



Is general intelligence responsible for differences in individual reliability in personality measures?



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ABSTRACT

One possible hypothesis for personality differentiation is the higher reliability of high-ability individuals in typical response measures. This differential reliability has been explained as resulting from different verbal abilities as a consequence of the difficulties that low-ability individuals have in understanding items, or as the effect of response bias, or due to higher precision in the answers of high-ability individuals. The lack of an estimation of individual reliability has made it difficult to test these hypotheses. However, recent psychometric advances have made it possible to measure person reliability and thus address the issue. The present study analyses the relationships between person reliability measures and the response bias of different personality measures in measurements of intelligence in a sample of 532 adolescents. The results show that person reliability is more closely related to general intelligence than to specific abilities and that the results for low-ability individuals cannot be explained by verbal deficits or by higher levels of acquiescence or social desirability. The differential reliability of measures across ability levels therefore seems to be related to higher levels of trait-ness in high-ability individuals, i.e. traits are represented in them with greater strength and clarity.

1. Introduction

The potential interactions between intelligence and personality measures are a subject that has generated considerable controversy for many decades. These interactions do not refer directly to the relationships between personality and intelligence, but rather to a series of problems related to (a) the extent to which intelligence levels affect the factorial structure of personality measures or the relationships between personality dimensions, and (b) the possibility that the level of differentiation of abilities may depend on certain personality dimensions.

The issue summarized above was first reported by [Shure and Rogers \(1963\)](#), who found that the factor structure of personality scales differed as a function of individual levels of intelligence, and [Eysenck and White \(1964\)](#), who found a different factor structure of intelligence depending on individual levels of neuroticism. These types of result were later integrated into the personality differentiation hypothesis (PDH) framework developed by [Brand, Egan, and Deary \(1994\)](#). The PDH suggests that people with a higher level of ability have a more differentiated personality structure because they have more freedom to develop their personality, and this, results in greater distinction between them. If this hypothesis is true, then certain outcomes can be predicted when analysing the interactions between measures of personality and measures of ability. First we can expect a lack of factorial

invariance when assessing the structure of personality measures across different intelligence levels, insofar as fewer dimensions will be needed to describe the personality structure of less intelligent individuals. Second, high-ability individuals will show greater variability in personality measures than low-ability individuals. Finally, we can expect a lack of invariance of ability measures across levels of personality due to different relationships between ability measures across levels of different personality dimensions such as neuroticism.

The above predictions have generated a considerable amount of research over the last 30 years, but so far the evidence in favour of the PDH is inconsistent. With respect to the first issue mentioned, certain studies have detected a lack of invariance in personality measures across intelligence levels ([Allik, Laidra, Realo, & Pullmann, 2004](#); [Mclarnon & Carswell, 2013](#)) or different correlations between personality measures across ability levels ([Austin et al., 2002](#)). Others, however, have reported that personality remains essentially invariant ([De Fruyt, Aluja, García, Rolland, & Jung, 2006](#); [Waiyavutti, Johnson, & Deary, 2012](#)) or that the correlations between personality measures were equal across ability levels ([Austin, Deary, & Gibson, 1997](#)).

With regard to the second prediction, different authors have reported an increased variance of personality scores among high-ability individuals, but only for some of the personality dimensions analysed. [Austin et al. \(1997\)](#), for instance, reported this effect only for openness

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and neuroticism, while Harris, Vernon, and Jang (2005) found an increased variance for three of the twenty dimensions of personality and De Fruyt et al. (2006) found increased variance only for neuroticism and extraversion. However, other studies have reported no differences in any dimension (Allik et al., 2004; Escorial, García, Cuevas, & Juan-Espinosa, 2006).

Finally, regarding the lack of invariance of ability measures across levels of personality, Austin et al. (1997) and Austin, Hofer, Deary, and Eber (2000) found that the correlation between two intelligence measures increased as neuroticism increased, while Austin et al. (2002) found that the correlation between fluid and crystallized intelligence increased with the level of neuroticism. Nevertheless, Escorial et al. (2006) found no difference between the eigenvalues of the g factor across different levels of personality dimensions, and Bonaccio and Reeve (2006) reported that the structure of cognitive abilities remained invariant across neuroticism levels.

Overall, the results so far summarized suggest that, despite the inconsistencies, there is partial support for the predictions deriving from the PDH. However, a clear and univocal rationale for the results obtained is still lacking. Although the PDH suggests that more intelligent individuals have more differentiated personalities, there are other explanations that may account for these results. Different authors have reported that personality measures have varying amounts of reliability depending upon individual levels of ability and education, with high-ability groups showing higher reliability (Allik et al., 2004; Austin et al., 1997; McFarland & Sparks, 1985). This increase in turn is expected to result in both higher variability (because of the increase in true variance) and higher score correlations (because they become less attenuated by measurement error). In the end these stronger correlations are expected to impact the factor structure of the measures analysed. Taking this alternative explanation into account, Austin et al. (1997) suggested that the results associated with the PDH may be reflecting (a) a true personality differentiation, (b) a simple effect of differential reliability, or (c) a mixture of the two.

Different explanations have been put forward regarding the differential reliability associated with ability levels (DRAAL). These explanations mainly derive from the fact that the process of answering items requires a considerable amount of cognitive processing, and have therefore focused on issues such as the difficulties that low-ability individuals have in understanding certain items, differences at verbal ability level, and the presence of a “highly calibrated ruler” in high-ability subjects that enables them to give more meaningful responses (Austin et al., 1997, 2000). Other authors have suggested that the DRAAL may ultimately be related to differences in response styles between high and low-ability groups, i.e. groups may show different levels of faking, self-enhancement and/or acquiescence which may be the cause of differential reliability (Allik et al., 2004; Austin et al., 2000). So far, however, there has been little research relating response styles and intelligence. De Fruyt et al. (2006) found no relationship between intelligence and self-enhancement. Meanwhile acquiescence has been related to intelligence and low levels of education (Meisenberg & Williams, 2008) and has been proved to have a considerable impact on the factor structures of personality insofar as the number of factors extracted in a personality test varies depending upon whether or not acquiescence effects are removed (Navarro-González, Lorenzo-Seva, & Vigil-Colet, 2016; Rammstedt & Farmer, 2013; Soto, John, Gosling, & Potter, 2008). These results may partly explain the effects described in the PDH because, if low ability individuals have higher levels of acquiescence and these effects are not removed, then different factor structures for these individuals are expected to arise.

Overall, as pointed out by Austin et al. (2000), the main problem is that it is difficult to disentangle which of the effects associated with the PDH are due to changes in personality structure across ability levels and which are due to other problems such as differential reliabilities on the sole basis of self-report results. At a group level, it is quite straightforward to assess whether the marginal reliability of personality scores

is lower for the low-ability groups. However, assessing (a) the individual contributions to reliability, and (b) further potential relations to response bias indexes, verbal ability measures, etc. is not so simple. It is submitted here that a more finely-graded analysis that would enable points (a) and (b) above to be assessed would, in turn, enable the different explanations given for the DRAAL to be better investigated. This type of analysis, which is based on the concept of person reliability, is already feasible and is summarized below.

1.1. Person reliability

Conventional psychometric models for personality consider only a single parameter for each respondent: his/her level of the trait being measured. Implicitly, therefore, this modelling assumes that all individuals respond to the test with the same degree of consistency and accuracy. This view has been challenged for over 70 years (Coombs, 1948; Mosier, 1942) and the evidence in personality is also against it; some individuals respond to personality items with very high consistency, almost deterministically, whereas the responses of others are much more random. This differential degree of consistency has been labelled “person fluctuation”, “person reliability” or “person discrimination” (Ferrando, 2007, 2009). Person reliability is the term we shall use here.

Ferrando (2007, 2009, 2013) proposes a comprehensive item response theory (IRT) model for assessing person reliability under a variety of response formats. Essentially, the proposal consists of a series of extended conventional IRT models with an extra parameter that functions as an individual slope or discrimination index, and which models the degree of response consistency. This parameter is bounded below by zero and has no upper bound. Values near zero imply that the way the individual responds is almost random, i.e. totally insensitive to the normative item ordering, whereas very high values imply an almost deterministic, Guttman-type responding.

Following Tellegen (1988), Ferrando (2007, 2009, 2013) conceptualized person reliability as a relevant individual-differences dimension to partly explain the behaviour of the individual responding to a test. Furthermore, and also in line with previous proposals (Markus, 1977; Tellegen, 1988), Ferrando hypothesized that this dimension was related to the degree of clarity and strength with which the trait was organized in the individual. Recent empirical evidence suggests that this interpretation is tenable, with person reliability measures being indicators of traitedness (LaHuis, Barnes, Hakoyama, Blackmore, & Hartman, 2017). More generally, applied research results suggest that person reliability estimates have certain relevance in personality assessments. They are directly related to measures of conscientiousness and impulsivity (Austin, Deary, Gibson, McGregor, & Dent, 1998; Ferrando, 2007; Ferrando, 2009) and they have also been shown to function as moderator variables in validity assessments, in the sense that stronger relevant validity relations have been found for the most reliable individuals (Ferrando, 2015).

1.2. Aims of the study

The feasibility of obtaining reliability estimates at individual level might enable us to answer some of the questions discussed above. Thus if the low marginal (i.e. mean) reliability values found in low-ability groups is due to a poor understanding of the item content by low-ability individuals, then we can expect the person reliability estimates to be more closely related to measures of verbal ability than to measures of fluid or general intelligence. In the present research we shall use different personality measures, some of which have been developed using a method proposed by Ferrando, Lorenzo-Seva, and Chico (2009), enabling not only content but also acquiescence (AQ) and social desirability (SD) scores to be obtained for each individual. Hence relationships between intelligence measures and response bias measures can also be directly assessed. If, as authors such as Allik et al. (2004) and

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