

Running Head: IMPLICIT THEORIES OF INTEREST

Implicit Theories of Interest: Finding Your Passion or Developing It?

Paul A. O'Keefe

Yale-NUS College

National University of Singapore Business School

Carol S. Dweck

Gregory M. Walton

Stanford University

In press at *Psychological Science*

Author Note

Paul A. O’Keefe, Division of Social Sciences, Yale-NUS College and Department of Management and Organisation, NUS Business School, National University of Singapore (by courtesy); Carol S. Dweck and Gregory M. Walton, Department of Psychology, Stanford University.

Correspondence concerning this article should be addressed to Paul A. O’Keefe, Division of Social Sciences, Yale-NUS College, 10 College Avenue West, #01-101, Singapore 138609. E-mail: paul.okeefe@yale-nus.edu.sg.

Author Contributions

Paul A. O’Keefe, Carol S. Dweck, and Gregory M. Walton all developed the study concepts and all authors contributed to the study designs. Data collection was performed by Paul A. O’Keefe for all studies. Paul A. O’Keefe performed the data analyses and all authors interpreted the results. Paul A. O’Keefe drafted the manuscript, and Carol S. Dweck and Gregory M. Walton provided critical revisions. All authors approved the final version of the manuscript for submission.

Acknowledgements

We thank E. J. Horberg for her contributions to this research.

Funding

Research reported in this publication was supported in part by the Ruth L. Kirschstein National Research Service Award for Individual Postdoctoral Fellows from the National Institute of Child Health and Human Development of the National Institutes of Health under award number F32HD062185. The content is solely the responsibility of the authors and does not

necessarily represent the official views of the National Institutes of Health.

Abstract

People are often told to find their passion as though passions and interests are pre-formed and must simply be discovered. This idea, however, has hidden motivational implications. Five studies examined implicit theories of interest—the idea that personal interests are relatively fixed (fixed theory) or developed (growth theory). Whether assessed or experimentally induced, a fixed theory was more likely to dampen interest in areas outside people’s existing interests (Studies 1–3). Those endorsing a fixed theory were also more likely to anticipate boundless motivation when passions were found, not anticipating possible difficulties (Study 4). Moreover, when engaging in a new interest became difficult, interest flagged significantly more for people induced to hold a fixed than a growth theory of interest (Study 5). Urging people to find their passion may lead them to put all their eggs in one basket but then to drop that basket when it becomes difficult to carry.

Implicit Theories of Interest: Finding Your Passion or Developing It?

In recent years, the injunction to “find your passion” has become increasingly common (Google Trends, 2017). But where do interests come from and how do they unfold? Are interests there all along, waiting to be revealed? Or must a spark of interest be cultivated through investment and persistence? This distinction is the crux of implicit theories of interest: whether interests and passions are understood as inherent and relatively fixed or as developed.

We theorize that the belief that interests are inherent, not developed, carries important hidden implications. First, this belief may imply that the number of interests one can have is limited and, thus, that once people have found their interest(s) there is little reason to explore other areas. Second, the idea that interests are inherent may imply that a strong and deeply internalized interest—a passion—provides constant motivation and inspiration; thus engaging in the interest should come relatively easily, with minimal difficulty or frustration. On the other hand, if interests are developed, then having a strong interest in one area does not preclude developing interests elsewhere. Moreover, the belief that interests are developed, not revealed fully formed, implies that this development may sometimes be difficult. If so, a growth theory of interest may help sustain interest in the face of frustration or difficulty.

Consider an analogy with love. People can believe that successful relationships are destined or cultivated (see Knee & Petty, 2013). With the former perspective, people see dating as an attempt to find “the one.” Faced with relationship challenges, people may quickly move on. By contrast, the latter belief can increase people’s motivation to maintain relationships and resolve differences when they arise (Knee, 1988; Knee et al., 2002). Similarly, a fixed theory of interest implies that a core interest awaits discovery. When found, other areas may be ignored. If difficulties arise, these difficulties may be taken as evidence that the interest was not “the one”

after all. In this way, the well-meant imperative “Find your passion” may undermine the development of interests.

To test these predictions, Studies 1–3 examined how implicit theories of interest, both measured as an individual difference and induced to test their causal effects, influence people’s openness to areas outside their core interests. Study 4 examined how theories of interest influence expectations for how motivation should unfold. For those holding a fixed theory, finding a passion should suggest that it will provide unlimited motivation, making its pursuit relatively easy. By contrast, those holding a growth theory should expect that pursuing even strong interests will sometimes be difficult. Finally, if a fixed theory is associated with expectations that pursuing a strong interest will be easy, that belief may lead people to discount an interest if it becomes difficult. We tested this hypothesis in Study 5.

The current research draws on previous work on implicit self-theories, which shows that people can hold fixed and growth theories for many different attributes (e.g., intelligence: see O’Keefe, 2013; personality: Erdley & Dweck, 1993; shyness: Beer, 2002; willpower: Job, Dweck, & Walton, 2010). Importantly, the belief that change is possible in one domain (e.g., intelligence) does not necessarily mean that a person believes that change is possible in another area (e.g., personality) (e.g., Dweck, Chiu, & Hong, 1995; Schroder, Dawood, Yalch, Donnellan, & Moser, 2016). Theories of interest are also theoretically distinct from these other constructs. For example, although theories of intelligence—beliefs about the malleability of intelligence—can predict whether people pursue intellectual challenges, they would not be expected to predict a person’s openness to developing new interests in areas outside their existing area of interest. The current work is also distinct from previous work exploring beliefs about vocational passion

(Chen, Ellsworth, & Schwarz, 2015), which focuses on vocational fit and deeply internalized passions related to occupations rather than the broader spectrum of interests.

Implicit theories of interest also extend the predominant theory describing how interests develop, the Four-Phase Model (Hidi & Renninger, 2006). That model suggests that interests are sparked externally (e.g., by an exciting lecture) and that, through a process of increased valuation, positive affect, and accrued knowledge, people come to internalize the interest and pursue it as part of their identity. This model, however, does not incorporate people's beliefs about the nature of interests. Instead, it tacitly assumes that all people view interests as developed. Implicit theories of interest may help clarify why some people delve into new, diverse interests and persist in pursuing them while others do not.

Study 1: Openness to New Interests

Do theories of interest predict people's openness to new interests? University students reported their interest in two academic articles, one that was related to their existing interest and another that was not. We expected that students endorsing fixed and growth theories would not differ in their interest in the article within their area of interest, but that students endorsing a fixed theory would express less interest in the article outside this area as compared to a stronger growth theory.

Method

This study was a preregistered replication (<https://tinyurl.com/y9gssj5e>) of a previous laboratory study that yielded nearly identical results. The prior study was delivered in a higher impact manner—in a lab setting, not online—but with a smaller sample size, and is summarized in the Supplement.

Participants. In the present study and those that follow, we focus on college students, as they are typically exploring possible interests and are often implored to find their passion.

For our primary hypothesis, we estimated N for a medium effect size and four predictor variables, power set at 0.80, and $\alpha=0.05$, yielding a projected sample size of 84. Our presumed medium effect size was based on the prior study, which had a large effect size, yet was conducted in a more controlled setting. Because the current study was conducted online, we expected that the less controlled setting would result in a relatively smaller effect size. We exceeded this target, recruiting 126 university students (73 female; $M_{age}=23.11$, $SD_{age}=5.30$) from a paid pool in exchange for a \$6 gift card.

Procedure. Participants were recruited for a study they were told would involve reading two articles and reporting their opinions about them. First, they completed an online prescreen, which included measures of personality and the degree to which participants self-identified as a “techy” (local vernacular for students interested in technology, math, engineering, and hard sciences) and as a “fuzzy” (local vernacular for students interested in the arts and humanities). As described below, only students who identified as one and not the other (not both or neither) immediately proceeded to the main study.

In the main portion of the study (also online), after providing informed consent, students completed an assessment of implicit theories of interest, and were then told they would share their thoughts about two articles. One related to techy interests and the other to fuzzy interests. Participants read the article that *mismatched* their techy/fuzzy identity first, and then the article that matched their interest identity. After reading each article, participants reported their level of interest in the topic. Finally, they completed several secondary tasks and questions (see

Supplement), as well as demographic questions, and were then debriefed. The entire session took about 30 minutes.

Materials. The techy article was published in *Science* (Hornby & Kurtoglu, 2009) and discussed the future of the Internet and the potential for websites to utilize adaptive evolutionary algorithms rather than to simply respond to user input as is typically done. The fuzzy article was published in the *Proceedings of the Modern Language Association* (Klein, 2010) and discussed the future of literary criticism and the influence of Derrida. Both articles were edited to be roughly similar in length (920 and 1194 words, respectively) and format, and images were removed from the techy article for consistency. The source of each article was provided.

Measures.

Openness to experience. In the prescreening session, participants completed the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). They were presented with 10 personality characteristics, with two items representing each Big-Five personality dimension, and asked to report the extent to which they agreed or disagreed that the item applied to them (1=*disagree strongly*, 7=*agree strongly*). We used the two items tapping openness to experience (i.e., “I see myself as open to new experiences, complex” and “I see myself as conventional, uncreative,” reverse-scored; $M=5.04$, $SD=1.16$). Greater openness to experience might predict greater interest in the mismatching article. Including this covariate allowed us to test the effects of theories of interest above and beyond this factor.

Techy and fuzzy interest identity. Also in prescreening, amid two filler items, students reported their level of agreement with two statements: “I am a Techy” ($M=3.70$, $SD=1.72$) and “I am a Fuzzy” ($M=3.55$, $SD=1.54$; 1=*strongly disagree*, 6=*strongly agree*). (In the prior laboratory study reported in the Supplement, these measures were completed in an unconnected mass

testing session embedded within many other measures 4 to 10 weeks prior to the participation in main study rather than immediately before beginning the study.) Students who reported agreement with one (4, 5, or 6) and disagreement with the other (1, 2, or 3) were eligible for the main study. In all, 64 self-identified techies and 62 fuzzies took part. In addition to aiding our selection procedure, we used the degree of participants' self-identification as a techy and as a fuzzy as covariates. These variables controlled for the strength of participants' interest identity in each area, which might also predict their interest in the two articles. In doing so, we test the hypothesis that theories of interest would predict interest in the mismatching article above and beyond the strength of their interest identities.

Implicit theories of interest. Students eligible for the current study reported their level of agreement with four statements assessing the construct. These were adapted from the theory of intelligence scale (Dweck, 1999): “To be honest, your core interests will remain your core interests. They won’t really change,” “No matter how central your interests are to you, they can change substantially,” “You can be exposed to new things, but your core interests won’t really change,” and “Even if you have very strong interests, they can change dramatically” (1=*strongly disagree*, 6=*strongly agree*; $\alpha=0.77$, $M=3.68$, $SD=0.89$). [Like techy and fuzzy interest identity, in our prior study (see Supplement), implicit theories of interest were assessed weeks earlier in an unconnected mass testing session. That recruitment procedure, and the procedure used in Study 2 below, prevented the possibility that demand processes could account for our findings.]

Interest in article topics. After reading each article, participants' interest in the article topic was assessed using a modified version of the interest scale developed by Linnenbrink-Garcia and colleagues (2010, Study 2). The 11 items included: “Reading this article was exciting,” “I’d like to learn more about the topic discussed in the article,” and “I could see

myself pursuing a career in the field discussed in the article” (1=*strongly disagree*, 7=*strongly agree*) (techy article: $\alpha=0.95$, $M=4.67$, $SD=1.43$; fuzzy article: $\alpha=0.96$; $M=3.63$, $SD=1.54$).

Results

Interest in article topics. A repeated-measures analysis yielded the predicted interaction between theories of interest and article type, $F(1, 123)=5.32$, $p=0.023$, $\eta_p^2=0.04$. The more participants endorsed a fixed theory, the less interest they expressed in the article that mismatched their interest identity, $\beta=0.22$, $t(123)=2.50$, $p=0.014$. As expected, however, theories of interest did not predict interest in the identity-matching article, $\beta=-0.04$, $t(123)=-0.46$, $p=0.647$.

This interaction held, $F(1, 120)=6.70$, $p=0.011$, $\eta_p^2=0.05$ (Figure 1), controlling for the main effects of techy identity strength, $F(1, 120)=12.34$, $p=0.001$, $\eta_p^2=0.09$, fuzzy identity strength, $F(1, 120)=10.08$, $p=0.002$, $\eta_p^2=0.09$, openness to experience, $F(1, 120)=1.97$, $p=0.163$, $\eta_p^2=0.02$, and each of their interactions with article type (techy identity strength: $F(1, 120)=0.68$, $p=0.412$, $\eta_p^2=0.006$; fuzzy identity strength: $F(1, 120)=0.09$, $p=0.766$, $\eta_p^2=0.001$; openness to experience, $F(1, 120)=22.13$, $p<0.001$, $\eta_p^2=0.16$). Participants’ level of interest in the matching versus mismatching articles varied only with theory of interest, not with their interest identity or level of openness to experience.

As in the model without covariates, with covariates a stronger fixed theory predicted relatively less interest in the mismatching article, $\beta=0.24$, $t(120)=2.88$, $p=0.005$; however, as expected, implicit theories of interest did not predict interest in the matching topic, $\beta=-0.04$, $t(120)=-0.42$, $p=0.678$.

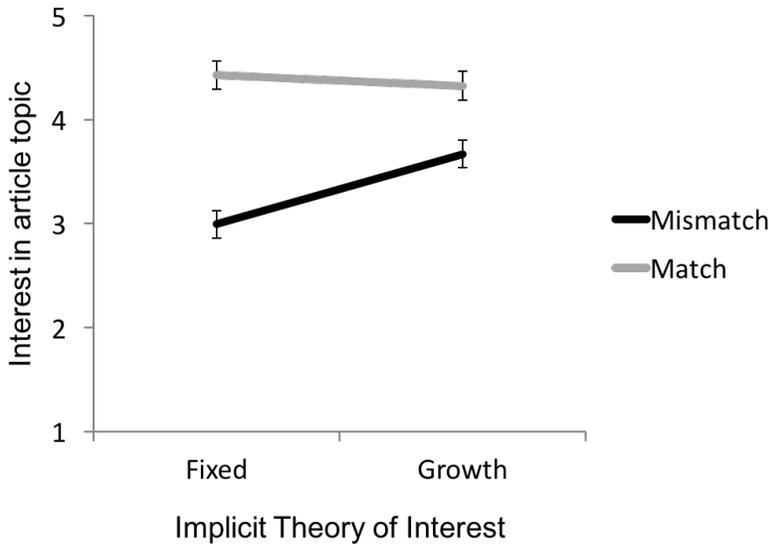


Figure 1. Students' interest in the articles that matched and mismatched their techy or fuzzy interest identity as a function of their theory of interest (Study 1). Fixed and growth theories of interest are plotted at $-1 SD$ and $+1 SD$, respectively. The analysis controlled for techy and fuzzy interest identities and openness to experience as well as their interactions with article type. The interest scale ranged from 1–7. Error bars represent standard errors.

Discussion

The belief that interests are fixed suggests that people simply have some interests and not others. Consistent with this reasoning, a stronger fixed theory was associated with less interest in the topic outside participants' preexisting interest.

Study 2: Ruling Out Demand Characteristics and Alternative Explanations

Perhaps responses to the implicit theories of interest scale influenced students' interest responses to the two articles. Although demand processes are unlikely to explain the results of our study described in the Supplement, which assessed interest identity and implicit theories of interest weeks earlier in an unconnected setting in which the measure was embedded among many others, Study 2 further addressed this possibility by reversing the order of the key tasks.

Students first read the articles and rated their interest in each, and later completed the implicit theories of interest scale.

Furthermore, to rule out the possibility that implicit theories of intelligence explains our results, we assessed the variable to establish that implicit theories of interest is a unique predictor of our outcomes.

Method

This study and its hypotheses were preregistered (<https://tinyurl.com/y74eqpvc>) and predicted a replication of Study 1, such that a stronger fixed theory would predict greater interest in the mismatching article topic and equal interest in the matching article topic as compared to a stronger growth theory.

Participants. One-hundred-forty-one undergraduates (88 female; $M_{\text{age}}=23.24$, $SD_{\text{age}}=3.09$) were recruited from Mechanical Turk. Although the sample size plan was identical to Study 1, we exceeded this amount (without first viewing the data) given uncertainty about how our materials would fare on the platform (vs. a university campus). Participants were paid \$2 for their participation, which took a median of 11.95 minutes.

To check whether participants were students, an item in the demographics questionnaire assessed whether they were currently enrolled in an undergraduate degree program. Two reported that they were not and were consequently omitted from all analyses.

Procedure. The study was visible only to Mechanical Turk workers between the ages of 18 and 30 in order to limit recruitment to those who were college-aged. Prospective participants were told they would read two articles and to report their opinions about them. They first completed a prescreen, which assessed their student status and interest identity amid other items to disguise the purpose of the study. Only those who reported themselves to be full-time college

students and could be identified as a Techy or Fuzzy (not both or neither) were eligible. Eligible students immediately advanced to the study.

The procedure was the same as described in Study 1 with a few exceptions. Most notably, after the main task in which students read the two articles and rated their interest in each, they completed the personality inventory, the theories of interest scale, the implicit theories of intelligence scale, and then general demographics. By placing the theory of interest scale between other measures, we sought to further disguise its purpose. No other measures or tasks were included.

Furthermore, at the beginning of the study, students read “Today we are pre-testing materials for future research and will be asking your opinions about two articles. Afterward, we will ask you some demographic and general information questions to ensure that we get opinions from a diverse group of people.” The first statement was intended to convey that we did not have particular hypotheses related to their reported opinions about the articles. The second statement intended to suggest that their responses to the questionnaires, including the theories of interest scale, were unconnected to their article ratings. By doing so, we further reduced the possibility of demand.

Materials. The articles described in Study 1 were also used in this study. Again, students reported more interest in the techy article than the fuzzy article, $t(138)=4.44, p<0.001$.

Measures. Interest identity was assessed in the same manner described in Study 1; however, we used different labels because the local vernacular used before (i.e., techy and fuzzy) might not be understood in a general student population. Instead we asked potential participants to report the extent to which they agreed with two statements: “I am a Science/Technology-

oriented person” (techy; $M=4.02$, $SD=1.50$) and “I am an Arts/Humanities-oriented person” (fuzzy; $M=3.67$, $SD=1.50$)

Interest in the techy ($M=4.23$, $SD=1.51$, $\alpha=0.96$) and fuzzy ($M=3.42$, $SD=1.51$; $\alpha=0.96$) articles, openness to experience ($M=5.08$, $SD=1.15$), and implicit theories of interest ($M=3.65$, $SD=0.96$; $\alpha=0.85$), were assessed in the same manner as described in Study 1.

To test whether implicit theories of interest were unique in predicting interest in the article outside students’ core area, we also assessed implicit theories of intelligence for use as a covariate. The assessment included four items from a validated scale (Dweck, 1999): “You have a certain amount of intelligence, and you can’t really do much to change it,” “Your intelligence is something about you that you can’t change very much,” “To be honest, you can’t really change how intelligent you are,” and “You can learn new things, but you can’t really change your basic intelligence.” The items were reversed scored and a mean composite was calculated with higher scores reflecting a stronger growth theory (1=*strongly disagree*, 6=*strongly agree*; $M=4.10$, $SD=1.20$; $\alpha=0.95$).

Results

Forty-three undergraduates spent 1 minute or less reading each article suggesting that they did not thoroughly engage with the material. Omitting them from the analyses does not change the results. We retained them, however, to provide a more conservative test of our hypotheses.

Interest in article topics. A repeated-measures analysis ANCOVA yielded the predicted interaction between theories of interest and article type, $F(1, 137)=7.46$, $p=0.007$, $\eta_p^2=0.05$. The more students endorsed a fixed theory, the less interest they expressed in the article that

mismatched their interest identity, $\beta=0.20$, $t(137)=2.42$, $p=0.017$. Theories of interest did not predict interest in the identity-matching article, $\beta=-0.08$, $t(137)=-0.98$, $p=0.328$.

This interaction held, $F(1, 133)=9.26$, $p=0.003$, $\eta_p^2=0.07$ (Figure 2), controlling for techy identity strength, $F(1, 133)=1.44$, $p=0.287$, $\eta_p^2=0.01$, fuzzy identity strength, $F(1, 133)=1.76$, $p=0.186$, $\eta_p^2=0.01$, openness to experience, $F(1, 133)=2.71$, $p=0.102$, $\eta_p^2=0.02$, and implicit theories of intelligence, $F(1, 133)=0.20$, $p=0.656$, $\eta_p^2=0.001$, and each of their interactions with article type (techy identity strength: $F(1, 133)=17.27$, $p<0.001$, $\eta_p^2=0.12$; fuzzy identity strength: $F(1, 133)=1.83$, $p=0.178$, $\eta_p^2=0.01$; openness to experience, $F(1, 133)=0.14$, $p=0.713$, $\eta_p^2=0.001$; and implicit theories of intelligence, $F(1, 133)=0.79$, $p=0.375$, $\eta_p^2=0.01$).

With covariates included, a stronger fixed theory predicted less interest the mismatching article topic, $\beta=0.17$, $t(133)=2.08$, $p=0.039$; however, implicit theories of interest did not predict interest in the matching topic, $\beta=-0.13$, $t(133)=-1.52$, $p=0.130$.

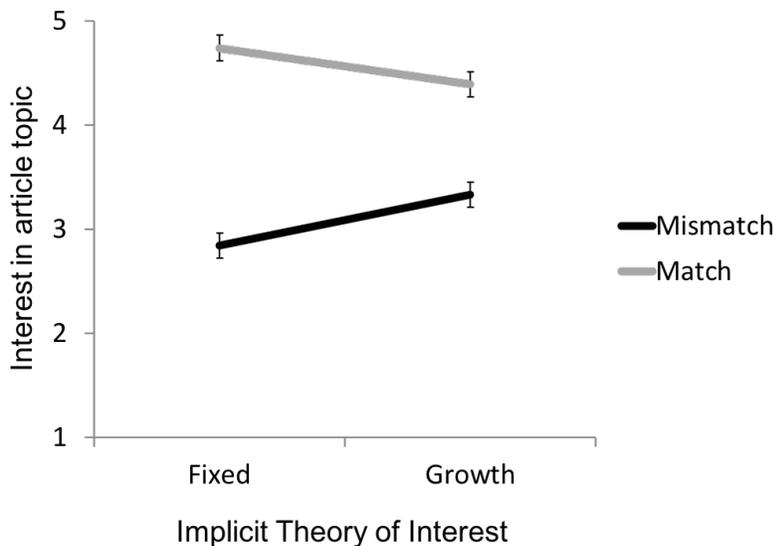


Figure 2. Students' interest in the articles that matched and mismatched their techy or fuzzy interest identity as a function of their theory of interest (Study 2). The analysis controlled for techy and fuzzy interest identities, openness to experience, and implicit theories of intelligence,

as well as their interactions with article type. A stronger fixed theory predicted less interest in the mismatching article topic ($p=0.039$), whereas theories of interest did not predict interest in the matching article topic ($p=0.130$). Fixed and growth theories of interest are plotted at $-1 SD$ and $+1 SD$, respectively. The interest scale ranged from 1–7. Error bars represent standard errors.

Discussion

Together, Studies 1 and 2, and the in-lab supplementary study, showed that a fixed theory of interest predicts less interest in an article topic outside students' interest area (but not an article within their interest area), that this effect does not result from demand, and that it does not arise from other factors, such as theories of intelligence.

Study 3: Does a Fixed Theory of Interest Cause Less Openness to New Interests?

Does a fixed theory *cause* people to limit their interest to topics inside their core area? Study 3 tested whether experimentally inducing theories of interest would produce the same pattern of results observed in Studies 1 and 2.

Method

Participants. For our primary hypothesis, we estimated N for a predicted medium effect size and three predictor variables, power set at 0.80, and $\alpha=0.05$, yielding a projected sample size of 76. Data were collected until the subject pool closed for the academic term, yielding 89 undergraduate students (52 female; $M_{\text{age}}=19.96$, $SD_{\text{age}}=1.67$) who participated in exchange for \$6. Participants completed a prescreen survey embedded in mass testing at the beginning of the term—which was conducted weeks earlier and not linked to our study—and were subsequently recruited if they identified as either a techy or a fuzzy (not both or neither). Recruitment materials stated they would read a few articles and report their opinions about them. Four participants for whom data were missing on key variables were omitted from all analyses.

Procedure. With a few exceptions, the procedure was similar to Study 1. First, the study was conducted in the lab rather than online. Second, before participants read the techy- and fuzzy-related articles, they read one of two 2-page *Psychology Today*-type articles. For a random half, the article reported that interests are stable and inherent predispositions revealed at some point in one's life and then relatively unchanging (fixed-theory condition). For the other half, the article reported that interests are malleable and develop over time, cultivated through interaction between a person and the domain (growth-theory condition). Both articles highlighted notable people (e.g., Albert Einstein) to illustrate how interests do not or can change significantly across the lifespan. After completing the critical tasks, participants completed several additional tasks not central to our main hypotheses (see Supplement). The entire session lasted about 30 minutes.

Measures. In a mass testing prescreening session several weeks before the main portion of the study, students completed the techy ($M=3.69$, $SD=1.44$) and fuzzy ($M=3.45$, $SD=1.38$) identity strength measures embedded in many other measures. Openness to experience was not assessed because Studies 1 and 2 and the supplement study found that it did not explain our results and, moreover, Study 3 induced rather than measured theories of interest. Later, in the lab, participants reported their interest in the techy article topic ($M=3.69$, $SD=1.64$; $\alpha=0.97$) and the fuzzy article topic ($M=2.42$, $SD=1.25$; $\alpha=0.95$). Afterward, they completed a manipulation check (5 items). For example, participants were asked what the research on the historical figures described in the *Psychology Today*-type article showed. Response options included "It showed that their core interests had changed significantly over their lives" (correct for the growth-theory condition), "It showed that their core interests had remained the same over their lives" (correct for the fixed-theory condition). We calculated the number of items answered correctly for a maximum of five points. Participants performed well in both the fixed-theory condition ($M=4.22$,

$SD=0.82$) and the growth-theory condition ($M=4.59$, $SD=0.79$), although the latter group performed somewhat better, $t(83)=-2.13$, $p=0.036$, $d=0.46$, reflecting the fact that one item in the fixed-theory quiz was relatively difficult (only 50 percent of participants answered it correctly).

Results

Interest in article topics. A mixed-model ANOVA with matching and mismatching interest ratings as the within-subjects measure and theory of interest condition as the between-subjects variable yielded the predicted interaction, $F(1, 83)=5.92$, $p=0.017$, $\eta_p^2=0.07$. Extending Studies 1 and 2, as well as the supplementary study, students in the fixed-theory condition ($M=2.04$, $SD=0.81$) reported less interest in the article topic than those in the growth-theory condition ($M=2.04$, $SD=0.81$), $F(1, 83)=5.44$, $p=0.018$, $\eta_p^2=0.07$; however, there was no difference in interest for the matching topic between the fixed-theory ($M=3.96$, $SD=1.59$) and growth-theory conditions ($M=3.57$, $SD=1.69$), $F(1, 83)=1.20$, $p=0.276$, $\eta_p^2=0.01$.

The interaction held, $F(1, 81)=7.47$, $p=0.008$, $\eta_p^2=0.08$ (see Figure 3), controlling for the main effects of techy identity strength, $F(1, 81)=3.41$, $p=0.069$, $\eta_p^2=0.04$, and fuzzy identity strength, $F(1, 81)=0.40$, $p=0.529$, $\eta_p^2=0.005$, and each of their interactions with article type (techy identity strength: $F(1, 81)=13.16$, $p<0.001$, $\eta_p^2=0.14$; fuzzy identity strength: $F(1, 81)=0.33$, $p=0.566$, $\eta_p^2=0.004$). (The interaction between techy identity strength and interest ratings indicates that, the more students held a techy interest identity, the more interested they were in the matching article relative to the mismatching article. This was also found in Study 2, but not in Study 1, where techies were more interested in the article topics than fuzzies overall. Regardless, our main hypothesis was confirmed across all three studies.)

The students reported less interest in the mismatching article in the fixed-theory condition ($M_{adj}=2.04$, $SD_{adj}=0.81$) than in the growth-theory condition ($M_{adj}=2.64$, $SD_{adj}=1.38$), $F(1,$

81)=6.04, $p=0.016$, $\eta_p^2=0.07$. By contrast, there was no condition difference in interest in the matching article (fixed-theory condition: $M_{adj}=3.90$, $SD_{adj}=1.59$; growth-theory condition: $M_{adj}=3.64$, $SD_{adj}=1.69$), $F(1, 81)=0.84$, $p=0.36$, $\eta_p^2=0.01$.

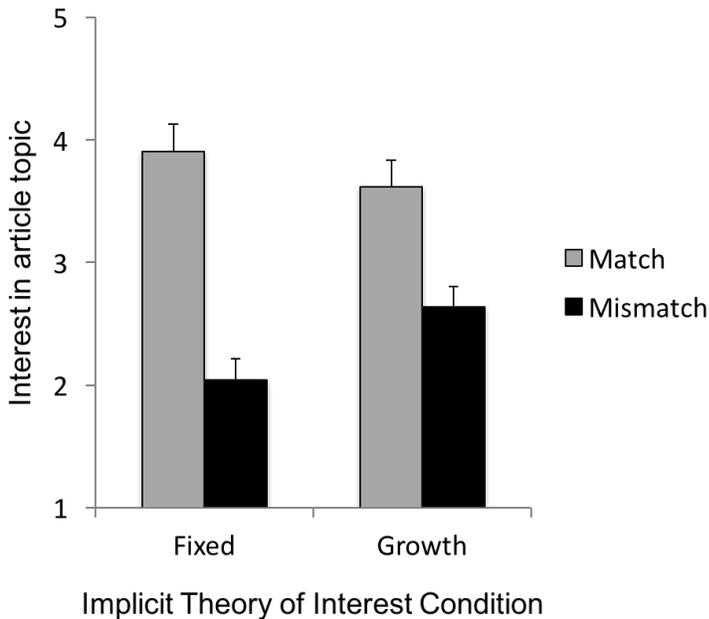


Figure 3. Students' interest in article topics that matched and mismatched their techy or fuzzy interest identity by theory-of-interest condition (Study 3). The analysis controlled for techy and fuzzy interest identity strength. The interest scale ranged from 1–7. Error bars represent standard errors.

Discussion

Implicit theories of interest have a causal effect. As compared to a growth theory, a fixed theory of interest reduced people's interest in a topic outside their established area of interest.

Study 4: Motivational Expectations for Strong Interests

How do theories of interest affect people's expectations about motivation *within* a core area of interest? If people believe that strong interests (i.e., passions) are inherent and emerge fully formed, they may assume that those interests will come with limitless motivation, making

them easy to pursue. If passions are cultivated, however, the developmental process may hold challenges, and people may anticipate that pursuing them may sometimes be difficult.

Method

Participants. This study examined the probability of hypothesized responses in a free-response paradigm. Accordingly, we estimated N based on an odds ratio of 2.33, a medium effect size, power set at 0.80, and $\alpha=0.05$. This yielded a projected sample size of 51. We collected data until the subject pool closed at the end of the term, yielding 47 undergraduates who participated in exchange for partial course credit. Three participants did not complete the tasks and were omitted from all analyses. Forty-four participants remained (24 females; $M_{age}=19.18$, $SD_{age}=1.33$). Therefore, we fell short of our estimated sample size; however, Study 5 addressed a similar question using a different methodology and with a larger sample.

Procedure. At the beginning of the term, participants completed the theories of interest scale in a mass testing session; no connection was made to the outcome measures they saw weeks later. Participants were told that the purpose of the study was to “investigate ideas about people’s deepest interests—their passions,” and was administered entirely online. Given that this was our first investigation of the link between theories of interest and expectations for motivation, we allowed participants to offer their own responses rather than imposing responses on them. To this end, participants responded to several open-ended questions (see Supplement for the full survey) of which the critical ones were:

1. “Once someone has discovered a passion, what happens to their motivation as they pursue that passion? Will they have limitless motivation? Will they stop procrastinating? Please explain.”

2. “Once someone has discovered a passion, what is it like for them to pursue that passion?
Please explain.”

These questions represented interests from the perspective of a fixed theory (i.e., as “discovered”) because our primary interest was in whether participants endorsing more of a fixed theory would also endorse the hypothesized motivational implications of that theory.

Nonetheless participants were free to respond in any way they wished.

Finally, participants were debriefed.

Coding. Two trained research assistants, blind to our hypotheses and participants’ implicit theory, coded responses to each question. All codes reflected the presence (1) or absence (0) of prespecified content. Question 1 was coded (a) for statements referring to the belief that passions provide a source of limitless motivation (e.g., “They will have limitless motivation as long as this remains their passion”) and (b) whether a passion causes people to cease procrastination (e.g., “Their motivation for the passion definitely increases. Since they actually want to do it, there is no procrastination...”). We distinguished between limitless motivation and procrastination to provide a more nuanced measure of the motivational consequences people might anticipate for a new passion. Although we viewed the constructs as related, we also viewed them as distinct. Even if someone believes passion provides limitless motivation, they could still put off engaging in it until, for example, they feel particularly inspired or that the time is right. Question 2 was coded for whether participants suggested that passions can sometimes be difficult to pursue (e.g., “I think that pursuing a passion is never simply easy and fun. It is challenging and that is what makes the pursuit rewarding”). Interrater reliability was strong for all categories (κ s=0.91, 0.85, and 0.79, respectively). Discrepancies were resolved through discussion.

Results

Data were analyzed using logistic regression. First, analyzing responses to Question 1, the more students endorsed a fixed theory the more likely they were to report that a newly discovered passion would unleash boundless motivation. For every unit endorsement toward a fixed theory, the odds a participant said that a passion provides limitless motivation rose by 0.48, $\beta=0.74$, $Wald=3.97$, $p=0.046$ (see Figure 4A). Theories of interest, however, did not predict whether people reported that passions would eliminate procrastination, $\beta=0.40$, $Wald=0.37$, $p=0.541$. Although we distinguished the constructs of limitless motivation and procrastination, participants may not have. Because the reference to procrastination came second within the prompt, participants may have felt they had already addressed the issue in their response about limitless motivation.

Analyzing responses to Question 2, the more students endorsed a fixed theory the less likely they were to report that pursuing a newly discovered passion would be difficult at times. For every unit of endorsement toward a fixed theory, the odds a participant said that pursuing a passion will sometimes be difficult decreased by 3.59, $\beta=1.28$, $Wald=4.77$, $p=0.029$ (see Figure 4B).

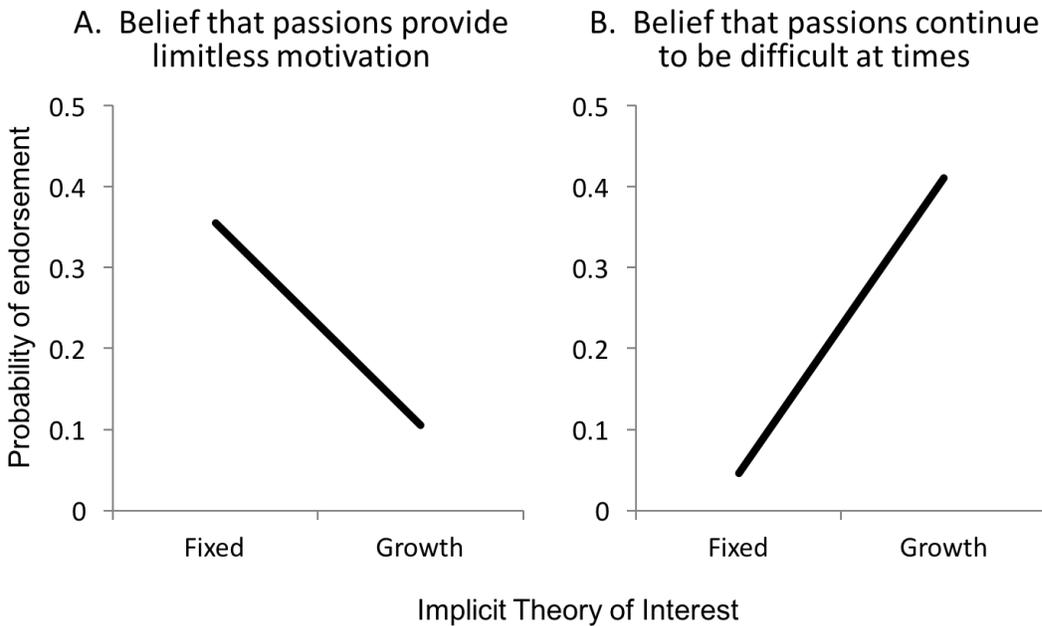


Figure 4. Predicted probabilities that students endorsed the ideas (A) that passions provide limitless motivation and (B) that pursuing passions will be difficult at times (Study 4). Fixed and growth theories of interest are plotted at $-1 SD$ and $+1 SD$, respectively.

Discussion

The more students endorsed a fixed theory, the more likely they were to think that a passion would provide endless motivation. By contrast, the more students endorsed a growth theory, the more likely they were to anticipate that pursuing a passion would sometimes be difficult.

Although Study 4 is somewhat underpowered, it suggests the differing motivational expectations fixed and growth theories elicit. As such, it informs Study 5, which builds on these ideas with a larger sample.

Study 5: Sustaining Interest In the Face of Difficulty

Early in college, students often take a class because the topic sparks their interest. Astronomy, for example, can seem fascinating. The vastness of space and the possibility of life

in a galaxy far, far away beg to be explored. But what happens when the material becomes difficult, the concepts abstract, and the mathematics challenging? Will such difficulty signal that it was not a true interest after all? Study 4 found that those with more of a fixed theory of interest were less likely to anticipate that pursuing a new passion would be difficult at times. When this expectation is violated, does a fixed theory lead students to discount a newfound interest more readily than a growth theory?

In Study 5, we induced theories of interest and then sparked students' interest in black holes with an engaging video. After reporting their initial level of interest in the topic, students read a challenging scientific article on the same topic and again reported their interest. We predicted that students' interest would decline more in the fixed-theory condition than in the growth-theory condition, and especially among students who found the article challenging.

Method

Participants. For our primary hypothesis, we estimated N for a medium effect size and three predictor variables, power set at 0.80, and $\alpha=0.05$, yielding a projected sample size of 68. In total, 71 community college students took part in exchange for course credit. One participant spent more than 9 hours on the 15-minute study and was therefore omitted from all analyses. Seventy participants remained (42 female; $M_{\text{age}}=26.26$, $SD_{\text{age}}=7.92$). There were no gender differences on any measure ($F_s < 1$).

Procedure. The study was conducted entirely online. Participants were told they would be asked to share their opinions about several videos and articles. First, participants were randomly assigned to read either the fixed or the growth theory-inducing article described in Study 3. To buttress the cover story, participants reported their interest in the article, after completing a manipulation check. Next, participants watched a brief video (2 min and 40 sec) on

Stephen Hawking's theory about black holes and their connection to the origins of the universe. This video was selected following a pilot study described below to identify materials that would spark interest in a majority of participants. It was created by *The Guardian* for a general audience (Jha, Hill, & Boyd, 2013) and communicated Hawking's ideas in an accessible and exciting manner. Participants then reported their level of interest in the topic (described below). The most strongly worded item was selected *a priori* to identify participants whose interest had been sparked: "What I learned about in the video was fascinating to me" (1=*strongly disagree*, 6=*strongly agree*). Focusing on this item allowed us to automate the selection criterion within the experimental software such that only participants who responded either "agree" or "strongly agree" (i.e., 5 or 6) proceeded to the main portion of the study. This allowed us to examine how theories of interest affect a strongly sparked interest when the topic later became challenging. Of the 88 participants who completed the prescreen measure, 71 (81%) qualified for the main study. There was no difference by theory condition, $\chi^2(1)=0.30, p=0.418$). The remaining participants were directed to the demographics survey, which concluded their participation.

Next, participants read the first page of a journal article taken from *Science* about black holes (Begelman, 2003). To ensure participants at least began to read the article, they were required to spend at least 5 minutes on the page (i.e., they could not advance until 5 minutes had elapsed); however, they could spend as long as they wanted. The article was written for a scientific audience and was therefore far more technical and challenging than the video. After reading this article, participants rated their interest in the topic again. They also reported how difficult it was for them to understand the article. They then completed demographic items and were debriefed.

Materials.

Black holes video and pilot study. The black hole video was part of *The Guardian's* “made simple” series of educational films (Jha et al., 2013). Before running the study, the video and five others were subjected to an online pilot test to identify materials that would interest most people and thus serve as an appropriate stimulus. Forty-one participants (28 females) watched all six videos and rated their interest in each using the interest scale described in Study 1 ($M=4.61$, $SD=1.10$; $\alpha=0.97$). The black hole video was the highest rated among the six videos; 68% of pilot participants agreed or strongly agreed that it was “fascinating.” Given this interest and because it appealed strongly to both males and females, we used it in the main study.

Measures.

Manipulation check. A single item assessed the effectiveness of the theory-of-interest manipulation, “In your opinion, how difficult is it to change core interests?” (1=*not at all*, 7=*extremely*).

Interest in black holes. A 12-item scale similar to that used in the previous studies was adapted to assess interest in black holes as described in the video and the article (e.g., “What I learned about in the video/article is fascinating to me”; “The things discussed in the video/article are important to me”; $\alpha_{\text{video}}=0.84$; $\alpha_{\text{article}}=0.95$).

Perceived difficulty of article. After reading the article, participants responded to two questions assessing the difficulty they had understanding it: “It was hard to understand this article,” and “It was difficult for me to follow what was discussed in this article” (1=*strongly disagree*, 6=*strongly agree*). The article was moderately difficult to understand ($M=3.77$, $SD=1.20$).

Results

Manipulation check. Participants reported that changing core interests was significantly more difficult in the fixed-theory condition ($M=5.31$, $SD=1.18$) than in the growth-theory condition ($M=3.17$, $SD=1.48$), $t(68)=6.68$, $p<0.001$, $d=1.60$.

Interest in black holes after watching the easy video. As predicted, interest in black holes after watching the video was high ($M_{\text{Fixed theory}}=5.12$, $SD_{\text{Fixed theory}}=0.45$; $M_{\text{Growth theory}}=5.03$, $SD_{\text{Growth theory}}=0.38$) with no difference by condition, $t<1$. There was also no difference between conditions when retaining those who did not pass the prescreen measure, $t<1$ ($M_{\text{Fixed theory}}=4.47$, $SD_{\text{Fixed theory}}=1.28$; $M_{\text{Growth theory}}=4.61$, $SD_{\text{Growth theory}}=1.11$).

Interest in black holes after reading the difficult article. As predicted, a mixed model ANOVA yielded the predicted interaction, $F(1, 68)=5.31$, $p=0.024$, $\eta_p^2=0.07$. Participants in the fixed-theory condition showed a greater drop in interest in black holes than those in the growth-theory condition.

Perceived difficulty of understanding the article as a moderator. Participants reported similar levels of difficulty understanding the article in the fixed-theory condition ($M=3.83$, $SD=1.31$) and in the growth-theory condition ($M=3.71$, $SD=1.10$), $t(68)=0.40$, $p=0.693$, $d=0.10$.

Did finding the article difficult undermine interest more among students in the fixed-theory condition than among students in the growth-theory condition? It did. We tested the effects of theory-of-interest condition, difficulty understanding the article, and their interaction on interest in black holes after having read the article, controlling for interest after having watched the video, $\beta=0.45$, $t(65)=2.23$, $p=0.030$. Both main effects were significant: theory condition, $\beta=0.20$, $t(65)=2.44$, $p=0.017$; difficulty, $\beta=-0.47$, $t(65)=-6.67$, $p<0.001$. These effects were qualified by the predicted interaction, $\beta=0.18$, $t(65)=2.60$, $p=0.012$ (see Figure 5). As compared to students who found the article easy to understand ($-1 SD$; $M_{\text{predicted}}=2.58$), students

who found it difficult (+1 *SD*; $M_{\text{predicted}}=4.96$) expressed less interest in black holes both in the fixed-theory condition ($\beta=-0.65$, $t(65)=-7.04$, $p<0.001$) and in the growth-theory condition ($\beta=-0.29$, $t(65)=-2.69$, $p=0.009$). However, most critical to our hypothesis, among students who found the article difficult, those in the fixed-theory condition reported significantly less interest than those in the growth-theory condition, $\beta=0.42$, $t(65)=3.59$, $p<0.001$. Among those who found it easy to understand (-1 *SD*), there was no difference by theory condition, $\beta=-0.02$, $t<1$.

Despite their fascination with black holes following the video expressed just minutes earlier, students in the fixed-theory condition who found the article difficult (+1 *SD*), reported interest in black holes ($M_{\text{predicted}}=2.75$ on 6-point scale) significantly below the scale midpoint (3.50), one-sample $t(69)=-6.33$, $p<0.001$, $d=0.76$. For students in the growth-theory condition who found the article similarly difficult, this decline was attenuated ($M_{\text{predicted}}=3.59$).

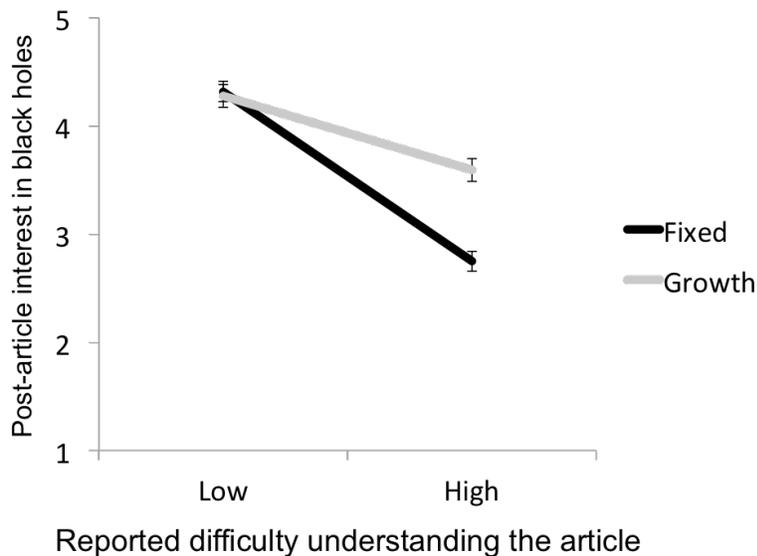


Figure 5. The effect of theory of interest condition and reported difficulty understanding the black holes article (± 1 *SD*) on students' interest in black holes after reading the article (Study 5). The analysis controlled for interest in black holes after watching the video. The interest scale ranged from 1–7. Error bars represent standard errors.

Discussion

After watching a popular science video about black holes, most students were fascinated. Then they read a challenging scientific article about the same topic, which caused students' interest to drop. This drop, however, was greater for students in the fixed-theory condition than the growth-theory condition. Moreover, among students who found the article difficult to understand, those in the fixed-theory condition expressed less interest in the topic than those in the growth-theory condition.

Study 4 found that students with a stronger fixed theory were less likely to anticipate difficulties in pursuing passions. Study 5 found that inducing a fixed theory led students to discount a newfound interest more definitively upon exposure to challenging content. Difficulty may have signaled that it was not their interest after all. Taken together, those endorsing a growth theory may have more realistic beliefs about the pursuit of interests, which may help them sustain engagement as material becomes more complex and challenging.

General Discussion

Fixed and growth theories of interest lead people to approach interests in quite different ways. Relative to a growth theory, a fixed theory reduces interest outside people's preexisting interests (Studies 1–3). Within people's area of interest, a fixed theory, more than a growth theory, leads people to anticipate that a passion will provide limitless motivation and that pursuing it will not be difficult (Study 4). When this expectation is violated, a fixed theory leads to a sharper decline in interest—as if the person comes to think that the topic was not their interest after all (Study 5). A growth theory, by contrast, leads people to express greater interest in new areas, to anticipate that pursuing interests will sometimes be challenging, and to maintain greater interest when challenges arise. These differences were found both when we assessed

naturally occurring variation in theories of interest (Studies 1, 2, and 4) and when we experimentally induced theories, demonstrating their causal effect (Studies 3 and 5).

Implicit theories of interest contribute to extant theory regarding the development of interest. The Four-Phase Model (Hidi & Renninger, 2006) presumes that people view interests as developed. Our work, however, suggests that the development of interest may vary significantly as a function of the implicit theory of interest a person holds. A fixed theory may prevent a person from initiating the developmental process in new areas, and thwart the process if they encounter difficulty. In turn, given the way in which interests can engender intrinsic motivation (O’Keefe, Horberg, & Plante, 2017), theories of interest may shape the degree to which people develop intrinsic rather than solely extrinsic (e.g., getting a good grade) motivations (see O’Keefe & Harackiewicz, 2017).

An important question for future research is how theories of interest play out in real-life settings. The more limited range of interests that arises from a fixed theory is not in itself a liability and may, in some circumstances, reduce distraction as a person deepens pursuit of a topic. A fixed theory could, however, be disadvantageous when advances require interdisciplinary knowledge and the integration of ideas from diverse sources. It could also become a liability if people fail to explore topics that could become strong interests or if, in the face of difficulty or setbacks, it leads people to question their commitment and lose interest in an area. In these cases, the greater openness to new areas and greater resilience facilitated by a growth theory would be advantageous.

The injunction to find your passion draws on an independent view of the self in which important properties are seen as arising from within individuals and as defining them in contrast to others (Markus & Kitayama, 1991). In interdependent cultural contexts, by contrast, interests

may be understood as arising from duties and the desire to maintain harmony in families and communities. An important direction for future research is to explore cultural variation in interests and theories of interest. It is also important to explore boundary conditions within independent cultural contexts. We focused on college students because they are developing their interest identities and enjoined to “find your passion” (Frank, 2016). Whether other populations would show similar patterns is not known (see Supplement).

The message to find your passion is generally offered with good intentions, to convey: Do not worry so much about talent, do not bow to pressure for status or money, just find what is meaningful and interesting to you. Unfortunately, the belief system this message may engender can undermine the very development of people’s interests.

References

- Beer, J. S. (2002). Implicit self-theories of shyness. *Journal of Personality and Social Psychology, 83*(4), 1009–1024.
- Begelman, M. C. (2003). Evidence for black holes. *Science, 300*(5627), 1898–1903.
- Chen, P., Ellsworth, P. C., & Schwarz, N. (2015). Finding a fit or developing it: Implicit theories about achieving passion for work. *Personality and Social Psychology Bulletin, 41*(10), 1411–1424.
- Dweck, C. S., Chiu, C. Y., & Hong, Y. Y. (1995). Implicit theories and their role in judgments and reactions: A word from two perspectives. *Psychological Inquiry, 6*(4), 267–285.
- Erdley, C. A., & Dweck, C. S. (1993). Children's implicit personality theories as predictors of their social judgments. *Child Development, 64*(3), 863–878.
- Frank, T. (2016, January). Stop Trying to Find Your Passion. Retrieved from <https://collegetinfo geek.com/stop-trying-to-find-your-passion/>.
- Google Trends. (2017, May 23). Retrieved from <https://trends.google.com/trends/explore?date=all&q=%22find%20your%20passion%22>
- Gosling, S. D., Rentfrow, P. J., & Swann Jr, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality, 37*(6), 504–528.
- Hornby, G. S. & Kurtoglu, T. (2009). *Science, 325, 277*. Doi: 10.1126/science.1174400
- Jha, A., Hill, M., & Boyd, P. (2013, September 19). Stephen Hawking's big ideas ... made simple. The Guardian. Retrieved December 4, 2014, from <http://www.theguardian.com/news/video/2013/sep/19/stephen-hawking-history-time-simple-video>

- Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion—Is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science*, 21, 1686–1693.
- Klein, R. (2010). The future of literary criticism. *Proceedings of the Modern Language Association*, 125, 4.
- Linnenbrink-Garcia, L., Durik, A. M., Conley, A. M., Barron, K. E., Tauer, J. M., Karabenick, S. A., & Harackiewicz, J. M. (2010). Measuring situational interest in academic domains. *Educational and Psychological Measurement*.
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, 98(2), 224.
- Molden, D. C., & Dweck, C. S. (2000). Meaning and motivation. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 131–159). San Diego, CA: Academic Press Academic Press.
- O’Keefe, P. A. (2013). Mindsets and self-evaluation: How beliefs about intelligence can create a preference for growth over defensiveness. In S. B. Kaufman (Ed.), *The complexity of greatness: Beyond talent or practice* (pp. 119–134). Oxford: Oxford University Press.
doi: 10.1093/acprof:oso/9780199794003.003.0008
- O’Keefe, P. A. & Harackiewicz, J. M. (Eds.) (2017). *The science of interest*. Springer: New York.
- O’Keefe, P. A., Horberg, E. J., & Plante, I. (2017). The multifaceted role of interest in motivation and engagement. In *The Science of Interest* (pp. 49–67). Springer: New York.

Schroder, H. S., Dawood, S., Yalch, M. M., Donnellan, M. B., & Moser, J. S. (2016). Evaluating the domain specificity of mental health–related mind-sets. *Social Psychological and Personality Science*, 7(6), 508–520.

Supplement

Pilot Studies

Pilot for Study 1 (Do theories of interest predict interest outside of one's core area?).

We ran a study similar to Study 1 at an earlier date with a smaller sample ($N=49$) but using an in-person laboratory procedure. It yielded similar and statistically significant results on the primary outcome. The design and method were identical with the exception that undergraduate students completed the theory of interest and interest identity scales in a separate mass testing session at the beginning of the term. Several weeks later, those who qualified as either a techy or a fuzzy (not both or neither) were invited to the lab to participate in the study. With this procedure, there was no way for participants to identify a connection between their responses to the prescreen items and the main portion of the study, mitigating demand processes.

Primary analyses. A repeated-measures analysis yielded the predicted interaction between theories of interest and article type: $F(1, 47)=7.97, p=0.007, \eta_p^2=0.15$. A stronger fixed theory predicted less interest in the article that mismatched participants' techy or fuzzy interest identity, $\beta=0.36, t(48)=2.64, p=0.011$. As predicted, however, theories of interest did not predict interest in the identity-matching article, $\beta=-0.22, t(48)=-1.51, p=0.138$. This interaction also held, $F(1, 44)=11.09, p=0.002, \eta_p^2=0.20$, controlling for the main effects of techy $F(1, 44)=4.92, p=0.032, \eta_p^2=0.10$, and fuzzy identity strength $F(1, 44)=2.58, p=0.116, \eta_p^2=0.06$, and openness to experience, $F(1, 44)=0.73, p=0.397, \eta_p^2=0.02$, as well as their interactions with article type (techy identity strength: $F(1, 44)=7.58, p=0.009, \eta_p^2=0.15$, fuzzy identity strength: $F(1, 44)=0.37, p=0.545, \eta_p^2=0.01$, openness to experience: $F(1, 44)=0.75, p=0.786, \eta_p^2=0.002$).

There were two notable, yet theoretically consistent, differences in the results as compared to Study 1. Unlike Study 1, in the pilot study, those with a stronger growth theory (+1

SD) expressed equal interest in the matching and mismatching article topics (at ± 1 *SD*), $\beta = -0.22$, $t(48) = -1.51$, $p = 0.138$. In Study 1, interest was lower for the mismatching article topic for both growth and fixed theorists, though more so for fixed theorists. The pilot study also yielded a larger effect size ($\eta_p^2 = 0.15$) than Study 1 ($\eta_p^2 = 0.05$). These differences may be attributable to the laboratory (vs. online) procedure.

Exploratory measures and analyses. After completing the primary dependent measures, participants completed several exploratory measures to refine our materials and inform future work.

First, we examined whether theories of interest predicted the perceived interconnectedness between techy and fuzzy areas. If fixed theorists are less open to topics that mismatch their core interests, might they also be less likely to see them as interconnected? Participants were asked to what degree techy and fuzzy areas overlap, which they rated on a 5-point scale from mutually exclusive (1) to completely overlapping (5). The more participants endorsed a fixed theory, the less overlap they perceived between techy and fuzzy fields, $\beta = 0.45$, $t(47) = 3.46$, $p = 0.001$. Controlling for techy and fuzzy interest identity strength and openness to experience yielded the same results, $\beta = 0.44$, $t(44) = 3.42$, $p = 0.001$.

Next we assessed how fixed and growth theorists would allocate resources to different academic programs. If fixed theorists are less interested in areas outside their core interests, would they allocate less money to other fields? We told participants that the university was polling students to inform how it would fund particular academic programs (see Hing, Li, & Zanna, 2002). Participants were asked to divide funds among three types of programs: techy programs, fuzzy programs, and programs that integrated the two. There was no interaction between theories of interest on allocations to the three categories of programs, $F(1, 47) = 1.61$,

$p=0.21$, $\eta_p^2=0.03$. Controlling for techy and fuzzy interest identity strength and openness to experience, however, there was a trending interaction, $F(1, 43)=2.91$, $p=0.066$, $\eta_p^2=0.12$. In this analysis, fixed theory endorsement was associated with the allocation of more funds to programs that matched their interest identity, $\beta=-0.27$, $t(48)=-2.17$, $p=0.035$. Theories of interest did not predict allocations to the mismatching area, $\beta=0.11$, $t(48)=0.93$, $p=0.357$, or to integrative programs, $\beta=0.76$, $t(48)=0.08$, $p=0.593$. Growth theorists may have split their allocation between mismatching and integrative programs, potentially washing out an effect.

Finally, we assessed the stereotypes techy and fuzzy participants held for in- and out-group members as a function of their theory of interest. Participants were asked to list five words that described a typical techy student and five words that described a typical fuzzy student. Trained research assistants coded for positive and negative attributes. We tested for in- and out-group biases based on theories of interest. Whether or not we controlled for techy and fuzzy interest identity strength and openness to experience, theories of interest did not predict endorsement of positive or negative stereotypes attributes for in- or out-group students, $0.405 < p_s < 0.500$.

Pilot for Study 4 (Sustaining interest in the face of difficulty). Before Study 4, we piloted the Study 4 materials (a) measuring rather than inducing theories of interest and (b) running Mechanical Turk participants rather than college students ($N=116$; 42% female; $M_{age}=37$; 87% non-students). The difference in participant sample is theoretically relevant. As we have emphasized, college students are exploring different academic areas and figuring out what area(s) to invest in. They are also more likely to be exposed to injunctions like “Find your passion.” Thus theories of interest may be most relevant in this population and it is why our primary studies focused on college students. Consistent with this reasoning, in the Mechanical

Turk pilot study, theories of interest (measured), $\beta=-0.16$, $t(104)=-0.76$, $p=0.449$, and the interaction between theories of interest and perceived difficulty, $\beta=0.02$, $t(104)=0.51$, $p=0.610$, did not predict interest following the article. Nonetheless, the pilot helped us anticipate the percentage of participants who would pass the prescreen and to gauge how long the study would take.

Study 1: Exploratory Measures

After completing the primary dependent measures reported in the main text, participants completed the same exploratory measures described in the “Pilot for Study 1” section above.

First, we examined the extent to which people endorsed fixed and growth theories viewed techy and fuzzy fields as overlapping. Consistent with the Pilot for Study 1, there was a correlation such that a stronger growth theory marginally predicted greater perceived overlap between techy and fuzzy areas, $r(124)=0.17$, $p=0.059$. Theories of interest did not significantly predict the degree of perceived overlap, however, when controlling for techy and fuzzy interest identity strength and openness to experience, $\beta=0.13$, $t(123)=1.52$, $p=0.140$, although the pattern was in the same direction.

In the university funds allocation task, there was an interaction between theories of interest and the three program types (i.e., matching, mismatching, and integrated), $F(1, 119)=3.29$, $p=0.039$, $\eta_p^2=0.03$. Consistent with the Pilot for Study 1, a stronger fixed theory predicted a greater allocation to the matching program, $\beta=-0.20$, $t(124)=-2.22$, $p=0.028$, and theories of interest did not predict allocations to the mismatching domain, $t<1$. Those endorsing a growth theory, however, marginally predicted the allocation of more funds to integrative programs than those endorsing a fixed theory, $\beta=0.16$, $t(124)=1.82$, $p=0.071$. Including the

covariates yielded weaker results (matching programs, $\beta=-0.14$, $t(124)=-1.65$, $p=0.102$; mismatching programs, $t<1$; integrative programs, $\beta=0.12$, $t(124)=1.31$, $p=0.192$.)

Finally, participants listed five adjectives to describe a typical techy student and another five to describe a typical fuzzy student. Although there was no interaction between theories of interest and the positive adjectives used to describe people in matching and mismatching fields, $F(1, 99)=1.13$, $p=0.290$, $\eta_p^2=0.01$, there was a marginally significant interaction for negative adjectives, $F(1, 99)=3.38$, $p=0.052$, $\eta_p^2=0.04$. Surprisingly, growth theory endorsement was associated with the use of more negative adjectives to describe people from the mismatching field. This pattern of results was consistent when controlling for techy and fuzzy identity strength and openness to experience (positive adjectives: $F(1, 96)=1.60$, $p=0.209$, $\eta_p^2=0.02$; negative adjectives: $F(1, 96)=3.46$, $p=0.066$, $\eta_p^2=0.04$). Twenty percent of participants did not complete the task, however. This together with the fact that the same task in the Pilot for Study 1 produced no condition difference suggests that this result should be interpreted with caution.

Study 2: Exploratory Measures

As in Study 1, after completing the primary measures assessing interest, participants completed several exploratory measures. Because Study 2 experimentally induced theories of interest, here we tested whether the induction would affect these exploratory measures, not whether participants' extant theories of interest would as we tested in Study 1 and the Pilot for Study 1.

First, participants completed the same questions regarding the degree of overlap between techy and fuzzy fields and the allocation of university funds to techy and fuzzy programs. In contrast to the correlational patterns in the Pilot for Study 1 and in Study 1, whether or not

controlling for techy and fuzzy interest identification strength, there was no effect of condition, $F < 1$.

Next, we tested whether induced fixed and growth theories affected perceptions of the difficulty of techy and fuzzy fields. We asked participants to rate the difficulty of nine techy (e.g., chemistry, mathematics) and nine fuzzy academic areas (e.g., world history, philosophy). Whether or not we controlled for techy and fuzzy interest identification strength, there was no condition difference in perceived difficulty of techy and fuzzy fields, $F_s < 1$.

Finally, we explored whether theories of interest might affect a sense of belonging in fields in and outside of participants' interest identity. Participants were asked to provide three reasons why they would or would not fit in and succeed in a techy field and in a fuzzy field (see Walton, Cohen, Cwir, & Spencer, 2012). Trained research assistants coded the number of times participants reported that they would or would not fit in and succeed. Whether or not controlling for techy and fuzzy interest identity strength, the interaction between theories of interest and responses in the matching versus mismatching field was not significant, $F_s < 1$.

Study 3: Exploratory Measures

As described in the main text, the chief purpose of Study 3 was to examine expectations for motivation that arise from fixed and growth theories of interest and, specifically, whether a fixed theory leads students to construe passions as providing limitless motivation (assessed in Question 6 below) and as providing a path forward that is relatively free of difficulties (assessed in Question 4 below). These questions directly informed Study 4, which tested the motivational implications of a fixed versus growth theory when pursuing a newfound interest became difficult.

However, Study 3 also explored several additional questions. Questions 1 and 2 explored how fixed and growth theorists think about the genesis of passions. Trained research assistants coded the data for both (a) agreement and (b) disagreement with the prompts. Results from Question 2 confirmed that fixed theorists were more likely than growth theorists to agree that interests reside within the individual, waiting to be revealed (e.g., “Yes, passions reveal inner desire that the person has always possessed.”), $\beta=-0.82$, $Wald=4.64$, $p=0.031$. Growth theorists, in contrast, were more likely to disagree with the statement (e.g., “No, passion is developed through prolonged interest and hard work”), ($\beta=0.71$, $Wald=4.35$, $p=0.037$). Additional questions assessed what a newly discovered passion feels like (Questions 3), how it affects the pursuit of other interests (Question 5), and how a newly discovered passion would be experienced in a hypothetical situation (Question 7a and b). No significant results were obtained for these latter questions.

The full survey for Study 3 was as follows:

INSTRUCTIONS: The purpose of this survey is to investigate ideas about people’s deepest interests—their passions. Below are several questions for which we would like you to write short responses. There are no right or wrong answers. We are simply interested in your ideas.

First, we’d like to ask you some questions about where a passion comes from.

1. Is a passion something that people tend to discover all at once, or is it something that people come to know over time? Please explain.
2. Is a passion something that was always in you waiting to be revealed?

Next, we’d like to ask you about what people experience the moment they discover a passion.

3. What does it feel like when people first come to know a passion?

Finally, we’d like to ask you about what happens *after* people discover their passion.

4. Once someone has discovered a passion, what is it like for them to pursue that passion?
Please explain.
5. Once someone has discovered a passion, does it change how they think about other potential interests? Do people pursue those other things, or do they tend to focus only on their passion? Please explain.
6. Once someone has discovered their passion, what happens to their motivation as they pursue this passion? Will they have limitless motivation? Will they stop procrastinating?
Please explain.
7. Imagine that someone thinks they have recently discovered their passion and takes a well-regarded course on the topic at his or her university.
 - a. Suppose the person finds the course boring. How does he or she respond? Does their passion persist? Were they mistaken about their passion? Please explain.
 - b. Suppose the person doesn't do very well in the course. How does he or she respond? Does their passion persist? Were they mistaken about their passion?
Please explain.

Summary of Pilot and Exploratory Results

Our pilot studies and exploratory measures show a high degree of consistency with our theory. The pilot for Study 1 showed virtually the same pattern of significant effects as reported in Study 1. Although the pilot for Study 4 used a theoretically irrelevant sample, it was useful in determining our pre-selection criterion and other study materials. Our exploratory measures, which were added to inform future research directions, were predominantly consistent with our hypotheses, whether statistically significant or trending the predicted direction.

References

- Hing, L. S. S., Li, W., & Zanna, M. P. (2002). Inducing hypocrisy to reduce prejudicial responses among aversive racists. *Journal of Experimental Social Psychology, 38*(1), 71–78.
- Walton, G. M., Cohen, G. L., Cwir, D., & Spencer, S. J. (2012). Mere belonging: The power of social connections. *Journal of Personality and Social Psychology, 102*(3), 513.