

# The Potential of Survey-Effort Measures to Proxy for Relevant Character Skills

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# Character Skills are Relevant for Life Outcomes but Seldom Included in Evaluations

- Despite their relevance for important life outcomes, measures of character skills are seldom included in evaluations of public policies and social interventions
- Researchers are struggling to find valid measures of character skills to be used in evaluations
- Three approaches to measure character skills:
  - 1. Grades and Behavioral Reports**
  - 2. Self-Reported Measures or External reports**
  - 3. Performance Task Measures**
- These measures are not always available in researchers' datasets and could be manipulated or affected by biases if used for evaluation purposes (e.g. social desirability bias, reference group bias, learning effects)

## Charassein's Proposed Approach

- **Measures Based on Studying Response Patterns in Surveys and Tests** as performance-task measures of character skills
- Focusing on surveys:
  - Surveys take effort to complete
  - Resemble paperwork and clerical tasks in everyday life
  - For students, surveys administered in schools, resemble schoolwork or homework
  - Respondents reveal something about their character skills through the effort they exhibit on these tasks
  - Our hypothesis is that they could capture conscientiousness and character skills related to conscientiousness such as grit or self-control

# Charassein's Proposed Approach

- As long as participants are unaware that their survey effort is being measured, these measures are not affected by the same types of biases as self-reports or external reports
- These measures could be constructed in already collected data, opening the opportunity for new research on the development of character skills

# Outline

- Discuss the potential of three parametrizations of survey effort:
  1. **Item non-response rates**
  2. **Careless Answering Patterns**
  3. **Survey omission**

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- Overall Conclusions and other relevant work



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➔ Definition of survey effort measures and previous literature

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# Item Non-Response as a Proxy for Character Skills

- **Measure**: Percentage of answerable questions skipped in the survey
- Earlier work found promise for item non-response to serve as a proxy for character skills:
  - **Hedengren and Stratmann (2012)** find item non-response to be correlated with self-reported conscientiousness and it significantly predicted earnings and mortality risks using nationally representative samples of adolescents and adults from the U.S and Germany
  - **Hitt, Trivitt & Cheng (2016)**-Using data from six nationally-representative, longitudinal datasets (NLSY:79; NLSY:97; HSB:80; NELS:88; Add Health; ELS:02) of secondary school students found that item non-response patterns in adolescence were predictive of educational attainment and labor market outcomes later as adults, independent of cognitive test scores

# Careless Answering as a Proxy for Character Skills

- Some people might show low effort in the survey by providing thoughtless and random answers:

	Almost never	Sometimes	Often	Almost always
a. I'm confident that I can do an excellent job on my math tests	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. I'm certain I can understand the most difficult material presented in math tests	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. I'm certain I can understand the most difficult material presented in English tests	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. I study to get a good job	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. When I sit myself down to learn something really hard, I can learn it	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. I'm confident I can understand the most complex material presented by my English teacher	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. When I study, I make sure that I remember the most important things	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. I study to increase my job opportunities	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. I'm confident I can do an excellent job on my English assignments	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. When studying, I try to work as hard as possible	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. I'm confident I can do an excellent job on my English tests	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. I'm confident I can understand the most complex material presented by my math teacher	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. I'm certain I can master the skills being taught in my English class	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n. If I decide not to get any bad grades, I can really do it	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o. When studying, I keep working even if the material is difficult	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p. I study to ensure that my future will be financially secure	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q. If I decide not to get any problems wrong, I can really do it	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
r. I'm confident I can do an excellent job on my math assignments	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
s. When studying, I try to do my best to acquire the knowledge and skills taught	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
t. If I want to learn something well, I can	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
u. I'm certain I can master the skills being taught in my math class	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
v. When studying, I put forth my best effort	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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# Careless Answering as a Proxy for Character Skills

- Some respondents might show low effort in the survey by providing thoughtless and random answers:
  - **Hitt (2016)**-Proposes and validates a measure of careless answering based on the study of response patterns to validated scales within a survey
    - Using longitudinal data of American adolescents (NELS:88 and ELS:02) found that careless answering patterns at adolescence were predictive of education and labor outcomes later in adulthood, after controlling for cognitive ability measures

# Building Careless Answering Measures

- Individual responses to questions in a reliable scale should be well predicted by responses to other questions in this same scale
- We build careless answering measures as deviations in responses from predicted values, given responses in other questions in the scale

1. Responses to each item ( $j$ ) are regressed on the average score of responses given to the remaining items on the same scale ( $s$ ) following this type of “item-rest” bivariate regression equation:

$$Y_{ijs} = \beta_0 + \beta_1 \bar{Y}_{is,-j} + \eta_{ijs}$$

2. Standardized absolute values of residuals from previous regressions ( $\eta_{ijs}$ ) are averaged and standardized again within scales

3. These standardized scores from multiple scales are combined into a composite average “careless answering” measure

# Item Non-Response and Careless Answering as Proxy Measures

- We further study the potential of item non-response and careless answering measures to proxy for relevant character skills:
  - **Comparing and Validating Measures of Character Skills: Findings from a Nationally Representative Sample (Zamarro, Cheng, Shakeel & Hitt, 2016) :**
    - Nationally representative internet panel of American adults
    - Respondents are observed taking surveys over time and so survey effort can be observed in multiple points in time
    - Rich dataset: self-reported measures of character skills, cognitive ability measures, and relevant life outcomes (education, household income, employment, occupation status)

## Item Non-Response and Careless Answering as Proxy Measures

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  - **Further Validation of Survey-Effort Measures of Conscientiousness: Results from a Sample of High School Students (Zamarro, Nichols, Duckworth & D' Mello, 2017)**
    - Longitudinal convenience sample of high school students
    - Rich in measures of character skills through different approaches not just self-reports: external reports by teachers and academic outcomes in high school and early college (i.e. HS grades, Graduation, Achievement test scores, College enrollment)



# Survey Omission as a Proxy for Character Skills

- Rather than skipping items or responding thoughtlessly, some individuals exhibit low survey effort by entirely ignoring a survey even after they are asked to complete it
  - Some evidence in survey research methods suggests that survey omission likely occurs due to a lack of conscientiousness:
    - Social norms, a sense of civic duty or moral obligation, and interest in the survey topic all affect the likelihood of responding to a survey (Bosnjak & Batinic, 2002; Bosnjak, Tuten, & Wittmann, 2005; Groves, Singer, & Corning, 2000; Lubin, Levitt, & Zuckerman, 1962; Marcus & Shütz, 2005; Rogelberg et al., 2003)
    - In our paper “**Personality as a Predictor of Unit Nonresponse in Panel Data: An analysis of an Internet Based Survey**” (Cheng, Zamarro, Orriens, 2016) we link survey omission directly to measures of personality traits

# Comparing and Validating Measures of Character Skills (Zamarro et al., 2016)

- **Data:** Understanding America Study <https://uasdata.usc.edu/>
  - A nationally representative internet panel of adults (18 and older) run by the University of Southern California
  - Participants are provided internet access and hardware, such as tablets, so that all households in the sample may participate
  - Respondents complete up to 30-minute surveys in waves that occur once or twice each month
  - Respondents receive compensation for their time spent answering questions at a rate of \$20 per 30 minutes of interview time
  - Sample size about 6,000 respondents (Our empirical sample about 1,700)

# Data Source: The Understanding America Study (UAS)

- No other dataset – cross-sectional or longitudinal – simultaneously has all the measures that are available in our data for validation purposes
- **Convergent Validity:** Correlation of survey effort measures with self-reported measures of character skills
  - Constructed using UAS1:
    - BIG 5 personality traits (John et. al 1990, 1991 & 1999):  
Conscientiousness (-), Agreeableness(-), Neuroticism(+)
  - Constructed using UAS15:
    - Grit scale (Duckworth & Quin, 2009) (-)
- **Divergent Validity:** Little correlation with Big 5 personality traits: Extroversion and Openness

## Data Source: The Understanding America Study (UAS)

- **Criterion Validity:** Survey effort measures should predict educational and labor-market outcomes, after controlling for cognitive ability and relevant demographic information
- **Outcome and Explanatory variables** constructed using multiple waves UAS1, UAS15 & UAS22
  - Years of education, household income, employment and occupational status
  - Cognitive ability (constructed using a factor analysis of total number of correct responses on a Numeracy and a Cognitive Reflection Test) (Lipkus et. al, 2001; Frederick, 2005)
  - Other important demographic information (e.g. age, gender, race, region dummies)

# Survey Effort Measures of Character Skills

- **Item non-response rate:** built using UAS11, UAS12, UAS20, UAS21 and UAS22
  - Constructed as the mean of non-response across five surveys
- **Careless answering patterns:** built using 3 reliable scales on satisfaction with life & well-being from UAS2, and a depression scale from UAS20
  - Cronbach's alpha scores ranging from 0.7 to 0.9

# Results (Summary Statistics of Character Skills Measures)

Table 2. Summary Statistics for Measures of Character Skills

Measure	Mean	Standard Deviation	Minimum	Maximum	Cronbach's Alpha	Correlation Matrix							
						1	2	3	4	5	6	7	
1. Grit	3.60	0.57	1.38	5.00	0.71	-							
2. Conscientiousness	4.06	0.61	1.00	5.00	0.76	0.48	-						
3. Agreeableness	4.03	0.59	1.67	5.00	0.74	0.27	0.44	-					
4. Neuroticism	2.64	0.81	1.00	5.00	0.81	-0.33	-0.43	-0.39	-				
5. Extroversion	3.36	0.79	1.00	5.00	0.81	0.18	0.29	0.19	-0.25	-			
6. Openness	3.60	0.63	1.60	5.00	0.77	0.14	0.27	0.25	-0.19	0.33	-		
7. Item non-response	0.11	0.03	0.01	0.32	n/a	0.01	-0.01	-0.05	0.05	-0.02	-0.02	-	
8. Careless Answers	0.01	1.02	-1.95	4.39	n/a	-0.16	-0.22	-0.12	0.32	-0.09	-0.12	0.02	

Note: Summary statistics presented using population weights.

# Results (Partial Correlations Across Character Skills Measures)

Table 3. Partial Correlations of Survey-Effort Measures of Character Skills

	Item non-response rate	Careless Answers
Item non-response rate	-	-
Careless Answers	0.02	-
Grit	0.00	-0.15
Conscientiousness	-0.01	-0.21
Agreeableness	-0.03	-0.15
Neuroticism	0.03	0.28
Extroversion	-0.01	-0.08
Openness	-0.03	-0.05

Note: Partial correlations presented using population weights. Controls for cognitive ability & demographic variables included.

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# Results (Years of Education)- Standardized OLS coefficients

Table 4.B. Years of Education and Survey-Effort Measures of Character Skills

	(1)	(2)	(3)	(4)	(5)	(6)
Cognitive Ability		1.325** (0.080)	1.340** (0.083)		1.181** (0.076)	1.168** (0.075)
Nonresponse	-0.038 (0.126)	-0.033 (0.101)	0.003 (0.104)			
Careless Answering				-0.496** (0.074)	-0.278** (0.075)	-0.386** (0.071)
Demographic Variables Included			x			x
Observations	1,435	1,435	1,396	1,702	1,702	1,661
Adjusted R <sup>2</sup>	-0.001	0.237	0.280	0.038	0.224	0.275

Note: Standardized regression coefficients reported. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.

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# Results (Household Income level)- Average Marginal Effects

Table 5.B. Household Income and Survey-Effort Measures of Character Skills

	Less than \$25,000	\$25,000 to \$49,999	\$50,000 to \$99,999	More than \$100,000	Less than \$25,000	\$25,000 to \$49,999	\$50,000 to \$99,999	More than \$100,000
Cognitive Ability	-0.050** (0.016)	-0.031 (0.020)	-0.002 (0.021)	0.083** (0.014)	-0.045** (0.014)	-0.017 (0.019)	-0.009 (0.019)	0.070** (0.014)
Nonresponse	-0.040* (0.020)	0.020 (0.018)	-0.010 (0.028)	0.030† (0.016)				
Careless Answering					0.054** (0.013)	-0.008 (0.019)	-0.034 (0.021)	-0.027 (0.017)
Observations		986				1,180		
Pseudo R <sup>2</sup>		0.220				0.202		

Note: Table reports average marginal effects estimated after running multinomial logit models. Demographic variables, educational attainment levels, and employment status included as controls. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.

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# Results (Employment status)-Average Marginal Effects

Table 6.B. Employment Status and Survey-Effort Measures of Character Skills

	(1)	(2)	(3)	(4)	(5)	(6)
Cognitive Ability		0.043**	0.014		0.034*	0.006
		(0.016)	(0.016)		(0.015)	(0.014)
Nonresponse	-0.022	-0.023	-.001			
	(0.018)	(0.018)	(0.017)			
Careless Answering				-0.047**	-0.042**	-0.018
				(0.013)	(0.013)	(0.014)
Demographic Variables						
Included			x			x
Observations	1,024	1,024	984	1,222	1,222	1,180
Pseudo-R <sup>2</sup>	0.004	0.024	0.127	0.027	0.040	0.139

Note: Table reports average marginal effects estimated after running logit models. Demographic variables and educational attainment levels are included as controls. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.



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Nonresponse	-0.022 (0.018)	-0.023 (0.018)	-.001 (0.017)			
Careless Answering				-0.047** (0.013)	-0.042** (0.013)	-0.018 (0.014)
Demographic Variables Included			x			x
Observations	1,024	1,024	984	1,222	1,222	1,180
Pseudo-R <sup>2</sup>	0.004	0.024	0.127	0.027	0.040	0.139

Note: Table reports average marginal effects estimated after running logit models. Demographic variables and educational attainment levels are included as controls. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.

# Results (High Skilled Occupation)-Average Marginal Effects

Table 7.B. High Skilled Occupation and Survey-Effort Measures of Character Skills

	(1)	(2)	(3)	(4)	(5)	(6)
Cognitive Ability		0.160** (0.017)	0.065** (0.021)		0.147** (0.017)	0.078** (0.020)
Nonresponse	-0.057 (0.035)	-0.059† (0.034)	-0.046 (0.030)			
Careless Answering				-0.086** (0.023)	-0.055* (0.023)	-0.056** (0.020)
Demographic Variables Included			x			x
Observations	754	754	731	860	860	837
Pseudo-R <sup>2</sup>	0.005	0.098	0.270	0.018	0.095	0.252

Note: Table reports average marginal effects estimated after running logit models. Analytic sample is restricted to those who are employed. Demographic variables and educational attainment levels are included as controls. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.

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## Conclusions

- Our results show that careless answering measures show promise to be valid proxy measures of relevant character skills
- Careless answering correlates mostly with self-reported measures of conscientiousness and neuroticism
- Item non-response does not seem to show much correlation with the self-reported measures as well as with education or labor outcomes
  - Survey design effect?
- A limitation: We can only validate survey effort with self-reported measures in this data

# Further Validation of Survey-Effort Measures (Zamarro et al., 2017)

- **Data:** Longitudinal study on college persistence at the University of Pennsylvania
  - Baseline survey in 2014 to high school seniors (n=513) attending a public high school in the northeast of the U.S
  - Followed one year after to track college enrollment status
  - Rich measures of character skills:
    - **Self-reported measures:** Grit scale, locus of control, self-control (work skills, interpersonal skills, combined)
    - **Teacher reports:** teacher reported grit, teacher reported self-control (work skills and interpersonal skills), teacher reported students' redirection times within last week and percentage of homework completion
    - **Direct performance-task measures:** Academic Diligence Task (Galla et al., 2014) and a Frustration task

## Further Validation of Survey-Effort Measures

- **Item Non-Response:** Percentage of questions left blank in the Spring survey
- **Careless Answering:** Based on 10 reliable scales (Cronbach's alpha scores above 0.6), excluding scales of self-reported character skills
- **Outcome Measures:**
  - HS senior GPA
  - HS Graduation
  - Attempted SAT; SAT scores
  - Math and Reading Keystone test scores: End of year assessments needed for graduation
  - College enrollment 1 year after HS
- **Cognitive Ability:** Kaufman Brief Intelligence Test (KBIT)
- **Other relevant information:** age, ethnicity, ELL status, SPED status, FRL status, household income



# Results (Summary Statistics of Character Skills Measures)

**Table 2. Summary Statistics for Measures of Character Skills**

Measure	Mean	Standard Deviation	Minimum	Maximum
<i><b>Survey Effort</b></i>				
Item Non-response	2.41	5.35	0.0	37.2
Dichotomous Item Non-response	0.53	0.50	0.0	1.0
Careless Answers	0.00	1.00	-2.3	4.9
<i><b>Performance Task Measures</b></i>				
Diligence Task % Math	0.64	0.30	0.0	1.0
Frustration Task % Trace	0.54	0.27	0.0	1.0
<i><b>Self-Reported Measures</b></i>				
Grit	3.76	0.71	1.0	5.0
Locus of Control	4.57	0.75	2.5	6.0
Self Control Combined (Work and Interpersonal)	3.61	0.60	1.0	5.0
<i><b>Teachers Reported Measures</b></i>				
Teacher Reported Work Self Control	3.72	0.88	1.0	5.0
Teacher Reported Interpersonal self control	4.21	0.77	1.0	5.0
Teacher Reported Grit	3.53	0.87	1.0	5.0
Teacher Reported Redirection	0.92	1.16	0.0	5.0
Teacher Reported HW Completion	77.69	21.63	0.0	100.0

# Results (Partial Correlations Across Character Skills Measures)

**Table 5: Partial Correlations between Performance Task Measures and Self-Reports and Teacher Reports**

	<b>Item Non- response</b>	<b>Careless Answers</b>	<b>Diligence Task PT Math</b>	<b>Frustration Task PT Trace</b>
<i><b>Self-Reported Measures</b></i>				
Grit	<b>-0.199</b>	-0.103	<b>0.152</b>	<b>0.231</b>
Locus of Control	-0.134	-0.051	<b>0.208</b>	<b>0.199</b>
Self Control Combined	<b>-0.165</b>	<b>-0.170</b>	0.122	<b>0.180</b>
Self Control Work	-0.138	<b>-0.189</b>	0.125	<b>0.159</b>
Self Control Interpersonal	-0.145	-0.102	0.085	<b>0.150</b>
<i><b>Teachers Reported Measures</b></i>				
Teacher Reported Grit	-0.130	-0.144	0.088	0.102
Teacher Reported work self control	-0.111	-0.133	0.082	0.070
Teacher Reported Interpersonal self control	-0.029	-0.078	0.086	0.108
Teacher Reported Redirection	0.017	0.132	-0.067	-0.076
Teacher Reported HW Completion	-0.081	-0.039	-0.038	0.009

Notes: Controls include KBIT Scaled Score, Age, Ethnicity, Gender, FRL, SPED, ELL, and household income.

# Results (Partial Correlations Across Character Skills Measures)

**Table 5: Partial Correlations between Performance Task Measures and Self-Reports and Teacher Reports**

	Item Non- response	Careless Answers	Diligence Task PT Math	Frustration Task PT Trace
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Grit	<b>-0.199</b>	-0.103	<b>0.152</b>	<b>0.231</b>
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Self Control Combined	<b>-0.165</b>	<b>-0.170</b>	0.122	<b>0.180</b>
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Self Control Interpersonal	-0.145	-0.102	0.085	<b>0.150</b>
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Teacher Reported Grit	-0.130	-0.144	0.088	0.102
Teacher Reported work self control	-0.111	-0.133	0.082	0.070
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Teacher Reported HW Completion	-0.081	-0.039	-0.038	0.009

Notes: Controls include KBIT Scaled Score, Age, Ethnicity, Gender, FRL, SPED, ELL, and household income.

# Results: Predictive Power of Relevant Outcomes

**Table 6. Standardized Coefficients of Linear Regression Models for Predicting Academic Outcomes**

	Senior Year GPA	HS Grad.	Attempt SAT	SAT	Keystone Math	Keystone Read	College Enroll 1 year	4yr Coll. Enroll 1 year	4yr Coll. Enroll Full Time 1 year
<b>Item Non-Response (%)</b>	-0.196*** (-4.54)	0.024 (0.52)	-0.236*** (-5.31)	-0.139** (-2.44)	-0.193*** (-4.76)	-0.197*** (-4.86)	-0.238*** (-5.23)	-0.213*** (-4.80)	-0.192*** (-4.31)
<i>Adj R-squared</i>	0.240	0.077	0.161	0.273	0.374	0.316	0.130	0.170	0.160
<b>Careless Answering</b>	-0.166*** (-3.81)	-0.043 (-0.91)	-0.132*** (-2.87)	0.025 (0.42)	-0.137*** (-3.40)	-0.111** (-2.60)	-0.103** (-2.20)	-0.079* (-1.72)	-0.068 (-1.49)
<i>Adj R-squared</i>	0.229	0.078	0.124	0.255	0.356	0.290	0.082	0.130	0.129
<b>Diligence Task PT Math</b>	0.145*** (3.07)	-0.021 (-0.42)	0.023 (0.46)	0.114* (1.79)	0.144*** (3.26)	0.126*** (2.75)	0.093* (1.83)	0.064 (1.31)	0.057 (1.14)
<i>Adj R-squared</i>	0.232	0.077	0.110	0.242	0.352	0.304	0.091	0.147	0.127
<b>Frustration Task PT Tracing</b>	0.092** (2.02)	0.077 (1.60)	0.095** (1.99)	0.095 (1.57)	0.175*** (4.17)	0.125*** (2.80)	0.076 (1.57)	0.053 (1.12)	0.037 (0.79)
<i>Adj R-squared</i>	0.207	0.089	0.117	0.245	0.354	0.267	0.083	0.122	0.120

Note: t-ratios in parenthesis. Additional controls include KBIT Scaled Score, Age, Ethnicity, Gender, FRL, SPED, ELL and household income;

\*P<0.1; \*\*P<0.05; \*\*\*P<0.01.

# Conclusions

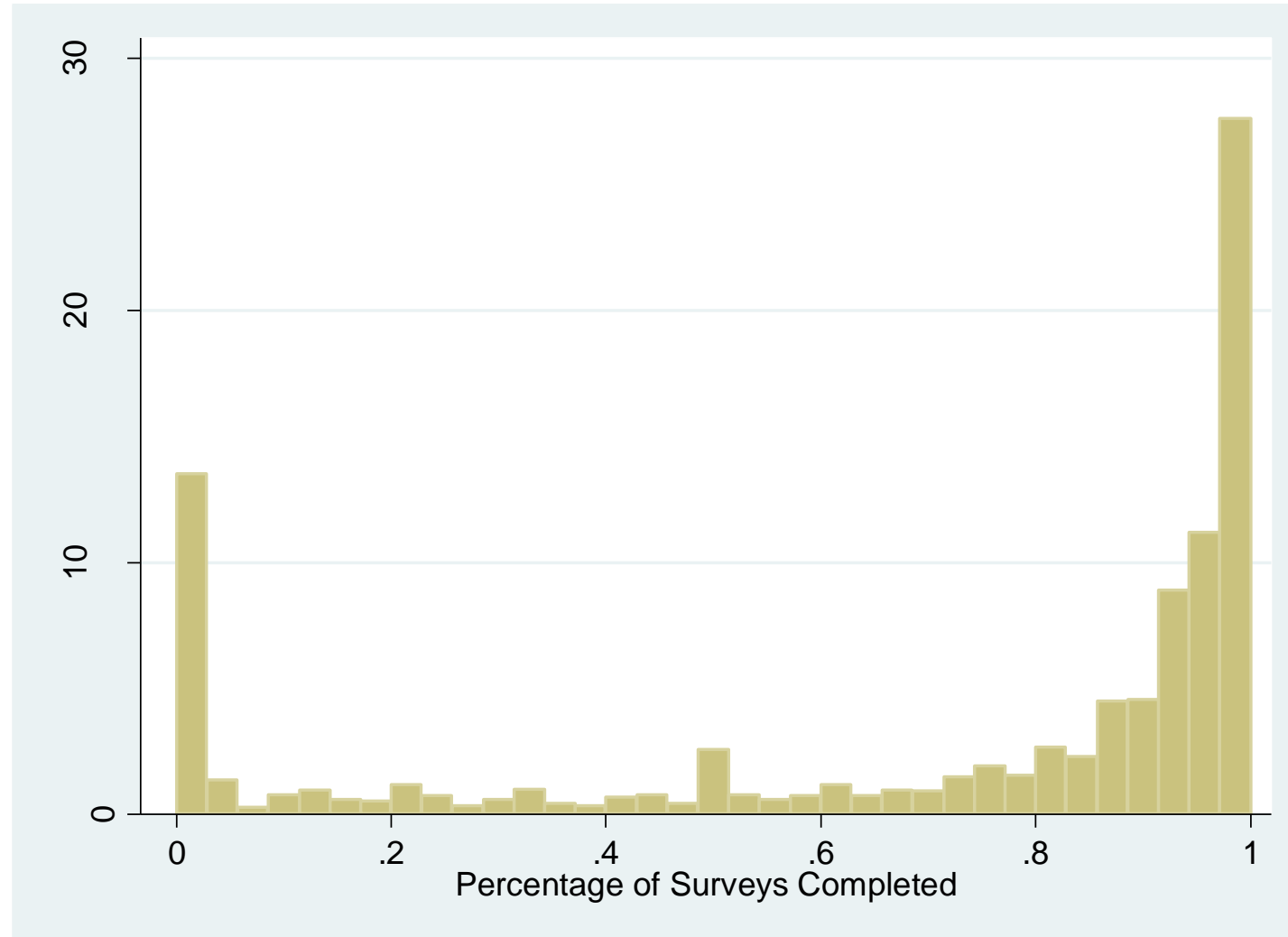
- Our results show promise of survey-effort measures to be used as proxy measures of character skills related to grit and self-control
- Careless answering was also positively correlated with teacher's reports of students needing redirection, even after controlling for cognitive ability and demographic information
- Our survey effort measures also presented criterion validity through negative significant correlations with senior year GPA, the probability of attempting the SAT, SAT scores, performance on the Keystone Math and Reading tests, and the probability of enrolling in college

# Personality as a Predictor of Unit Nonresponse in Panel Data (Cheng, Zamarro, Orriens, 2016)

- **Objective:** Study if personality traits are related to the incidence of unit non-response (survey omission) in a panel dataset. Can paradata proxy for relevant personality traits?
- **Data:** Understanding America Study <https://uasdata.usc.edu/>
- Using the respondents of UAS1 as our initial sample we studied the predictive power of self-reported personality traits on predicting unit nonresponse in subsequent surveys, controlling for cognitive ability and demographic characteristics that are usually available and used by researchers to correct for panel attrition bias
- We also tested the potential to use paradata on recruitment reminders to be used as proxies for personality traits

# Personality as a Predictor of Unit Nonresponse in Panel Data

Figure 1: Distribution of Individual Survey Completion Rates



Note: Figure displays the percentage of respondents who completed a given percentage of the surveys that they were asked to complete.



# Personality as a Predictor of Unit Nonresponse in Panel Data

Table 3: UAS Recruitment Paradata Used in the Analysis and Timeline

Action	Timing
1. Respondents receive recruitment questionnaire	
2. Respondents who have not completed the recruitment questionnaire are sent reminders ( <i>Reminded to Complete the Recruitment Survey</i> )	4 weeks after 1
3. Respondents who express interest in participating in UAS per their reply on the recruitment questionnaire are asked to complete the My Household Survey	
4. Respondents who have not completed the My Household Survey receive a first reminder to complete it ( <i>Reminded Once to Finish “My Household”</i> )	2 weeks after 3
5. Respondents who have not completed the My Household Survey receive a second reminder and an additional monetary incentive to complete it ( <i>Reminded Twice to Finish “My Household”</i> )	3 weeks after 4

# Personality as a Predictor of Unit Nonresponse in Panel Data

Table 4: The Influence of Personality (based on Self-Reported Measures) on Panel Attrition

	Dependent Variable: Total Surveys Completed						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Big 5 Personality Traits</i>							
Conscientiousness		0.263*** (0.095)					0.354*** (0.111)
Agreeableness			0.039 (0.097)				-0.036 (0.112)
Neuroticism				-0.140 (0.096)			-0.117 (0.114)
Openness					-0.310*** (0.098)		-0.367*** (0.107)
Extraversion						-0.158* (0.095)	-0.148 (0.107)
Cognitive Ability	0.329*** (0.115)	0.314*** (0.116)	0.310*** (0.116)	0.305*** (0.116)	0.335*** (0.116)	0.293** (0.116)	0.337*** (0.117)

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# Personality as a Predictor of Unit Nonresponse in Panel Data

Table 5: Relationship between Personality Traits and Receipt of a Reminder

	Dependent Variable: Conscientiousness					
	(1)	(2)	(3)	(4)	(5)	(6)
Reminded to Complete the Recruitment Survey	0.027 (0.039)			0.014 (0.039)		
Reminded Once to Finish “My Household”		-0.104 (0.069)			-0.135* (0.069)	
Reminded Twice to Finish “My Household”		-0.066 (0.058)			-0.091 (0.059)	
Received Any Reminder to Finish “My Household”			-0.082* (0.046)			-0.109** (0.047)
Control Variables Included				X	X	X

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	(1)	(2)	(3)	(4)	(5)	(6)
Reminded to Complete the Recruitment Survey	0.027 (0.039)			0.014 (0.039)		
Reminded Once to Finish “My Household”		-0.104 (0.069)			-0.135* (0.069)	
Reminded Twice to Finish “My Household”		-0.066 (0.058)			-0.091 (0.059)	
Received Any Reminder to Finish “My Household”			-0.082* (0.046)			-0.109** (0.047)
Control Variables Included				X	X	X

# Personality as a Predictor of Unit Nonresponse in Panel Data:

Table 5: Relationship between Personality Traits and Receipt of a Reminder

		Dependent Variable: Openness to Experience		
Reminded to Complete the Recruitment Survey	0.006 (0.039)		0.008 (0.038)	
Reminded Once to Finish “My Household”		0.136** (0.069)		0.145** (0.068)
Reminded Twice to Finish “My Household”		0.092 (0.058)		0.063 (0.058)
Received Any Reminder to Finish “My Household”			0.110** (0.046)	0.096** (0.046)
Control Variables Included			X	X
				X

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Received Any Reminder to Finish “My Household”			0.110** (0.046)	0.096** (0.046)
Control Variables Included			X	X
				X

Table 6: The Influence of Personality (as Proxied by Paradata) on Panel Attrition

	Dependent Variable: Total Surveys Completed			
	(1)	(2)	(3)	(4)
<i>Paradata Proxies of Personality Traits</i>				
Received Reminder to Complete Recruitment Survey	-0.442* (0.225)	-0.478** (0.225)		
Reminded Once to Finish “My Household”			-3.919*** (0.395)	-3.743*** (0.397)
Reminded Twice to Finish “My Household”			-4.054*** (0.340)	-3.909*** (0.341)
<i>Big 5 Personality Traits</i>				
Conscientiousness		0.359*** (0.110)		0.284*** (0.108)
Agreeableness		-0.035 (0.112)		-0.038 (0.109)
Neuroticism		-0.108 (0.114)		-0.128 (0.110)
Openness		-0.367*** (0.107)		-0.324*** (0.104)
Extraversion		-0.148 (0.107)		-0.106 (0.104)
Cognitive Ability	0.328*** (0.115)	0.338*** (0.117)	0.223** (0.112)	0.245** (0.114)



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	Dependent Variable: Total Surveys Completed			
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## Conclusions

- We find that personality traits are related to panel attrition in the UAS
- We find survey omission is more prevalent among those less conscientious and more open to experience, even after controlling for demographics and cognitive ability
- It would be good to collect personality measures in baseline surveys as this information could potentially improve statistical weights for addressing panel attrition bias
- We should be careful with using paradata to improve sample weights as it is not clear to what extent bias can be addressed by paradata
- Type, time and quality of paradata might be important

# Overall Conclusions and Other Relevant Work

- Overall we find that survey effort measures are promising measures to be used as proxy measures of character skills related to conscientiousness, grit, self-control
- We are using survey-effort measures to advance research in character skills:
  - **“Measuring Teacher Non-Cognitive Skills and Its Impact on Students: Insight from the Measures of Effective Teaching Longitudinal Database”**, Albert Cheng & Gema Zamarro (2016)
    - Teacher survey effort might capture important dimensions of teacher quality
  - **“When Students Don’t Care: Reexamining International Differences in Achievement and Non-Cognitive Skills”**, Gema Zamarro, Collin Hitt & Ildefonso Mendez (2016)
    - Measures of survey and test effort could explain between 32 and 38 percent of the observed variation in PISA scores across countries

**THANK YOU!**

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# Results (Summary Statistics of Character Skills Measures)

Table 2. Summary Statistics for Measures of Character Skills

Measure	Mean	Standard Deviation	Minimum	Maximum	Cronbach's Alpha	Correlation Matrix							
						1	2	3	4	5	6	7	
1. Grit	3.60	0.57	1.38	5.00	0.71	-							
2. Conscientiousness	4.06	0.61	1.00	5.00	0.76	0.48	-						
3. Agreeableness	4.03	0.59	1.67	5.00	0.74	0.27	0.44	-					
4. Neuroticism	2.64	0.81	1.00	5.00	0.81	-0.33	-0.43	-0.39	-				
5. Extroversion	3.36	0.79	1.00	5.00	0.81	0.18	0.29	0.19	-0.25	-			
6. Openness	3.60	0.63	1.60	5.00	0.77	0.14	0.27	0.25	-0.19	0.33	-		
7. Item non-response	0.11	0.03	0.01	0.32	n/a	0.01	-0.01	-0.05	0.05	-0.02	-0.02	-	
8. Careless Answers	0.01	1.02	-1.95	4.39	n/a	-0.16	-0.22	-0.12	0.32	-0.09	-0.12	0.02	

Note: Summary statistics presented using population weights.

# Results (Years of Education)- Standardized OLS Coefficients

Table 4.A. Years of Education and Self-Reported Measures of Character Skills

	(1)	(2)	(3)	(4)	(5)	(6)
Cognitive Ability		1.203** (0.074)	1.181** (0.076)		1.241** (0.073)	1.236** (0.076)
Conscientiousness	0.191* (0.095)	0.185* (0.081)	0.194* (0.078)			
Agreeableness	-0.279** (0.095)	-0.005 (0.093)	-0.059 (0.095)			
Neuroticism	-0.253** (0.088)	-0.040 (0.077)	-0.158* (0.081)			
Extroversion	-0.326** (0.092)	-0.158† (0.084)	-0.184* (0.078)			
Openness	0.389** (0.077)	0.222** (0.073)	0.263** (0.073)			
Grit				0.201* (0.095)	0.211* (0.084)	0.254** (0.080)
Demographic Variables Included			x			x
Observations	1,695	1,695	1,654	1,701	1,701	1,662
Adjusted R <sup>2</sup>	0.038	0.224	0.270	0.005	0.218	0.263

Note: Standardized regression coefficients reported. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.

# Results (Household Income level)- Average Marginal Effects

Table 5.A. Household Income Level and Self-Reported Measures of Character Skills

	Less than \$25,000	\$25,000 to \$49,999	\$50,000 to \$99,999	More than \$100,000	Less than \$25,000	\$25,000 to \$49,999	\$50,000 to \$99,999	More than \$100,000
Cognitive Ability	-0.052** (0.017)	-0.007 (0.016)	0.042* (0.018)	0.017 (0.014)	-0.046** (0.015)	-0.018 (0.019)	-0.007 (0.020)	0.071** (0.014)
Conscientious- ness	0.041* (0.016)	0.035* (0.017)	-0.022 (0.017)	-0.054** (0.012)				
Agreeableness	0.065** (0.015)	0.003 (0.016)	-0.023 (0.017)	-0.046** (0.013)				
Neuroticism	0.031* (0.014)	-0.002 (0.016)	-0.032* (0.016)	0.004 (0.014)				
Extroversion	0.003 (0.014)	0.032* (0.015)	-0.022 (0.016)	-0.013 (0.013)				
Openness	-0.052** (0.017)	-0.007 (0.016)	0.042* (0.018)	0.017 (0.014)				
Grit					0.008 (0.013)	-0.022 (0.016)	-0.000 (0.019)	0.014 (0.015)
Observations		1,172				1,181		
Pseudo-R <sup>2</sup>		0.220				0.192		

Note: Table reports average marginal effects estimated after running multinomial logit models. Demographic variables, educational attainment levels, and employment status included as controls. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.

# Results (Employment status)-Average Marginal Effects

Table 6.A. Employment Status and Self-Reported Measures of Character Skills

	(1)	(2)	(3)	(4)	(5)	(6)
Cognitive Ability		0.041** (0.015)	0.004 (0.015)		0.047** (0.014)	0.008 (0.014)
Conscientiousness	0.024 (0.015)	0.025† (0.015)	0.015 (0.014)			
Agreeableness	-0.033* (0.015)	-0.025† (0.015)	-0.023† (0.013)			
Neuroticism	-0.038* (0.015)	-0.031* (0.016)	-0.029* (0.015)			
Extroversion	0.007 (0.013)	0.012 (0.014)	0.017 (0.014)			
Openness	-0.021 (0.013)	-0.026† (0.014)	-0.030* (0.013)			
Grit				0.018 (0.013)	0.017 (0.013)	0.017 (0.011)
Demographic Variables Included			x			x
Observations	1,214	1,214	1,172	1,221	1,221	1,181
Pseudo R <sup>2</sup>	0.031	0.047	0.160	0.004	0.027	0.137

Note: Table reports average marginal effects estimated after running logit models. Demographic variables and educational attainment levels are included as controls. Estimates use population weights. †p<0.1; \*p<0.05; \*\*p<0.01.



# Results (High Skilled Occupation)-Average Marginal Effects

Table 7.A. High Skilled Occupation and Self-Reported Measures of Character Skills

	(1)	(2)	(3)	(4)	(5)	(6)
Cognitive Ability		0.154** (0.018)	0.073** (0.020)		0.161** (0.016)	0.087** (0.019)
Conscientiousness	0.003 (0.028)	0.013 (0.026)	0.026 (0.023)			
Agreeableness	-0.036 (0.026)	-0.002 (0.026)	-0.013 (0.022)			
Neuroticism	-0.041 (0.027)	-0.011 (0.025)	-0.031 (0.022)			
Extroversion	-0.020 (0.025)	0.010 (0.025)	0.007 (0.021)			
Openness	0.062** (0.024)	0.039 (0.024)	0.023 (0.021)			
Grit				0.080** (0.021)	0.088** (0.020)	0.077** (0.017)
Demographic Variables Included			x			x
Observations	853	853	830	860	860	837
Pseudo-R <sup>2</sup>	0.015	0.092	0.251	0.018	0.112	0.266

Note: Table reports average marginal effects estimated after running logit models. Analytic sample is restricted to those who are employed. Demographic variables and educational attainment levels are included as controls. Estimates use population weights.

†p<0.1; \*p<0.05; \*\*p<0.01.