Neuroticism influences informant ratings of other people's memory performance

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Running head: NEUROTICISM MEMORY RATINGS

Neuroticism influences informant ratings of other people's memory performance

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ABSTRACT

Informant-reports of cognitive performance may be influenced by factors other than the actual status of the individual being rated. Two studies tested the hypothesis that informant neuroticism was associated with higher ratings of a target's memory problems. Study 1 found that more neurotic students rated their professor as having more memory problems. Study 2 found that more neurotic participants rated a participant in a simulated cognitive testing session as having more memory problems, but did not show any such biases in their estimates of how many mistakes were actually made in the testing session. These studies provide evidence that more neurotic individuals rate the memory performance of others as worse. This does not appear to be due to vigilance for objective indicators of cognitive performance. These findings may have implications for how informant-report measures are used in research and clinical practice.

Keywords: memory; informant report; neuroticism; proxy

Introduction

Accurate and reliable measurement of everyday memory function plays an important role in both clinical diagnosis and research settings. In the context of neuropsychological assessment for age-related and other cognitive disorders, it is common to seek such information about an individual's everyday functioning from 'significant others', such as relatives or caregivers of the individual in question. Thus, standardized informant-report measures of day-to-day cognitive performance are widely used in clinical practice and in screening for memory and other cognitive problems. Jekel et al. (2015) reviewed 37 studies dealing with assessment of everyday problems in individuals living with mild cognitive impairment. In over half, informant-report measures were used.

There are a number of informant-report measures of everyday cognitive problems that can be used to screen for age-related cognitive disorders such as Mild Cognitive Impairment (MCI) or Alzheimer's Disease (AD). Perhaps the most widely used is the AD8 (Galvin, Roe, Xiong, & Morris, 2006). The AD8 is a brief screening measure which is part of a toolkit developed by the Alzheimer's Association for use in Medicare assessments in the United States, with 8 items asking whether there have been changes in issues such as "Daily problems with thinking and/or memory" and "Repeats the same things over and over (questions, stories or statements)". Other instruments provide information about potential stage of disease progression (e.g. the Quick Dementia Rating System; Galvin, 2015); aim to distinguish between normal cognitive aging, MCI and AD (e.g. the Alzheimer's Questionnaire; Sabbagh et al, 2010); or provide information about everyday functional activities (e.g. the Functional Activities Questionnaire; Pfeffer, Kurosaki, Harrah, Chance, & Filos, 1982). Even the Clinical Dementia Rating Scale (Morris, 1993), long regarded as the

‘gold standard’ for dementia diagnosis, contains an element of informant reporting. Given that clinical decisions, characterization of research cohorts, and evaluation of treatment interventions may be shaped by these scores, it is important that they can be trusted.

However, an informant rating measure can only ever be as reliable as the informant making the rating. It is known that informants may provide ratings that over- or under-estimate the capacity of the target person being rated (e.g. Davis, Martin-Cook, Hynan and Weiner, 2006). Evidence suggests that raters’ assessment of the target’s cognitive problems are influenced by their own characteristics as well as their relationship to the target. For example, in a very large sample of individuals diagnosed with MCI, Hackett, Mis, Drabick and Giovannetti (2020) found that the education level and race/ethnicity of the informant, their relationship to the participant, and whether they cohabited with them were significant predictors of their ratings of everyday functioning using the Functional Activities Questionnaire. These predictors explained up to 3.5% of additional variance in ratings of a target’s ability, over and above the participant’s characteristics (including objectively measured cognitive performance). On the basis of such findings, Hackett et al. (2020) caution that awareness of potential biases in informant-reports is important.

One additional source of variance, that has received little attention in the literature so far, is the personality of the informant. There is evidence that self-report measures of memory problems are influenced by neuroticism and conscientiousness, rather than actual memory (e.g. Buchanan, 2017; Uttl & Kibreab, 2011). There is also evidence that similar effects may extend to informant-report measures. In two studies using three different informant-report measures (the Alzheimer’s Questionnaire, the AD8, and the Prospective and Retrospective Memory

Questionnaire), Buchanan and Loveday (2018) asked respondents to rate the memory function of “a living older person who you know well. For example, this could be a family member who is above retirement age.” (p.482). They found that informants higher in neuroticism provided higher ratings of memory problems in the target persons. While the effects were relatively small, Buchanan and Loveday argued that they were sufficient to potentially increase the likelihood of problems being flagged as potentially clinically significant. Two possible explanations were advanced for the positive relationship between informants’ neuroticism and their ratings of memory problems in the targets they were evaluating.

The first is that individuals higher in neuroticism are more likely to worry about problems they see - or think they see - in others. Indeed, worrying is one of the defining characteristics of neuroticism, which is furthermore associated with a greater tendency to appraise events as harmful or threatening, and to experience recurrent negative thoughts (Denovan, Dagnall & Lofthouse, 2019). More neurotic individuals may thus over-report the severity or likelihood of perceived problems, because they are more concerned about them (conversely, more emotionally stable informants may underestimate memory problems because they are less concerned by them).

A second possible explanation is that more neurotic people are more attentive to markers of problems in a person they know. This notion is underpinned by research suggesting that neuroticism is associated with greater vigilance for health threats: Friedman (2000) suggested that more neurotic individuals might be more concerned with indications of health problems, and more likely to monitor them. This could extend to indications of memory problems, or other aspects of functional ability that affect daily life. According to this line of reasoning, higher neuroticism may be

associated with a greater accuracy in detecting such problems due to enhanced vigilance.

One weakness of Buchanan and Loveday's research is that the informants were left to freely choose the targets they would rate. There was no control or information about the actual functional status of the person being rated. Nor was there any control over the relationship between the informant and the target, or whether they cohabited. Hacket et al. (2000) have shown that these variables influence informant ratings.

The aim of this research was to test two rival explanations for the 'personality effect' (greater worry vs. greater accuracy) while addressing some of the shortcomings of Buchanan and Loveday (2018). This was done in two studies where the characteristics of the informants varied freely, but their relationship and exposure to the target (the same person in each case), and the target's cognitive performance, were held constant.

Study 1

In Study 1, a sample of University students recruited through a research participation scheme completed a measure of neuroticism, and rated the memory of one of their professors. This individual was used as the target because all students had a similar level of exposure to him, and having all participants rate the same target eliminated any potential variance arising from the functional status of the person being rated. Ethical approval for the study came from the University of Westminster Psychology Research Ethics Committee.

Method

Materials

Neuroticism of the participant was measured using an 8-item scale drawn from the International Personality Item Pool (Goldberg, 1999) validated for use online by Buchanan, Johnson and Goldberg (2005). Participants impression of the memory performance of the target being rated was measured using the proxy version (Crawford, Henry, Ward, & Blake, 2006) of the Prospective and Retrospective Memory Questionnaire (PRMQ; Smith, Della Sala, Logie, & Maylor, 2000), one of the measures found by Buchanan and Loveday (2018) to be affected by neuroticism. The 16-item PRMQ provides indices of prospective memory (ability to remember things one needs to do in the future) and retrospective memory (ability to remember things that have happened in the past). Scores on subscales measuring different aspects of these types of memory can also be derived. However, Crawford et al. (2006) showed that proxy ratings using the PRMQ were underpinned by strong general memory factor, combining both prospective and retrospective memory. They argued that it was appropriate to use the total score on the PRMQ as a measure of an informant's general impression of the memory performance of a target. This is therefore the approach adopted in this research.

Procedure

The study was conducted completely online, using materials hosted on the SONA platform used to administer the research participation scheme. It took place during the second teaching semester of the academic year. On signing up for the study, participants first saw an information page. After indicating consent, they completed the neuroticism scale. They then saw an image of a professor who had taught them in the previous semester (the first author), along with his name and

information about which classes he had taught them. They were asked to estimate how many of his lectures they had attended (0-4) and whether or not they had been part of a seminar class he taught. Following this, they were asked to provide information about “some aspects of your perception of Tom’s memory. You probably haven't interacted enough with Tom to be able to answer all of these questions accurately. Therefore, please give an estimate based on the impression you have formed of him”. Participants then rated his memory using the proxy version of the PRMQ. Finally, participants indicated their age and gender, were asked reconfirm consent, then were debriefed and thanked.

Participants

Participants were introductory-level undergraduate psychology students recruited through a research participation scheme (participant pool). Sixty-five individuals completed the study during the data collection period (institutional constraints – termination of the research participation scheme – precluded collection of a larger sample). Six of these did not confirm consent at the end of the study, so were removed. The final sample comprised 59 individuals (5 men and 54 women). Most (40) reported attending all the lectures with the professor being rated. Only 13 were in the professor’s seminar class.

Results and Discussion

Descriptive statistics are shown in Table 1. At M=29.29, the mean PRMQ rating of the professor was lower than (indicating fewer problems), but still within one standard deviation of, Crawford et al.’s (2006) general population sample (M=35.5, SD=9.94)

				Range			
	M	*SD*	α[1]	Potential	Actual	Skew	Kurtosis
Age (years)	20.54	3.97		18+	18-41	3.12	12.17
Neuroticism	22.32	5.32	.72	8-40	11-30	-0.36	-0.73
Memory rating	29.29	8.50	.92	16-80	16-45	-0.05	-1.01

Table 1

Descriptive Statistics, Study 1

[1]Cronbach's alpha, internal consistency

Participant neuroticism was positively and statistically significantly associated with higher ratings of memory problems in the target professor (r=.287, N=59, p=.028). This effect was still evident when level of exposure to the professor was taken into account, computing a partial correlation controlling for number of lectures attended and whether the participant had been in the professor's seminar class ($r_{partial}$=.261, df=55, p=.050).

The primary conclusion from this study is that more neurotic (student) participants rated their professor as having higher levels of day-to-day memory problems, even though all participants were rating the same person and their level of exposure to him was controlled for. This is consistent with, and goes some way to addressing the shortcomings of, Buchanan and Loveday (2018). However, the study is inevitably compromised by the small sample size, and has an almost entirely female sample. It is also unable to distinguish between the 'greater worry' and 'greater accuracy' explanations, given that there was no objective measure of the professor's functional status with which participant ratings could be compared.

Study 2

In Study 2, we set out to conceptually replicate the findings of Study 1, but with a modified design that enables the 'greater accuracy' hypothesis to be tested. This took the form of an online study where participants were shown a video of a person undergoing cognitive testing, then asked to report on his performance in the test and to rate his memory. Ethical approval for the study came from the University of Westminster Psychology Research Ethics Committee.

Method

Materials

Data collection took place via the Qualtrics online research platform. Neuroticism of the participant was measured using the 8-item neuroticism subscale of the Big Five Inventory (John & Srivastava, 1999). A different neuroticism scale from that employed in Study 1 was used to increase the likelihood that any effects found were related to neuroticism itself, and were not unique to the particular questionnaire used. General memory performance of the target was rated using the proxy PRMQ as in Study 1. As stimulus material, a short video (5min 28sec) was made depicting a test subject (actually the first author) being administered a simulated cognitive test (by the second author). The simulated test used was based on the Hopkins Verbal Learning Test (HVLT: Brandt, 1991), created by combining two of its parallel forms to increase its length. In the video, the tester first instructed the subject to "try and remember as many as you can" from a list of 24 words she read out. She then read out, in randomised order, those 24 words plus 24 additional foils that had not been in the original list. On each trial the subject was required to say "yes" or "no" to indicate whether or not he thought each word had been in the original list. Immediate verbal feedback ("correct" or "incorrect") was given by the

tester for each trial (this is a departure from the normal HVLT administration process, to render it suitable for use as a stimulus here). In the video, the subject got 25 from the 48 trials correct, making 23 errors. Neither the number correct, nor the number of trials, was stated.

Procedure

Participants were recruited using an established personality testing website, www.personalitytest.org.uk , where individuals can complete a personality questionnaire and receive feedback on their scores. Participants are not actively recruited or rewarded, but 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. During the data collection period for this study, users of the website were shown an invitation to participate in Study 2, described as ‘a project looking at links between personality and memory’, after receiving their personality feedback. Those who were interested then accessed the first page of Study 2, hosted on Qualtrics.

Participants first saw information about the study. They were asked to ensure their sound was turned on. Those giving consent to participate then answered a series of demographic questions, followed by the neuroticism scale. They then moved on to the next page, which hosted the video, seeing the instructions “When you are ready, please click on the play icon to start the video below. The video shows a man taking a memory test. Please pay close attention to what you see and hear, as you will be asked questions about it afterwards. The video lasts 5 minutes 30 seconds, so please ensure you have time to watch it all the way through without being disturbed. Please only watch it once. Once the video has finished, you will be

able to move on to the next page". Participants could not proceed from this page until 5 mins 30 seconds had elapsed.

When they did move on, respondents were first asked whether they could see and hear the video clearly. They were then told that in the video the man had answered 48 questions, and whenever he made a mistake the tester had said "incorrect". They were asked to indicate how many mistakes the man had made. Having given their estimate, they were asked to estimate his memory ability "based on the impression you have formed of him" using the proxy PRMQ. Finally, they were asked to reconfirm their consent, then were debriefed and thanked. Participants received no rewards.

Data screening and processing

During the data collection period, 488 individuals who accessed the information page either proceeded to the questionnaire or declined consent (*n*=29). 198 completed some part of the questionnaire but did not confirm their consent at the end (and are likely to have dropped out during the video portion). Twelve did not give their age, or indicated it was below 18, so were excluded on the grounds that they could not give valid consent. Six individuals responded to the video quality check question by saying they could not see or hear it clearly. Two individuals gave 'impossible' answers to the question about how many mistakes the man had made: one said 50 (the number of items was clearly stated as 48 in the instructions) and the other said 125. All of these individuals were excluded from the study, leaving *N*=241. No analyses were performed prior to the exclusions. There was missing data on the PRMQ for 12 participants. Data on the other variables for these participants was retained and used in analyses.

Participants

Sample size was initially planned to give 80% power to detect the effect size found in Study 1. The sample size eventually collected conferred 99.5% power to detect an effect equivalent to r=.287 as found in Study 1. Participant demographics are shown in Table 2. Participants came from 43 different countries around the world, but the great majority were from the US or UK. The sample was biased towards younger, employed women based in the USA with a relatively high level of education.

N	241
Sex	
Men	71 (29.5%)
Women	168 (69.7%)
Prefer not to say	2 (0.8%)
Location	
USA	108 (44.8%)
UK	40 (16.6%)
Other	92 (38.2%)
Unanswered	1 (0.4%)
Highest level of education	
Less than High School	1 (0.4%)
High School / Secondary School	45 (18.7%)
Some College or University	56 (23.2%)
College or University Degree	84 (34.9%)
Master's Degree	42 (17.4%)
Doctoral Degree	10 (4.1%)
Professional Degree (JD, MD)	3 (1.2%)
Occupation	
Employed for Wages	104 (43.2%)
Self-employed	18 (7.5%)
Unemployed	16 (6.6%)
Home-maker	7 (2.9%)
Student	85 (35.3%)
Retired	5 (2.1%)
Unable to work	6 (2.5%)

Table 2

Demographic Data, Study 2

Results and Discussion

Descriptive statistics are shown in Table 3. In addition to the estimated number of errors made, scores were calculated for the discrepancy between participants' estimated and the target's actual test number of errors made, and also the absolute magnitude of that discrepancy.

					Range			
	N	*M*	*SD*	α[1]	Potential	Actual	Skew	Kurtosis
Neuroticism	241	22.08	7.36	.89	8 - 40	8 - 40	.12	-.53
Memory rating	229	44.87	8.46	.87	16-80	18 - 65	-.29	.57
Estimated errors	241	22.80	6.96		0 - 48	1 - 40	-.43	.31
Discrepancy (estimated – actual errors)	241	-.20	6.96		-23 - 25	-22 - 17	-.43	.31
Absolute discrepancy (magnitude of estimated – actual errors)	241	5.40	4.44		0 - 25	0 - 22	1.00	.31
Age (years)	241	34.62	14.23		18 -	18 - 83	.74	-.34

Table 3

Descriptive Statistics, Study 2

[1]Cronbach's alpha, internal consistency

Participants' neuroticism scores correlated positively and significantly with their ratings of the target's memory performance using the PRMQ (r=.136, n=229, p=.039). Neuroticism did not correlate with estimates of the number of mistakes made (r=.108, n=229, p=.103). If neuroticism led people to consistently over- or

under-estimate the number of errors made, it might be expected to correlate with the discrepancy between estimated and real number of errors made. However, no such correlation was observed (r=.036, n=241, p=.576). If more neurotic people were more accurate in their estimates, the neuroticism scores might be expected to correlate negatively with the absolute magnitude of such discrepancies. However, no such correlation was observed (r=.082, n=241, p=.206). Taken together, these findings are more consistent with the 'greater worry' hypothesis than they are with the notion that more neurotic people are better at detecting errors due to greater vigilance for symptoms of memory failures.

General Discussion

In two studies, using different types of sample, stimuli, and measures of neuroticism, participants higher in neuroticism rated a target person as more likely to experience memory problems. This effect applied to general ratings of memory performance obtained using a validated informant-report measure. It did not apply to participant evaluations of actual performance in a cognitive test (in Study 2 only). These findings suggest that more neurotic individuals provide inflated ratings – consistent with the idea that they over-report problems due to greater concern about them. They are not consistent with the idea that more neurotic people are more attentive to the actual errors exhibited by targets they rate.

Implications

The current data reinforce the notion that more neurotic informants are likely to rate people as having worse memory abilities, regardless of their actual functional status. This has implications for the interpretation of informant-reports in clinical situations, such as the detection of cognitive impairment. How much does this matter? The effect sizes (r=.287, r=.136*)* are low, but in the case of Study 1 at least,

higher than the ‘realistic minimum practical effect’ suggested by Ferguson (2009) as a benchmark for social science phenomena that are likely to be have consequences in practical settings. Hacket et al. (2020) evaluated the effect of patient and informant variables on informant ratings of the functional status of individuals with MCI. A composite measure of the actual cognitive performance of the MCI patient correlated only weakly with informant ratings of the patient’s functional status (Spearman’s rho = -.169). The correlation between neuroticism and memory rating observed in Study 1 can be recalculated as a Spearman’s *rho* of .280 (*p*=.031); the equivalent for Study 2 is *rho*=.133 (*p*=.044). While these findings were obtained with a different population and informant-report measure, the relative magnitude of these correlations suggests there is actually something here worth knowing about. Is it possible that neuroticism influences informant ratings as much as the actual functional status of the person being rated?

Limitations

The target being rated in this research was ostensibly ‘normal’ in terms of functional status, rather than being a candidate for being diagnosed with cognitive impairment. Most screening instruments are designed for detection of abnormality, rather than with cognitively typical populations. It is not clear whether the same phenomenon would be seen if the person being rated was cognitively impaired (i.e. would the objective reality of observable impaired function overpower any potential personality effect on ratings). However, the fact that more neurotic individuals gave elevated ratings of cognitive impairment for a relatively high-functioning individual suggests that the likelihood of false positive diagnoses could be increased.

In both Study 1 and Study 2 the degree of interaction raters had with the person they were rating was much lower than would be the case for typical

informants in clinical evaluations. In that context, the informants would be people who know the target well (e.g. a family member) and have many opportunities to observe their everyday performance. Further work is required to examine the role neuroticism may play in more realistic settings, and also incorporate objective measures of cognitive performance.

Conclusion

In summary, this paper provides further evidence that informant-report measures of cognitive function may be influenced by the neuroticism level of the rater. It goes further than previous research in exploring the mechanisms by which the effect may operate. The effect size is small, but sufficient that it may have practical implications. The finding that more neurotic informants are likely to over-report cognitive failures in people they provide ratings for may have implications for how informant-report measures are used in research and clinical practice. Future research should explore the effect in more ecologically valid contexts, to evaluate its practical significance and potential ways of dealing with it.

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