

Person and Thing Orientations: Psychological Correlates and Predictive Utility

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Abstract

Individuals differ in their orientation toward the people and things in their environment. This has consequences for important life choices. The authors review 15 studies on Person and Thing Orientations (PO-TO) using data from 7,450 participants to establish the nature of the constructs, their external correlates, and their predictive utility. These findings suggest that these two orientations are not bipolar and are virtually independent constructs. They differentially relate to major personality dimensions and show consistent sex differences, whereby women are typically more oriented toward people and men more oriented toward things. Additionally, these orientations influence personal preferences and interests. For university students, PO and TO uniquely predict choice of major and retention within thing-oriented fields (e.g., science and engineering).

Keywords

person and thing orientations, interests, sex differences, personality, STEM

The environment can exert powerful influence on people. Those who cannot respond adaptively will have difficulties prospering or even surviving (Deary, Whalley, & Starr, 2008). Theorists observed that people are responsive to different aspects of their environments—occupying different niches. One way the environment can be subdivided is into physical and social environments. Physical environments involve things and social environments involve other people (Kelley et al., 2003). However, individuals differ in their orientation to the things and people in their environment. These individual differences are important predictors of interests and major life choices.

At a conceptual level, Person Orientation (PO) and Thing Orientation (TO) can be seen as basic aspects of personality—parts of a dispositional–motivational complex (Graziano, Habashi, Evangelou, & Ngambeki, 2012). That is, orientation differences can be viewed as manifestations of an underlying latent variable system that influences the direction, intensity, and persistence of thoughts, feelings, and behavior. From a top–down perspective, this system can be a way to organize patterns in goal choices, personal preferences, career aspirations and vocational choices, and other forms of social behavior (Braun, Jackson, & Wiley, 2002).

Thorndike (1911) was probably the first to describe differential orientations toward social or physical aspects of the environment as psychological dimensions. In his book *Individuality*, Thorndike described PO and TO as part of a

single bipolar continuum. The first forum in which PO and TO were explored was vocational psychology. Cattell and Drevdahl (1955) collected data on personality characteristics of 294 research scientists in biological sciences, physics, and psychology. They found that research scientists within each field differed in PO and TO from administrators and teachers within the same field. The Cattell and Drevdahl interpretations implied that being thing-oriented was negatively related to being people-oriented and, consistent with Thorndike, that the two orientations were likely bipolar ends of a continuum. Cattell and Drevdahl also concluded that person–thing orientation were an aspect of extraversion–introversion.

It was not until the early 1970s that the explicit development of these constructs for the field of personality was addressed. Little (1968, 1972, 1974) published theoretical articles addressing the fit between individuals and the environment. He developed his PTO approach as a vehicle for exploring his

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Specialization Theory. One of Little's (1999) insights was that people may engage in niche-fitting. Like Cattell and Drevdahl, Little focused on selective orientations toward the social environment/people and toward the physical environment/things. He proposed that individuals differ in how much they attend and respond to people in their environment (PO), but that they *also* differ in how much they attend and respond to objects in their environment (TO).

Little's theorizing explicitly broke with previous work (Cattell & Drevdahl, 1955; Thorndike, 1911) in proposing that PO was not a bipolar opposite of TO—that the two dimensions might be separate or even orthogonal (see Graziano, Habashi, & Woodcock, 2011; Little, 1974; Tay, Su, & Rounds, 2011). There is now published empirical evidence supporting PO and TO as separate constructs, not opposing orientations (Graziano et al., 2012; Hills, 1989). For example, despite the stereotypical image of engineers as “thing” people, empirical research suggests that students in engineering typically score slightly above the scale midpoint on measures of both PO and TO (Graziano et al., 2012). This suggests that engineering students are oriented to both people *and* things in their environment. Taken together, Little's theory and the subsequent research suggest that at least empirically, PO may not be the bipolar opposite of TO. If this is true, then PO and TO would be consistently uncorrelated (not negatively correlated) across many samples, have different external correlates, and predict different behavior.

PO and TO also have a history of association with academic and occupational choice and are well established conceptually and empirically within vocational psychology. For example, Holland (1959, 1997) identified six interest-based vocational types: realistic, investigative, artistic, social, enterprising, and conventional (RIASEC). Holland's social and realistic vocational interests are generally related to person-oriented and thing-oriented occupational activities, respectively. Prediger (1982) conceptualized a single Person–Thing dimension with social and realistic types as bipolar opposites. Examining the technical manuals for 47 interest inventories utilizing Prediger's conceptualization, Su, Rounds, and Armstrong (2009) found that men preferred working with things and women preferred working with people. Hogan and Blake (1999) noted the connection between vocational interests and personality. Understanding the associations between environmental orientations and occupational preferences is important because it is likely interests in certain kinds of occupations are connected to the preparatory choices of certain academic majors and programs (e.g., Sewell & Little, 1973).

The measurement of PO and TO reflects the theoretical development of these constructs. Little (1968) created a 24-item self-report scale with questions that ask people to rate how much they would enjoy engaging in a variety of activities. Twelve items measure PO and 12 items measure TO. The independent measurement of PO and TO in two scales reflects his assertion that PO and TO are not opposing ends of a bipolar continuum but rather separate constructs. More recently, Graziano, Habashi, and Woodcock (2011) updated and validated a short-form scale of Little's original PTO measure.

Based on factor analysis, they reduced the number of items to eight measuring PO and five measuring TO and found evidence for the independence of PO and TO. The studies reviewed here use this measure (or an age appropriate adaptation) of PO and TO.

Regardless of how it is construed, differences in PO and TO have potential implications for motivation in general and for the formation and expression of interests in particular. Interests are one expression of individuality and are presumed to have motivational force with consequences for choices (e.g., Savani, Markus, & Conner, 2008; Schmidt, 2011). Individuals who are more person-oriented can be expected to develop more interests in subjects dealing with the relations of people to each other, whereas individuals who are more thing-oriented will develop more interests in physical objects and how they work (Graziano et al., 2012).

Following this logic, we might expect PO and TO to have patterned relations with external criteria. PO should be located in “Big Five space” (Ozer & Benet-Martinez, 2006) with social dimensions like agreeableness and extraversion. Similarly, we would expect PO to be positively related to traditional femininity, communion, and communal goals, whereas TO would be positively related to traditional masculinity, agency, and agentic goals. Even within agentic motivation such as spheres of control, PO should be more highly related to interpersonal spheres (Paulhus, 1983) than to personal efficacy. In contrast, TO should be more highly related to personal efficacy than to personal control. Some have argued that PO undermines academic achievement (e.g., Ackerman, Bowen, Beier, & Kanfer, 2001). If this is true, then PO should be negatively related to academic achievement. If academic achievement and self-esteem are related in college populations, we would expect a similar pattern of association with PO and self-esteem.

Now that several studies have been completed using PO and TO, it is appropriate to organize the outcomes to gain a clearer picture of the underlying constructs. The overarching goal of this article is to synthesize concisely what is known about PO and TO, specifically to explore (1) the theoretical coherence of PO and TO as separate or bipolar constructs; (2) generality across sex and across diverse samples including United States, Turkish, and Greek undergraduates, and elementary, middle, and high school students; (3) the stability of PO and TO across time; (4) external correlates of PO and TO; (5) the practical implications of PO and TO for academic choices; and (6) the hypothesis that TO is a distinctive predictor of persistence in one of the most thing-oriented academic majors, namely engineering.

Method

Participants

Data come from 7,450 participants across 15 studies (see Online Supplementary Materials for details found at <http://spps.sagepub.com/supplemental>). Thirteen studies were conducted in the United States ($N = 7,135$), one in Turkey

Table 1. Means, Standard Deviations, Reliability, Bivariate Correlations, and Sex Differences for Person Orientation (PO) and Thing Orientation (TO)

Data Set	N	PO-TO <i>r</i>	Residual <i>r</i> and SD	PO				TO			
				α	Women	Men	<i>d</i>	α	Women	Men	<i>d</i>
(1) Greece	120	.02	.02 (.09)	.653	3.09 (.62)	2.92 (.63)	.28	.788	2.30 (.89)	3.13 (.62)	.80
(2) Turkey	195	-.07	.12 (.05)	.777	3.67 (.66)	3.17 (.73)	.72	.847	2.27 (1.02)	3.14 (1.04)	.84
(3) Third graders	119	.25*	—	.596	4.28 (.51)	4.03 (.78)	.38	.681	2.82 (.88)	3.28 (.95)	.50
(4) Sixth graders	90	.04	—	.605	4.15 (.66)	3.65 (.56)	.82	.756	2.51 (.82)	3.29 (.96)	.87
(5) High school science students	151	-.07	.17 (.06)	.814	3.76 (.72)	3.30 (.80)	.60	.841	2.53 (.95)	3.40 (.97)	.91
(6) Purdue Intro Psychology (2007)	716	-.08	.12 (.05)	.781	3.47 (.69)	3.14 (.71)	.86	.874	3.16 (.97)	3.68 (.83)	.58
(7) Purdue Intro Psychology (2009)	804	-.06	.13 (.04)	.799	3.46 (.64)	3.07 (.66)	.60	.895	1.92 (.90)	3.19 (1.00)	1.33
(8) Purdue Intro Psychology (2010)	781	-.04	.08 (.05)	.796	3.41 (.68)	3.07 (.70)	.49	.877	1.92 (.83)	3.10 (.94)	1.33
(9) Purdue Intro Psychology (2011a)	795	-.05	.09 (.05)	.789	3.44 (.69)	3.16 (.65)	.42	.889	2.02 (.94)	3.18 (.95)	1.23
(10) Purdue Intro Psychology (2011b)	694	-.02	.03 (.04)	.787	3.33 (.70)	3.07 (.64)	.38	.902	1.90 (.88)	3.03 (1.03)	1.18
(11) Purdue STEM undergraduates (2009)	544	-.06	.19 (.05)	.830	3.57 (.71)	3.20 (.64)	.55	.910	2.41 (1.09)	3.61 (.93)	1.18
(12) Purdue and University of Michigan Intro Psychology (2008)	713	.004	0 (.03)	.748	3.49 (.63)	3.16 (.63)	.52	.900	1.96 (.92)	3.15 (.98)	1.25
(13) Purdue first year engineering students	979	.14**	-.15 (.04)	.811	3.47 (.69)	3.14 (.83)	.43	.839	3.16 (.97)	3.68 (.83)	.58
(14) Purdue engineering seniors	397	.06	-.06 (.05)	.824	3.39 (.61)	3.08 (.75)	.45	.701	3.02 (.98)	3.57 (.89)	.59
(15) Washington State University Intro Psychology	352	-.06	—	.810	3.86 (.53)	3.60 (.82)	.11	.860	2.05 (.82)	3.13 (.82)	1.30

Note. STEM = science, technology, engineering, and mathematics. Standard deviations in parentheses.

** $p < .001$. * $p < .05$.

($N = 195$) and one in Greece ($N = 120$). Studies were conducted with elementary ($N = 119$), middle ($N = 90$), and high school children ($N = 151$) and college undergraduates ($N = 7,090$). The U.S. college studies were conducted at three institutions: Purdue University, Washington State University, and University of Michigan. One focus of our research is the utility of TO as a predictor of selection of and retention in thing-oriented areas of study, so we ensured that the data sets covered the general undergraduate population as well as engineering majors ($N = 1,755$) and science majors ($N = 544$).

Design

Data were collected using slightly different procedures depending upon the age of participants and the setting. In all cases participants provided self-report. For the U.S. university students, data were collected via online survey in fulfillment of partial course credit or via paper survey as part of an in-class exercise. Each of the surveys contained the PO-TO scale (Graziano et al., 2011) where participants rated how much they typically enjoy different person-oriented or thing-oriented activities on a 1 (*strongly disagree*) to 5 (*strongly agree*) scale to create measures of PO (e.g., Notice the habits and quirks of people around you) and TO (e.g., Stop to watch a machine working on the street). Participants also answered questions regarding demographics and educational and career intentions, and some combination of the following measures: Big-Five Personality Inventory (John & Srivastava, 1999), Personal Attributes Questionnaire (Spence & Helmreich, 1978), Spheres of Control scale (Paulhus, 1983; Paulhus & Van Selst, 1990), and the realistic and social subscales of Holland's RIASEC personality types (RIASEC short form B: Armstrong, Allison, & Rounds, 2008).

Results

Reliability

No exhaustive assessment of the reliability of the 13-item PO-TO measure (see Graziano et al., 2011, for item wording) across diverse samples currently exists. To address this deficit, we used Cronbach's α as our measure (see Table 1) to compare the reliability of the PO and TO measures across samples. Overall, the reliability of the 5-item TO measure (mean $\alpha = .85$, range .65 to .91) is almost always greater than the 8-item PO measure (mean $\alpha = .76$, range .70 to .83). The reliability of the scales is slightly lower in the data from third and sixth grade children, probably because they completed reduced, 4-item measures of PO and TO.

Orthogonality of Constructs

There is strong, converging evidence supporting the orthogonality of PO and TO. First, we provide bivariate correlations of the constructs across all of our samples (see Table 1). Zero-order correlations between PO and TO range from $r = -.08$ to $.25$ (mean $r = -.04$) suggesting that they are independent constructs rather than bipolar. Following Tay, Su, and Rounds (2011), we examined the residual correlations of the PO and TO scale items after partialling the common variance out of the correlation matrix. The average residual correlations range from $r = -.15$ to $r = .17$, and none approach the rule of thumb of r exceeding $-.40$ suggested by Tay et al. These findings are also in line with previous factor analytic evidence of two independent constructs (Graziano et al., 2011). In addition, we examined the pattern of correlates between PO and TO (see subsequent section) and found no evidence of bipolarity of the constructs.

Sex Differences

Given the theoretical focus and past findings on sex differences in PO and TO, we present the means and standard deviations for both men and women on both subscales (see Table 1). We calculated a difference score (d) to quantify the sex differences in PO and TO. Using the convention of a small effect size being $d < .3$, a medium effect size being d between $.3$ and $.8$, a large effect size being $d > .8$, we see that the sex difference for PO across our samples is considerably smaller than the sex difference in TO. Women consistently score higher than men in PO (mean $d = .49$, range $.11$ to $.86$) with a medium sex difference. The magnitude of sex difference is greater for TO where men consistently score higher than women (mean $d = .99$, range $.58$ to 1.33). This large sex difference in TO is driven by the low scores of women rather than the high scores of men. Also noteworthy are the smaller sex differences in TO within the samples drawn from thing-oriented fields (e.g., first-year engineering students and science, technology, engineering, and mathematics [STEM] majors) compared with the larger sex differences in TO in the general undergraduate populations. This provides evidence of self-selection of Thing-Oriented individuals into thing-oriented majors of study.

We also find variation in PO and TO sex differences across cultures. Compared with U.S. undergraduates, Greek students show smaller sex differences in both PO and TO. Turkish students, however, have relatively large sex differences in PO and small sex differences in TO. This provides preliminary evidence for the impact of culture on the expression of person- and thing-oriented interests for men and women.

Stability

Longitudinal data affords the opportunity to examine the stability of PO and TO over time. Outcomes from engineering students measured at two time points, 4 years apart, suggest that both PO and TO are relatively stable across the undergraduate years when personality variables are solidifying ($r_s = .48$ and $.54$, respectively). Over the shorter term, we measured a sample of general undergraduates twice, 4 weeks apart, and found higher stability of both PO ($r = .69$) and TO ($r = .86$).

External Correlates

Table 2 provides information on the correlations between the PO and TO scales and measures of theoretically related and unrelated constructs. For each construct, we used the data set with the largest sample.

Big Five measure of personality. Locating PO and TO in “Big Five space,” we find that PO shares a moderate positive relation with agreeableness ($r = .35$), extraversion ($r = .38$), and openness to experience ($r = .34$). For TO, the only consistent associations were with openness to experience ($r = .29$) and a negative association with neuroticism ($r = -.21$). Thus, PO and TO are not synonymous with extraversion and introversion. This pattern of associations is consistent with other work

Table 2. Bivariate Correlations

Scale	Person Orientation	Thing Orientation
Big Five Measure of Personality ($N = 544$)		
Agreeableness	.35***	-.10*
Conscientiousness	.16***	-.06
Extraversion	.38**	-.002
Neuroticism	-.09*	-.21***
Openness to experience	.34***	.29***
PAQ ($N = 544$)		
Agency	.11*	.10*
Communion	.27***	-.06
Emotional vulnerability	.09*	-.30***
Goal endorsement (engineering undergraduates; $n = 357$)		
Agentic goal endorsement	.14**	-.004
Communal goal endorsement	.44***	.14**
Spheres of control ($N = 544$)		
Personal efficacy	.18***	.06
Interpersonal control	.37***	-.004
Sociopolitical control	.30***	-.02
Holland's vocational typology (RIASEC; $N = 795$)		
Social subscale	.50***	-.25***
Realistic subscale	-.11***	.70***
Impression management ($N = 1,033$)		
GPA ($N_s = 713$ and 397 , respectively)	.02	-.04
Undergraduates—general	.07	-.19***
Undergraduates—engineering	-.001	.06
Self-esteem ($N = 694$)		
	.15***	-.01

Note. GPA = grade point averages; PAQ = Personal Attributes Questionnaire; RIASEC = realistic, investigative, artistic, social, enterprising, and conventional. *** $p < .001$. ** $p < .01$. * $p < .05$.

(Graziano et al., 2012; Sarris, 1994) and suggests that major dimensions of personality structure are more focused on relations among people and underemphasize peoples' orientations toward the things in their environments.

Femininity and masculinity. The sex differences in PO and TO give rise to the question of how closely PO maps onto femininity and/or the endorsement of communal goals, and TO onto masculinity and/or the endorsement of agentic goals. Communal goals include “serving the community,” and agentic goals include “financial rewards” and “status” (Diekmann, Brown, Johnston, & Clark, 2010). Using measures of traditional masculinity and femininity (Spence & Helmreich, 1978) rescored to reflect agency and communion (Ward, Thorn, Clements, Dixon, & Sanford, 2006) and agentic and communal goal endorsement, we find that PO is moderately related to communion ($r = .27$), but more strongly related to the endorsement of communal goals ($r = .44$). TO is not related to agency ($r = .10$) or to the endorsement of agentic goals ($r = -.004$). These findings suggest that PO and TO are not proxies for masculinity and femininity, but that PO is related to the endorsement of communal goals.

Spheres of control. Spheres of control reflect the degree to which people feel they have agency or control over specific areas of their lives: personal, interpersonal, and sociopolitical

(Paulhus & Van Selst, 1990). PO is positively related to both the interpersonal control and the sociopolitical control subscales ($r_s = .37$ and $.30$) of the spheres of control scale. There was no evidence that TO was related to spheres of control.

Holland's vocational interests. The realistic and social subscales of Holland's RIASEC have been described as opposite ends of a bipolar Person–Thing continuum (Prediger, 1982; but see Tay et al., 2011, for a different interpretation). Realistic type items include the endorsement of interest in “repair[ing] household appliances” and “guard[ing] money in an armored car.” Social type items include the endorsement of interest in “work[ing] with juveniles on probation” and “work[ing] with mentally disabled children” (Interest profiler set B: Armstrong et al., 2008). Correlations between PO and TO and the realistic and social subscales of the RIASEC indicate that PO and social type are moderately related ($r = .50$), and that TO and realistic type are more strongly related ($r = .70$). TO is negatively related to the social type subscale ($r = -.25$) and PO is weakly negatively related to the realistic type subscale ($r = -.11$) providing additional evidence that TO and PO are orthogonal rather than bipolar constructs.

Questions arise about the links among RIASEC and PO and TO. Are the orientation measures merely alternative forms of the RIASEC measures? Taking a top–down perspective, we believe they are not. We believe that the RIASEC measures and orientation measures tap into common latent variables. The latent variable underlying PO and social types contributes to a range of behaviors that involve relationships with other people, including both occupations and social relations. A similar case could be made for the latent variable underlying TO and realistic types. The PO and TO constructs could be connected to a wide range of behaviors beyond those of occupation and vocation.

Ability, self-esteem, and impression management. We correlated grade point averages (GPAs) of U.S. undergraduates from both the general population and engineering majors to determine the extent to which PO and TO mapped onto ability in different spheres of endeavor. We found no evidence of association with either PO or TO and GPA in the undergraduate engineers, but a small negative association between TO and GPA for the general undergraduate population. We found no strong association between PO or TO and self-esteem. In addition, we found no evidence of association between PO or TO and scores on the impression management subscales of the Balanced Inventory of Desirable Responding (Paulhus, 2002), suggesting that person- or thing-oriented interests were not related to efforts to create a favorable image.

Behavioral Outcomes

There is a pressing need to attract and retain talent in STEM disciplines (e.g., Daempfle, 2003). TO has been shown to be a unique and significant predictor of interest in and the choice of STEM careers and majors in both undergraduates and children (Graziano et al., 2012). We examined the relation between

PO and TO in the choice of majors of 713 undergraduates from two large U.S. public universities (data set 11). Using logistic regression to predict STEM versus non-STEM major (coded 1 and 0, respectively), we find that TO is positively related to enrollment in a STEM major ($b = 1.42, p = .001$, odds ratio [OR] = 4.19). The odds of being enrolled in a STEM major quadruple as a function of a one point increase in TO. This effect was qualified by an interaction between PO and TO predicting STEM enrollment ($b = -.29, p < .05, OR = .75$). PO has a moderating effect on the association between TO and choice of a STEM major, whereby the likelihood of STEM enrollment is more influenced by PO for students high in TO than students low in TO. Students high in TO are less likely to be in a STEM major if they are also high in PO. This may indicate conflicting motives or a wider array of interests for students high in both PO and TO. Sex was entered into this regression as a covariate and did not significantly predict STEM major enrollment.

We extended this finding and explored the hypothesis that TO would be a predictor of persisting in one of the most thing-intensive activities in the university—undergraduate engineering (Graziano et al., 2012, study 1; Woodcock, Graziano, Branch, Ngambeki, & Evangelou, in press). Engineering suffers from attrition at all stages of the academic pipeline, so predicting actual stay/leave behavior is of practical importance (Chubin, May, & Babco, 2005). To test this hypothesis, students who had been enrolled in the common first-year engineering class at Purdue University 4 years' previously (~1,200 students) were invited to participate in a 30-min online study in return for \$5 (data set 12). We obtained valid survey data from 357 participants (66.9% men) with a mean age of 21 years old. The majority (55%) of participants reported being in their fourth year of school, and 88% were still majoring in engineering.

We hypothesized that TO would be a unique, significant predictor of persistence in engineering. We performed a logistic regression predicting staying in versus leaving engineering (coded 1 and 0, respectively) with sex, TO, PO, agency, communion, communal goal endorsement, and agentic goal endorsement as predictors. From Table 3, we can see that TO emerged as the only significant predictor of persistence in engineering. Controlling for the other variables in the model, as TO increases the likelihood of persisting in engineering increases such that each one point increase in TO almost doubles the odds of persisting in engineering ($b = .56, p < .05, OR = 1.75$). There was no significant interaction between PO and TO.

Discussion

Several patterns emerged from the current summary of recent theory and research on PO and TO. The weight of evidence suggests that PO is not a bipolar opposite of TO. Across samples, the correlation between PO and TO was minimal and did not demonstrate the negative relation necessary to indicate bipolarity. Additionally, the two orientations appear to have

Table 3. Summary of Logistical Regression Predicting Persistence in Undergraduate Engineering

Predictor	B	SE B	Wald's χ^2	p	Odds Ratio
Constant	1.54	2.29	.50	.503	4.65
Sex (1 = men)	.23	.40	.32	.572	1.25
Agency (PAQ)	.02	.33	.002	.964	1.02
Communion (PAQ)	-.29	.40	.53	.465	.75
Agentic goal endorsement	.11	.23	.22	.641	1.14
Communal goal endorsement	-.12	.26	.22	.638	.89
Thing orientation	.56	.20	7.82	.005	1.75
Person orientation	-.11	.30	.14	.705	.89

Note. PAQ = Personal Attributes Questionnaire. $N = 357$. 0 = left engineering, 1 = remained in engineering.

separate sets of external correlates and differentially predict academic and occupational preferences. In future work on PO and TO, construct and variable labels should refer to them as separate entities to avoid the misleading impression that the two orientations are bipolar opposites.

Sex differences in PO and TO appear consistently across samples but are larger for TO than PO. Variation within samples suggests that cultural and age-normative processes are contributing to the sex differences, but this process issue is largely unexplored in empirical work (see Graziano et al., 2012). Regarding the stability of PO and TO, repeated measures across short- and long-term time periods indicate that both are relatively stable across time.

By synthesizing what is known about PO and TO, the current articles provide evidence for the distinctiveness of both orientations; PO and TO are not just proxies for conventional measures of agency, communion, or Big Five factors. Each is connected to its own patterns of cognition and motivation and relevant to larger questions regarding the development of interests and occupational choices. Results of the current studies point to the unique and complex influence (above and beyond sex differences) of PO and TO on student enrollment and retention in STEM majors at the university level. Large questions lie behind these findings. Previous work has demonstrated that these orientations emerge within a relatively narrow window of time during childhood (Graziano et al., 2012), yet little is known about the processes that support and promote the development of these orientations. Given the growing need for a strong scientific and engineering workforce, it will be important to learn why (and how) students lose interest in things and thing-oriented careers. Fostering TO and managing competing motivations for those high on both PO and TO provide important avenues of research relevant to concerns surrounding the national shortage of professionals in STEM careers (Woodcock et al., in press).

Besides the connection between PO and TO and academic choices, there are larger theoretical implications. In keeping with Thorndike's (1911) original perspective, PO-TO are important aspect of individuality. In cultural settings where individuality is applauded, work on PO and TO may seem intuitive. In many cultures, individuality is encouraged and is expected to drive important life choices. In our North American samples, we find that people attempt to "niche-fit" and exploit

their interests. Individuality has different connotations and consequences, however, in different cultures. Certain cultural groups may not encourage individuals to translate PO and TO into life choices. Our outcomes from Greece and Turkey suggest that the patterns we find in North America may not be replicated exactly elsewhere (see also Ngambeki et al., 2012). Whether this limitation on generality is due to selection, treatment or some combination of the two remains to be seen. For example, our Turkish sample was drawn from an elite institution where only the top students are admitted into engineering. Perhaps the distinctive patterns for Turkish students reflect this selection. More generally, it is difficult to disentangle the influence of culture and selection the pattern of PO and TO in this sample.

In summary, PO and TO are important aspects of personality. The evidence suggests that PO is not the opposite of TO—they seem to be two different dimensions. PO and TO are related to important life choices. The processes underlying these associations await further investigation.

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