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On the interpretation of non-cognitive skills – What is being measured and why it matters☆

John Eric Humphries[a], Fabian Kosse[b,*]

[a] Department of Economics, University of Chicago, 1126 East 59th Street, Chicago, IL 60637, USA
[b] Institute for Applied Microeconomics, University of Bonn, Adenauerallee 24-42, 53113 Bonn, Germany

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ABSTRACT

Across academic sub-fields such as labor, education, and behavioral economics, the measurement and interpretation of non-cognitive skills varies widely. As a result, it is difficult to compare results on the importance of non-cognitive skills across literatures. Drawing from these literatures, this paper systematically relates various prototypical non-cognitive measures within one data set. Specifically, we estimate and compare several different strategies for measuring non-cognitive skills. For each strategy, we compare their relative effectiveness at predicting educational success and decompose what is being measured into underlying personality traits and economic preferences. We demonstrate that the construction of the non-cognitive factor greatly influences what is actually measured, how it relates to more standard taxonomies and what conclusions are reached about the role of non-cognitive skills in life-outcomes such as educational attainment. Furthermore, we demonstrate that, while sometimes difficult to interpret, factors extracted from self-reported behaviors can have predictive power similar to well established taxonomies, such as the Big Five.

1. Introduction

Many traits, skills, and abilities matter for success in life.[1] Yet, the underlying dimension and classification of these traits are widely contested within economics and across the social sciences. In economics, "non-cognitive" skills have recently become very popular in applied research, but there is little agreement on what these types of skills represent. In labor economics, non-cognitive skills are usually seen as a broadly defined second dimension of individual heterogeneity (next to cognitive skills). In the education and early childhood intervention literatures, non-cognitive skills are broadly categorized as skills not captured by standardized tests and are commonly measured by observing behavior. In economic psychology and behavioral economics, non-cognitive skills are seen as a superordinate concept summarizing various specific concepts (i.e. economic preferences such as time and risk preferences) as well as personality measures (as the Big Five). Overall, across

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* Corresponding author.
E-mail addresses: johneric@uchicago.edu (J.E. Humphries), kosse@uni-bonn.de (F. Kosse).

[1] The literature uses the expressions "traits", "skills" and "abilities" to describe unobserved individual heterogeneities. Some papers use "traits" to describe immutable characteristics of individuals while using "skills" when referring to malleable characteristics. For the most part, including this paper, these terms are used interchangeably.

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sub-fields, and across papers within sub-fields, the measurement and interpretation of non-cognitive skills varies widely due to the different motives and available data sources.

The aim of this paper is to compare several different strategies for measuring non-cognitive skills and to decompose and interpret their relative effectiveness in predicting educational success. Using data from the youth survey of the German Socio-Economic Panel (GSOEP), we construct four stylized factors based on measures from previous literature and relate the different estimates of non-cognitive skills to each other and to established taxonomies. To the best of our knowledge, this is the first paper that systematically relates the various non-cognitive measures used in the literature within one data set. We also contribute to the literature on skills in the education context and evaluate how the different non-cognitive skill constructs relatively perform in predicting educational success.[2] We shed light on what previous papers have measured when using different methods to generate proxies of non-cognitive skills and show that the construction of the non-cognitive factor greatly influences what is actually measured, how it relates to more standard taxonomies and what conclusions are reached about the role of non-cognitive skills.

Measuring non-cognitive skills: Different sub-fields tend to have different intentions when constructing non-cognitive factors, which may explain the lack of standardization. Researchers sometimes rely on formal models to determine the nature and dimension of the skills to be estimated. At other times, researchers may only be concerned with fully capturing and controlling for pre-existing differences. In the latter case, the researchers may not care about interpretation of the extracted skills, as their only aim may be to span as much of the underlying multidimensional heterogeneity as possible. Below we review three literatures that study non-cognitive skills, highlighting differences in their methodologies for measuring non-cognitive skills and their motivations for including them in their analyses.

In labor economics, a one dimensional skill or ability has been used to differentiate workers (Becker, 1964; Herrnstein and Murray, 1994; Neal and Johnson, 1996; Carneiro, 2002). More recent research has used a two-factor framework which usually consists of a "cognitive" component and a "non-cognitive," "socio-emotional," or "personality" component that is an aggregate of skills or traits other than cognition that are important determinants of educational and labor market outcomes (Heckman and Rubinstein, 2001; Heckman et al., 2006). For historical reasons, the "non-cognitive" component has been constructed from measures included in social surveys such as the National Longitudinal Survey of Youth 1979 (NLSY79). Commonly, these are one dimensional constructs combining self-reported measures of self-esteem, locus of control, or other similar measures. When labor-economists extract multi-dimensional heterogeneity, they commonly aim to simply control for pre-existing differences, and they do not focus on the interpretation of the additional traits.[3]

Non-cognitive skills have also become important components of the education economics and early childhood intervention literature. Some early interventions were found to have no lasting effect on test scores, yet still improved later-life performance of participants. Similarly, research on the GED (general education development) high school equivalency exam found that GED certificate recipients performed similarly to high school graduates on achievement tests, yet performed worse later in life. The research on early interventions and the research on the GED raised questions about what skills other than cognition were being formed by education. Looking beyond test scores, researchers in education economics have turned to behaviors measurable in their data, such as behavioral issues, absences, engagement, and teacher reports (Heckman et al., 2013a).

More recent research in economic psychology and behavioral economics have taken a somewhat different approach. This literature uses the term "non-cognitive" (or soft) skills as a generic term for a whole set of constructs to differentiate individuals (e.g. Borghans et al., 2008b; Koch et al., 2015).[4] The most frequently used constructs are either key economic variables, such as preferences for risk and time,[5] or, are borrowed from psychology as, e.g., the Big Five personality inventory (Costa and McCrae, 1992).[6] This work has focused on precisely measuring and describing multiple facets of personality and preferences, using incentivized laboratory experiments or extensive questionnaire batteries. However, these precise measures are often not connected to information about later-life outcomes. Exceptions that connect (incentivized) preference measures and real-life outcomes include Burks et al. (2015, 2012), Golsteyn et al. (2014), Sutter et al. (2013), Rustichini et al. (2016) and Chabris et al. (2008). Burks et al. (2015) is most closely related to this paper and considers the relation between education outcomes, personality measures, and economic preferences.

All three strands of literature concur that skills other than cognition are important in explaining heterogeneity in behaviors and outcomes between people.[7] Research across these fields shows the importance of non-cognitive skills, but little consensus exists on what is being measured and what matters. Due to data availability, the labor and education literature

[2] For papers that focuses on the relation between psychological personality measures and economic preference measures, see Becker et al. (2012) and Rustichini et al. (2016).

[3] See, for example, Keane and Wolpin (1994) and the related literature on latent types. This literature uses types to span a potentially multi-dimensional unobservable component of individuals but generally do not focus on what skills, traits, or differences the types are capturing.

[4] For an overview about the concepts and for a discussion on using the term "non-cognitive" in this context, see Borghans et al. (2008a).

[5] For an overview and discussion, see Becker et al. (2012)

[6] The five personality dimensions are labeled as conscientiousness, agreeableness, neuroticism, openness, and extraversion.

[7] There are a number of overviews of the literature on non-cognitive skills: Koch et al. (2015) on behavioral economics of education, Thiel and Thomsen (2013) on models and measurement, Gutman and Schoon (2013) on effects on various outcomes and Brunello and Schlotter (2011) on effects on educational and labor market outcomes. For an early overview focusing on labor market returns see Groves (2005). Almlund et al. (2011) refer to cognitive and non-cognitive skills and summarize empirical results.