks, and give consent for their data to be used in the second phase. They form the sample for this study.

Data quality for these 532 participants was assured in three ways. First, Qualtrics' proprietary methodology was used to screen out multiple submissions: instances where a person participated twice, either on purpose or accidentally by clicking the submit button more than once. Second, 9 people who reported their age as below 16 were removed from the sample due to ethical concerns about whether they could be considered to have given valid consent. Third, the file was examined for unrealistic combinations of demographic data (e.g. people claiming

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