



Comparing and validating measures of non-cognitive traits: Performance task measures and self-reports from a nationally representative internet panel[☆]



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ABSTRACT

Education researchers and labor economists are increasingly focusing on skills such as conscientiousness, grit and emotional stability. This is part of a larger research program that sees “non-cognitive skills” as drivers of educational attainment and labor market outcomes. However, data on these important non-cognitive traits is not always available and, when available, researchers have raised concerns on potential biases in self-reported measures. In this paper, we use data collected from the Understanding America Study, a nationally representative internet panel, to study the validity of measures of non-cognitive traits, including novel measures based on survey effort. We propose that surveys can be viewed as performance tasks and that respondents provide meaningful information about relevant non-cognitive traits based on the effort they put forward in completing them. In particular, we examine the extent to which respondents provide careless answers or intentionally skip questions. We compare self-reported measures of grit, conscientiousness, neuroticism, and other personality traits, with survey-effort measures. We study the relationship of survey effort measures to these self-reported measures, educational attainment, and labor-market outcomes. Our results show that measures of careless answering in surveys show promise for use as proxies of traits related to conscientiousness and neuroticism.

1. Introduction

Both cognitive and non-cognitive traits are important determinants of educational and labor-market outcomes. Individuals with higher cognitive ability exhibit higher educational attainment levels and earnings (e.g. Becker 1964; Hanushek and Woessmann 2012); this is one of the most well-established findings in human capital research. The literature on non-cognitive traits is more recent, which has recognized the crucial role that non-cognitive traits play in realizing the same outcomes, even after controlling for IQ or cognitive ability.

Non-cognitive traits such as grit, conscientiousness, and neuroticism have also been found to independently influence other important life and economic outcomes such as health, the propensity to engage in

criminal behavior, and retirement planning and savings (Almlund et al., 2011; ter Weel, 2008; Heckman et al., 2006; Hershey and Mowen, 2000). These findings rely mostly on data from self-reported psychometric scales, where study participants answer a series of Likert-type items.

Self-reported measures are relatively easy to collect when designing one's own survey. But self-reported measures are not always available in many existing data sets. Moreover, when self-reports are available, there are concerns that they can be affected by social-desirability and reference-group bias (Dobbie and Fryer, 2015; Krosnick et al., 1996; West et al., 2016). In addition, even if these sources of bias were absent from self-reported measures, these measures are rarely, if at all, validated in nationally representative samples. Self-reported measures have

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typically been validated in convenience samples, calling into question the extent to which they can be validly used for more general populations.

An alternative approach to self-reported measures of non-cognitive traits is to obtain measures based on performance tasks. In a performance task, a researcher asks respondents to complete a carefully designed task and interprets their behavior as some indication of an underlying non-cognitive trait. Psychologists and experimental economists commonly rely on performance tasks to measure underlying individual traits such as risk aversion (Holt and Laury, 2002; Deck et al., 2013) and altruism (Andreoni, 1995; Kahneman et al., 1986). Mischel and Ebbsen's (1970) famous "Marshmallow Test" and Segal's (2012) coding speed test — a clerical task where respondents are asked to rapidly match words to numerical labels — are additional examples of performance tasks designed to measure self-regulatory skills and conscientiousness.

Elsewhere, Galla et al. (2014) propose and validate the Academic Diligence Task among adolescents as a performance-task measure related to conscientiousness and grit. In this task, high school students were told of the cognitive benefits of completing simple math problems and then asked to solve as many of them as possible during a timed session at their schools. While students completed problems on the computer, they were also tempted to take breaks to watch entertaining internet videos or play computer games. The researchers then calculated the amount of time that students devoted to solving math problems or watching videos and playing games, as well as the number of successfully completed math problems. Although correlations between the task-based measure of diligence and self-reported measures were of smaller magnitude than correlations across multiple self-reported based measures, Galla et al. conclude that this task presented convergent validity with self-reported measures of conscientiousness, self-control, and grit, as well as discriminant validity, as it was uncorrelated with theoretically unrelated traits like extraversion and openness. The Academic Diligence Task also explained variation in outcomes related to conscientiousness such as GPA scores, math and reading achievement tests scores, high school graduation, and college enrollment, even after controlling for important demographic information and the cognitive ability of the students.

Though performance-task measures do not always suffer the same sources of biases as self-reports, they have limitations of their own. In particular, tasks are generally very costly and difficult to collect in large samples and it is not always clear that artificial tasks completed in a lab setting are generalizable to other contexts or are able to succeed in capturing the underlying concept of interest (Bardsley, 2008; Deck et al., 2013; Duckworth and Yeager, 2015; Falk and Heckman, 2009; Levitt and List, 2007). Finally, there are concerns of using the same performance task to obtain repeated measures of the desired skill, as participants might show learning effects after having performed the task once, or that measures be distorted by experimenter demand effects, even for tasks that study participants encounter for the first time (Zizzo, 2010).

In general, social-desirability bias, reference-group bias, questions of generalizability to broader populations, concerns over generalizability from a lab setting to contexts in the field, and the unavailability of measures in many data sets have generated calls to improve measurement of non-cognitive traits (Duckworth and Yeager, 2015). This paper is motivated by this call. Our claim is not that existing measures are unusable, especially given a long history of research validating and utilizing these measures. Rather, we propose an alternative approach to measuring non-cognitive traits that can be concurrently used with existing approaches or when other measures are not available.

We collected self-reported data on grit, Big Five personality traits and survey-effort measures of the same respondents, using data from a nationally-representative internet panel of American adults. We study the potential of survey-effort measures to capture underlying non-

cognitive traits. Survey questionnaires, we argue, can be viewed as tasks that require effort to complete. Respondents, then, may reveal important non-cognitive traits through the effort that they exhibit to complete the questionnaires.

We seek to validate two survey-effort measures — namely item nonresponse rates and careless answering — to serve as proxies for non-cognitive traits. Previous research has suggested that these kinds of behaviors capture a common tendency to satisfice, or to merely convey the semblance of effort while exerting minimal effort to complete the survey (Malhotra, 2008; Zhang and Conrad, 2013). We extend this research by making explicit links between such behaviors and non-cognitive traits. Other research has found that item nonresponse and careless answering among adolescents are predictive of later educational attainment, independent of cognitive ability. Yet this research is limited in the validation of these measures by a lack of specific personality traits with which to compare them (Hitt et al., 2016; Hitt, 2015). In this paper, we provide additional validation of these measures. We check for convergent and divergent validity by examining their relationship with self-reported measures of the Big Five personality traits and grit. We additionally examine the criterion validity of these survey-effort measures. Specifically, we hypothesize that these measures would be correlated with educational and labor-market outcomes, after controlling for cognitive ability and other relevant demographic characteristics, just as other non-cognitive traits are (Almlund et al., 2011).

This is the first study to simultaneously explore the relationships between survey-effort measures of non-cognitive traits and common self-reported measures in a nationally-representative sample. The remainder of this paper is divided into four sections. In Section 2, we describe our data and the non-cognitive traits that we aim to measure. In this section, we also discuss how researchers have studied these non-cognitive traits in the past as well as, provide background about our alternative survey-effort measures. Next, in Section 3, we describe the methods that we use to validate survey-effort measures of non-cognitive traits. In Section 4, we present the results of our analysis. Finally, in Section 5, we discuss these results and offer concluding remarks about these measures of non-cognitive traits and their place in future research.

2. Data and measures

We use data collected in the Understanding America Study (UAS) to develop and validate our measures of survey effort. The UAS is a new household panel recruited by the University of Southern California, comprising a nationally-representative sample of approximately 6000 US respondents.¹ UAS respondents complete surveys in waves that occur once or twice per month. Each wave, on average, takes 30 min to complete, and respondents receive compensation for their time spent answering questions at a rate of \$20 per 30 min of interview time. Annual attrition rates are modest (on the order of 6% per year).

Our results are based in part on a survey wave that we commissioned, using a survey instrument that we assembled. This wave includes self-reported grit and detailed information on school and family experiences during the respondents' childhood. Data collection started in June 2015 and the UAS team has continued to collect this data of new panel members up to this date. As a result, we have information of slightly over 4800 respondents. Unfortunately, however, information to build measures of type of occupation of respondents were only made available to us for a subsample of respondents and so, the analysis including these measures is based on a smaller sample of between about

¹ It is important to note that participants are not limited to households who have computer hardware or purchase internet access. The UAS research team provides internet access and hardware, such as tablets, so that all households in the sample may participate. For more information about the UAS, visit: <https://uasdata.usc.edu/>.

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