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Isolating Occupational Interests of Academics to Identify Metrics of Success

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One of the main problems most of academia faces today is the classic economic problem of supply and demand, i.e. the number of PhD candidates and post-doctorates seeking permanent academic positions (supply) far exceeds the available academic positions (demand). As a result, competition has increased among aspiring graduates as they scramble to advance in academia. Other studies have examined external factors that give these graduates a competitive edge, but they fail to identify whether the candidates actually have the right interests to thrive in academia. A sample of 94 graduate students, postdoctoral fellows, and professors completed a revised version of the Holland Interest Scale (Feldman, Smart, & Ethington, 2008). This is comprised of 6 factors: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C). Only graduate students and post-doctorates who intended to pursue careers in academia were considered for the study. In this study, we show that academics are high in S, A, and I interests. The frequency of the SAI trend is 56% in Group 1 (professors) and only 36% in Group 2 (PhD, post-doctorates). Of the 6 interests, the highest interest of Group 1 (professors) members was never E or C. However, highest interests of Group-2 members ranged across all 6 interests. Understanding this information would help students decide if academia is the correct career choice for them even before pursuing a doctoral degree. This conscious decision may eliminate incompatible candidates and leave a limited number of aspiring graduates to pursue academia. Thus alleviating the supply side of the problem.

Keywords: Holland Interest Scale, tenure track, academia, professorship

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The number of students who choose to enroll in graduate institutions to pursue advanced degrees is steadily increasing each year. (Gould, 2015; Okahana, Allum, Felder, & Tull, 2016) About 56.6% of all doctoral-level students complete their programs; 62.9% of doctoral-level students in life-science programs graduate (Grasso, Barry, & Valentine, 2009). While some pursue alternative nonacademic careers, others pursue tenure-track professorships with grant-run research groups. In the ever increasing competitive academic job market, however, most PhDs find it hard to attain tenure-track positions. Studies show that only 15–20% of PhD holders attain academic positions (Powell, 2015).

This low rate of success is fueled by two forces: the high supply of PhDs and postdoctorates who want to pursue academic careers and the low demand for professors. The proliferation of PhD candidates, who go into academia, without fully exploring their interests fuels the demand side of the problem. One study estimated that the typical tenured professor helps between seven and 10 doctoral students graduate over the course of their careers i.e. an average of 7.8 doctoral students for every professor. This implies that there is a 12.8% chance of PhD graduates obtaining a professorship in the

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United States (Larson, Ghaffarzadegan, & Xue, 2014). Since doctoral-level students spend an average of 5 years getting the degree and additional time fulfilling postdoctorate requirements, the opportunity cost is significant. Considering the opportunity cost and the alarming growth in the number of PhDs awarded every year, the demand for tenure-track positions is only going to fuel undue competition among aspiring academics. On the supply side, the unwillingness of professors to retire exacerbates the problem. They are guaranteed lifetime positions, and universities are unable to implement age cutoffs (Hammond & Morgan, 1991).

The effects of this imbalance between demand and supply can be seen in academia. In an attempt to remain competitive in the job market, many unemployed graduates seek to work with current professors who must conduct research and publish frequently, which has given rise to a new position in the field of academia, the "perma-doc" (Rohn, 2011). A postdoctoral fellow usually spends a few years under the tutelage of a professor before he or she finds a tenure-track position with a university, eventually directing his or her own lab with research grants. Perma-docs, however, are multiterm postdoctorates who never advance to become professors. There has been an increased demand for perma-docs because they are qualified scientists and bring stability to a lab that would otherwise face high turnover rates. They are hired as postdocs to manage the lab, mentor junior lab staffs and help with research ideas and methodologies. These postdocs are willing to be perma-docs because it is the only available position in the current job market that provides academic training. PhD holders are left with two equally impossible choices: respond to changes in the job market and embrace the position of the perma-doc with little to no advancement opportunity, or drop out of academia altogether and forego dreams of professorship. The stakes are higher than ever. This increased competition to attain professorships begs the question: Do some candidates have characteristics that are better suited for success in academia? What attributes do all successful professors share?

There is very little research about this topic. One previous study analyzed over 25,000 scientists in PubMed. Five statistically significant factors that affect whether a PhD holder or postdoctorate would become a professor were (a) the number of first and second author publications, (b) the impact factor of journals in which those papers are published, (c) the number of papers that receive more citations than the average for the journal in which they are published, (d) gender, and (e) university ranking (van Dijk, Manor, & Carey, 2014).

Another study delved more into the *h* index and its accuracy in predicting the success of scientists. An *h* index measures the quality (citations) and quantity (number) of an author's papers; a scientist has an *h*-index of *n* if they have published *n* articles that each have at least *n* citations (Acuna, Allesina, & Kording, 2012). Future *h* indices are predictions of future success. The power of current *h*-indices to predict future *h* indices decreased over time, with next year's *h* index's R^2 estimated to be 0.92, and 10 years into the future, $R^2 = 0.48$. Alternatively, the power of other factors such as number of articles written, articles in distinct journals, and articles in prestigious journals (defined as *Nature*, *Science*, *Nature Neuroscience*, *Proceedings of the National Academy of Sciences,* and *Neuron*) have increased over time. This study reinforces the importance of publishing and the importance of the journals in which the papers are published.

The studies above focus on creating a checklist of academic achievements that may give PhDs an extra push to get professorships. However, they fail to explain whether the candidate has the interest or the ability to perform well in such a position if he or she gets it. These studies do not test, from a behavioral perspective, whether the candidate is well-suited to have a career in academia in the first place. Using the Holland Interest Scale, we have defined what characteristics and interests professors need to enjoy the work they do. We aim to help aspiring academics introspect their interests before diving into the competitive academic market. This increases the likelihood of PhDs being more content in their future careers.

The Holland Interest Profile is used to discern the tasks the performer finds reinforcing. In behavioral terms, this is known as value (Commons, 2015). The Holland scale classifies interests as Realistic (doers), Investigative (thinkers), Artistic (creators), Social (helpers), Enterprising (persuaders), and Conventional (organizers); RIASEC (Folsom, Yoder, & Joslin, 2015). Table 1 further elaborates the char-

Table 1
Holland Interests of Individuals and Their Corresponding Characteristics

Interest factor	Affinity	Self-perception	Motivation
Realistic (doers)	Shows affinity towards work with animals, tools, or machines	Sees self as practical and mechanical	Motivated by tangible results of their work
Investigative (thinkers)	Shows affinity towards studying and solving math or science problems	Sees self as precise, scientific, and intellectual	Motivated by intellectual rewards
Artistic (creators)	Shows affinity towards creative activities	Sees self as expressive, original, and independent	Motivated by variety, creative pursuits, innovation
Social (helpers)	Shows affinity towards helping people	Sees self as helpful, friendly, and trustworthy	Motivated by social rewards
Enterprising (persuaders)	Shows affinity towards leading and persuading people, and selling things and ideas	Sees self as energetic, ambitious, and sociable	Motivated by monetary rewards, power, influence, control
Conventional (organizers)	Shows affinity towards working with numbers, records, or machines in a set, orderly way	Sees self as orderly, and good at following a set plan; risk averse	Motivated by stability, monetary rewards

acteristics of the different Holland Interest types. This theory is based on four assumptions (Smart, Feldman & Ethington, 2006).

1. Most people are categorized as one of the RIASEC personality types.
2. There are corresponding RIASEC work environments.
3. In pursuing vocational interests, people seek environments in which they can exercise their abilities and express those values.
4. The behavior of individuals is a result of the interaction between environmental characteristics and individuals' personalities.

Method

Procedure

The survey comprised of a modified Holland Interest Profile (HIP). The survey was shortened to include questions that were more relevant to academia from each of the six categories. The HIP gauged interest in performing different tasks. Participants were asked to rank each of the 24 tasks on a six-point Likert scale, with each task corresponding to a Holland interest: R, I, A, S, E, or C. The survey used a 6-point rating system, such that 1 represented *Hate* and 6 represented *Love*. It was hosted on Surveymonkey and distributed via listservs and emails to departments of research universities. Each aspect of the scale can take a value between 4 and 24, inclusive. Scores were scaled to fit between 0 and 18, inclusive. Average Holland scores and frequency of trends were computed accordingly.

Participants

This study used Holland Interest data from 94 participants, all of whom were volunteers and split into two independent groups as shown in Table 2. The first group (Group 1) consisted of 52 professors. The second group (Group 2) included 42 subjects: 35 PhD candidates and 7 postdoctoral fellows. In group 2, only members who intended to pursue careers in academia were considered for the study. Forty-one professors were male and 29 were female. The ethnic mix was skewed: there were 44 Caucasians, three Asians/Pacific Islanders, and five who identified as Hispanic or Latino/a. One

Table 2
Research Participants Divided According to Role in Academia

Groups	Roles
Group 1	Professors
	Instructor, assistant or associate professor, or full professor
Group 2	Those who aspire to be professors
	PhD candidates and postdoctoral fellows

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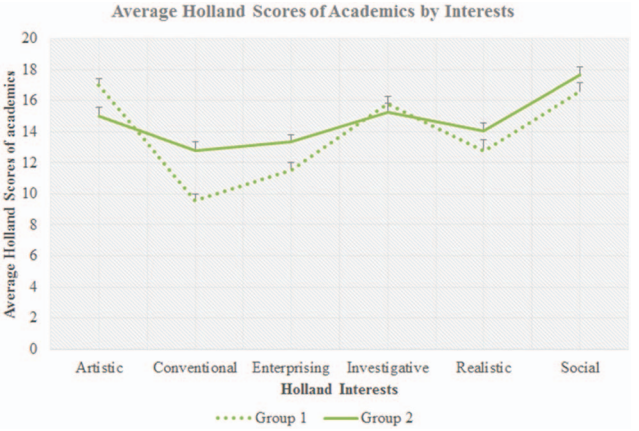

Figure 1. Comparison of average Holland scores of Group 1 and Group 2.

professor did not disclose gender, and two did not disclose ethnicity. Seventeen of the PhD candidates were Caucasian and the remaining five were Hispanic or Latino/a. Three postdoctorates identified themselves as Asian/Pacific Islanders and the remaining four as Caucasian. The participants belonged to 44 different research universities. The maximum time the different groups of participants spent in academia was as follows: PhD $n = 6$; postdoctorate $n = 10$, and professor $n = 59$.

Results

The results from our sample show that those in academia display high affinity towards - helping people (Social, S), engaging in creative endeavors (Artistic, A), and studying and solving math/ science problems (Investigative, I). This makes sense considering that academics often juggle teaching, advising, research, and service tasks, in addition to administrative duties. The Holland code predicts that people who are high in SAI and its permutations engage in jobs similar to that of professors/ principal investigators (Shatkin, 2012). The trend we observed matched this prediction.

As shown in Figure 1, the top three scores of both groups are similar. Professors were highest in A (16.98), closely followed by S (16.61), and I interests (15.78); postdoctorates/PhDs were highest in S (17.64), followed by I (15.262), and A interests (15.0). Calculation of average, standard deviation, standard error of Group 1 and Group 2 are shown in Table 3.

The frequency of the SAI trend was 56% in Group 1, and 36% in Group 2 (see Figure 2). In addition, the trend of high affinity to S, A, and I is more prominent in Group 1 (professors) than Group 2 (PhD candidates and postdoctorates), as shown in Figure 3. The prominence of the SAI trend was calculated such that if these three interests yielded the three highest scores,

Table 3
Comparison of Average Holland Values of Group 1 and Group 2

	Group-1 Holland scores			Group-2 Holland scores		
Interest factor	Average	Standard deviation	Standard error	Average	Standard deviation	Standard error
Artistic	16.981	2.993	.415	15.000	4.202	.583
Conventional	9.596	3.050	.423	12.810	3.827	.531
Enterprising	11.567	3.460	.480	13.357	3.312	.459
Investigative	15.779	3.629	.503	15.262	4.012	.556
Realistic	12.769	4.917	.682	14.048	3.709	.514
Social	16.606	3.750	.520	17.643	3.827	.531

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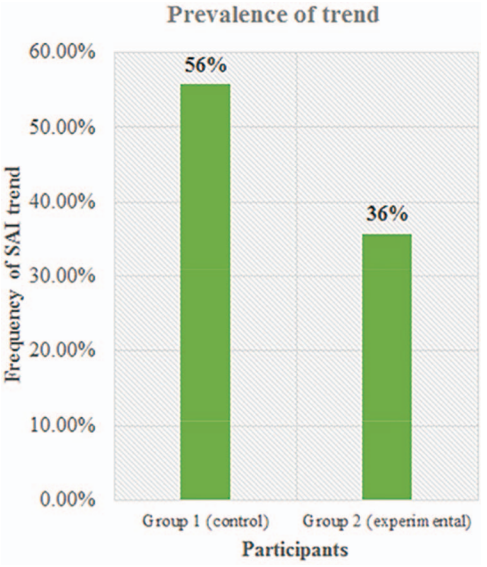

Figure 2. Frequency of the SAI trend compared between Group 1 and Group 2.

we assessed the trend to be present. If not, we assessed the trend to be absent. A sample calculation of the SAI trend is shown in Table 4.

When the primary (highest), secondary (second highest), and tertiary (third highest) interests of Group 1 and Group 2 members were examined, an interesting distinction between the two groups was observed. The primary interest of all Group 1 members was either S, A, I or R, but never E or C. However, primary interests of Group 2 members ranged between all six interests. Further, given that Group 1 had already secured academic positions and had higher SAI characteristics than Group 2, we might infer that the interests of Group 1 are more focused than Group 2.

Table 4
Sample Data and Calculation of SAI Trend

Participants	Primary	Secondary	Tertiary	SAI trend *yes/no*
Participant 1	24	20	16	No
	R	I	S	0
Participant 2	19	18	16	Yes
	I	A	S	1
Participant 3	21	12	9	Yes
	I	S	C	1
	A			

Note. SAI = Social, Artistic, Investigative factors of the Holland Inventory.

Most professors do perform E and C tasks, such as marketing their research and ideas to get funding and dealing with bureaucratic paperwork, and record keeping. However, they may not be interested in doing such tasks. They may be engaging in these tasks to continue doing what they love: generating ideas and completing research that may help society. The low E score also suggests that they may not be primarily motivated by monetary rewards, power, influence, or stability.

As shown in Figure 4, another trend observed was the decline in E interests from across the ranks among Group 1 members. Full professors had the least enterprising interest followed by associate professors and assistant professors/instructors accordingly. As a whole, Group 2 was more enterprising than Group 1. More data may be required to obtain a trend of higher significance.

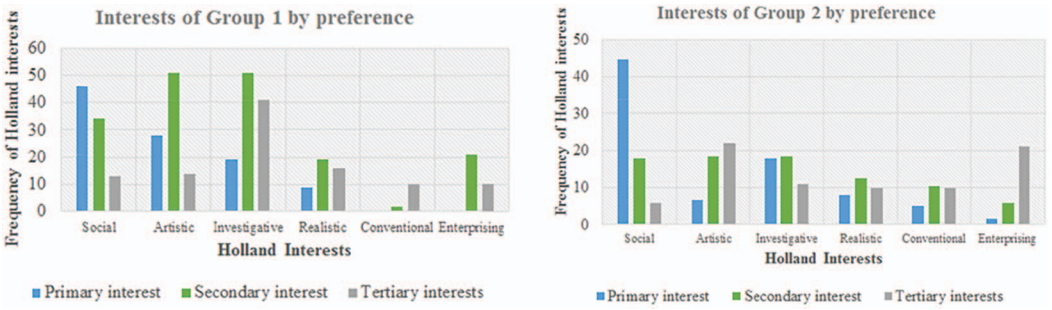

Figure 3. Comparison of Holland interests between Group 1 and Group 2 by primary, secondary, and tertiary interests.

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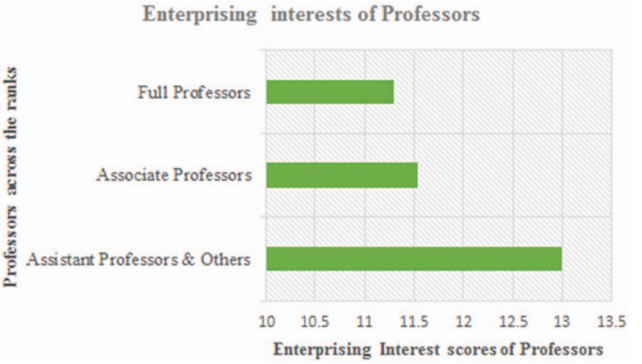

Figure 4. Examining the Enterprising interest among professors across the ranks.

Discussion

One of the main problems that most of academia faces is the disproportionate number of PhDs and postdoctorates seeking academic positions versus the available academic positions. There is a steady increase in the number of doctoral students enrolling in graduate institutions. However, the turnover in academia is low, due to the unwillingness of professors to retire. This leaves new graduates in the predicament of not being able to advance in academia. Considering the opportunity cost and lack of opportunity in academia, one wonders if it is possible to understand what characteristics are predominant in most academics.

The results of the study may seem common knowledge: academics are usually prosocial, creative and analytical. There is plenty of anecdotal evidence that portray academics in this light. However, there are no data-driven studies that prove this. By showing the prevalence of the SAI trend using the Holland Interest scale, this paper fills this gap. The paper also shows that despite having duties that require enterprising skills (like marketing research to acquire grant money), Professors show low interest on E. Similarly most research requires a lot of repetitive and administrative tasks; however, our data shows that Professors do not enjoy doing such monotonous work. Enterprising skills and conventional skills are a means to do what they actually enjoy doing which is - to conduct creative, analytical research that helps the society.

The assumption that SAI interests maybe beneficial to academic success is derived from the Holland Inventory. (Nauta, 2010; Shatkin, 2012). Because it is challenging to define and compare success in academia, we were unable to correlate interests with rates of success.

Understanding this information would help students make better career choices even before pursuing a doctoral degree. When students find out that their interests do not match the interests necessary to thrive in academia, they could transition to other career paths, which, in turn, would help the academic market become less congested, alleviating the supply side of the problem.

Limitations and Future Directions

Although comprehensive, this study has limitations. The sample size was 94. Additional data would help to detect variations in Holland interests by field, university, rank, and so forth. Further, a larger data sample from academics would assist in detecting variations in outliers such as Nobel-prize winners.

Future studies using more extensive data from participants of other countries would also help to establish and further examine these trends. Correlations between interests and success metrics would be valuable in predicting academic success. Longitudinal studies following the careers of Group 2 participants with high enterprising and conventional interests would provide the definitive evidence for our hypotheses. A tool developed from such a study will be useful for universities to screen future PhD candidates, who are better suited for academia.

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