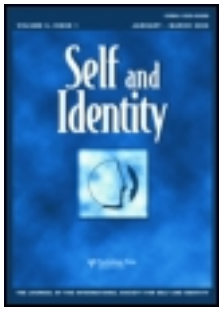

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Give Up or Get Going? Productive Uncertainty in Uncertain Times

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Give Up or Get Going? Productive Uncertainty in Uncertain Times

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We live in uncertain times; the path toward attaining important goals is best thought of as probabilistic, not certain. Three studies test the prediction that this "world uncertainty," uncertainty about the path, is motivating if accompanied by certainty that one can have the skills needed to work on one's goals. Self- and world-certainty were separately manipulated in college students, and effect on salience of academic and career possible identities and behaviors was assessed. For students, self-uncertainty reduces salience of academic–career possible identities (Study 1), but self-certainty does not help unless combined with some world-uncertainty (Study 2). This combination also increases planned study hours (Study 2) and actual goal-focused action, working on a resume builder instead of playing games (Study 3).

Keywords: Uncertainty; Motivation; Self; Academic; Goal; Possible selves.

Productive Uncertainty in Uncertain Times

These are uncertain times, and it seems unlikely that the world will become a more certain place any time soon. For college students, the destination is often clear—get a good job, one that is meaningful and fulfilling. Yet, no path can guarantee success; even students with the highest grades and best summer internships do not necessarily land dream jobs after graduating, and those who do cannot be sure that their jobs will continue to exist in the foreseeable future. Despite this uncertainty, college enrollment has not dropped (Snyder & Dillow, 2012). The uncertain economic perspective is not pleasant to imagine or struggle through, but it is the reality for students and non-students alike. To better understand the effect of uncertainty about the world outside the self on goal-relevant action, this paper develops a working model of *productive uncertainty* rooted in identity-

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based motivation theory (IBM, Oyserman, 2007, 2009). IBM theory predicts that people prefer to act in identity-congruent ways, but that what that implies is context-dependent because contexts influence which identities come to mind, what difficulty working on them implies, and which behaviors feel identity-congruent. As applied to uncertainty, IBM theory predicts that the situational constraints and affordances created by uncertainty matter in determining which identities come to mind and what a particular identity means for current action. An uncertain path requires more effort, effort one may feel able to provide if at the same time one experiences certainty about ones' self. For college students, this implies that uncertainty about the path to job success should increase the accessibility of academic- and career-focused possible identities and increase their sense that now is the time to make plans for and to act to attain these rather than other possible identities.

As outlined next, neither considering the motivational consequences of certainty in one's self and in the world outside ones' self, nor considering when self-concept matters for action toward long-term goals are novel topics (for a review, see Swann & Bosson, 2010). Indeed, in focusing on when future-oriented elements of self-concept influence action, we join a large tradition in identity, personality, and self-concept research that highlights that simply having a future identity does not mean one will act on it (e.g., Back, Schmukle, & Egloff, 2009; Bong & Skaalvik, 2003; Diefendorff, Hall, Lord, & Strean, 2000; Hoyle & Sherrill, 2006; Kuhl, 1994). What is new is our focus on the self and world as conceptually distinct sources of certainty and uncertainty that are dynamically constructed in context and have interactive effects on which aspects of identity come to mind and thus which actions make sense in the moment.

Self and World: Certainty, Confidence, and Control

To understand what this framework implies for the interplay between self- and world-certainty, it is useful to consider that people experience situations as informative both about themselves and about the world outside the self. Both self- and world-certainty and uncertainty have been used as main effects in a number of theoretical frameworks including stress and coping theory (Lazarus & Folkman, 1984) and reformulated learned helplessness theory (Abramson, Seligman, & Teasdale, 1978). For example, reformulated learned helplessness theory (Abramson et al., 1978) predicts that people quit either because they feel uncertain about their ability to produce desired behavior or uncertain that their behavior will have the desired effect. Self-efficacy (Bandura, 1977), stereotype threat (Aronson & Inzlicht, 2004), expectancy-value (e.g., Feather, 1982; Maddux, Norton, & Stoltenberg, 1986), and the theory of planned behavior (e.g., Ajzen, 2002) all include formulations of the motivational power of self-certainty versus uncertainty in some form.

For example, Ajzen (2002) argues that both a sense of control or certainty about the world and about the self contribute to plans for behavior, while Aronson and Inzlicht (2004) showed that uncertainty about the self's academic ability was related to vulnerability to stereotypes. Although distinct, each formulation considers ways in which doubts about the self can be undermining, often in conjunction with uncertainty about the world. While each of these formulations has shed light on particular ways in which self- and world-certainty can function in tandem, our focus is distinct in that we predict that self-certainty (feeling relatively certain that one has the skills and abilities to attain one's goals) is motivating in the context of world-uncertainty (feeling that the path to the future is uncertain), rather than that certainty is motivating and uncertainty is not.

World- and Self-Certainty: Operationalizations

We use the general terms world- and self-certainty rather than other related constructs such as self-efficacy and outcome expectancies to reduce confusion about what we are referring to. As detailed next, we are interested in what might be considered an aspect of self-efficacy and of outcome expectancies—certainty. Our operationalization of these constructs follows. In each of the studies in this paper, we translate our operationalization into a manipulation.

World-Certainty and Uncertainty. We define world-certainty as the feeling that desirable outcomes can be achieved and undesirable ones avoided *because the path connecting means and ends is clearly predictable and stable*. A clearly predictable and stable path implies that if action is taken, success will follow. Thus, world-certainty implies that one can start at any time and the outcome will be as predicted. Conversely, we define world-uncertainty as the feeling that one may or may not be able to achieve desirable outcomes or avoid undesirable ones *because the path connecting means and ends is unpredictable and probabilistic* rather than clear and stable (e.g., Skinner, 1996; Weisz & Stipek, 1982). An unpredictable and probabilistic path implies that one's external context cannot guarantee success. Thus, world-uncertainty implies that one should start sooner rather than later since initial attempts may not unfold as expected and multiple attempts may be needed.

Our operationalization of world-uncertainty is distinguishable from a number of conceptually related themes including procedural or distributive justice, belonging uncertainty, and expectancy. Procedural and distributive justice focus explicitly on whether processes and distributions of rewards and punishments are clearly specified and *fair* rather than simply uncertain (e.g., McFarlin & Sweeney, 1992; Thibaut & Walker, 1975; Tyler, 2012, 2013). Belonging uncertainty (Walton & Cohen, 2007) focuses on stigmatization and social bonds rather than cause and effect in the world generally. Outcome expectancy or likelihood is "a person's estimate that a given behavior will lead to certain outcomes" (Bandura, 1977, p. 193). Outcome expectancy predicts that when action is taken, it will either produce the desired outcome or not. World-uncertainty, on the other hand, implies that it is best to start trying because any single try may or may not result in success because the path itself is probabilistic. What is uncertain is not the end state one is trying to reach but rather the path.

Self-Certainty and Self-Uncertainty. Consistent with others, we define self-certainty as the feeling that one can learn and follow the steps associated with achieving one's goals, and self-uncertainty as feeling *doubtful that one can learn and follow the steps* associated with such goals (De Cremer & Sedikides, 2005; Oleson, Poehlmann, Yost, Lynch, & Arkin, 2000; Skinner, 1996). An uncertain self does not mean that failure is inevitable, but that the self is not likely to be the agent of success. In that sense, self-certainty is similar to self-efficacy, which Bandura (1977) defines as the belief that *one is capable of executing desired behaviors*. Feeling certain about one's abilities should heighten one's willingness to engage in effortful goal pursuit (e.g., Atkinson, 1964; Bembenutty, 2009; Feather, 1982). Likewise, feeling uncertain about one's abilities or about being able to learn the skills to move toward one's goals should imply that goal-focused action (e.g., studying) is futile. This should increase the temptation of immediate gratifications (e.g., partying instead of studying), pursuit of goals one feels more certain about attaining, and decrease goal-directed action in the domain of self-uncertainty. Indeed, this intuition underlies expectancy value theories, which were initially developed to predict attitudes toward objects and behaviors and have since been generalized to predict behavior and behavioral

intentions (e.g., Ajzen, 1988; Fishbein & Ajzen, 1975). Over time, uncertainty about one's ability to achieve desired academic identities is associated with misbehavior in school and a variety of risky behaviors such as binge drinking and drug use (Griffin, Botvin, Nichols, & Scheier, 2004; Honora & Rolle, 2002; Ludwig & Pittman, 1999). Although efficacy expectations are often examined separate from outcome expectancies, we argue that since self-certainty operates within the context of certainty and uncertainty about the world, understanding the motivational power of one requires considering it in the context of the other.

Negative Consequences of Certainty

Studies sometimes show that certainty rather than uncertainty undermines effort and learning. For example, effort in computer games is undermined by progress feedback that enhances certainty of success (Amir & Ariely, 2008), and certainty induced by knowing that one will have additional chances reduces the likelihood of taking immediate future-focused action (Khan & Dhar, 2007). Further, both self-report and neural measures indicate increased engagement with learning material when uncertainty is present (Howard-Jones & Demetriou, 2009; see also Ozcelik, Cagiltay, & Ozcelik, 2013). The same is true for research examining self-efficacy. There is some evidence that heightened self-efficacy can increase various kinds of risk taking (Llewellyn & Sanchez, 2008; Llewellyn, Sanchez, Asghar, & Jones, 2008; Merritt & Tharp, 2013; Slanger & Rudestam, 1997), undermine effort (Powers, 1991; Stone, 1994; Vancouver & Kendall, 2006; Vancouver, Thompson, Tischner, & Putka, 2002; Vancouver, Thompson, & Williams, 2001; for rebuttals, see Bandura & Jourden, 1991; Bandura & Locke, 2003), and does not always prove to be a robust indicator of behavioral intentions by itself (see Maddux et al., 1986). Thus, college students who feel more efficacious about learning spend less time studying than those who feel less efficacious, and less studying leads to worse grades (Vancouver & Kendall, 2006). Further, longitudinal analyses using national (Elliott, Chowa, & Loke, 2011) and regional (Uno, Mortimer, Kim, & Vuolo, 2010) data-sets show negative effects of self-efficacy on college attendance and no effects of academic self-efficacy on college completion. Experimentally, boosting efficacy decreases effort and performance (Vancouver et al., 2002), perhaps because it implies that one is certain about both one's abilities and about world processes—a combination that creates so much certainty that academic effort does not feel necessary and one is free to focus attention on other goals (e.g., Louro, Pieters, & Zeelenberg, 2007).

Productive Uncertainty

So when is uncertainty helpful and when does it undermine motivation to work toward one's possible identities? A first step in articulating this is to distinguish between the impact of self- and world-certainty (for a discussion, see Skinner, 1996). In order to do so, we focus on how these constructs are interpreted, building upon IBM theory (Oyserman, 2007). IBM theory predicts that though people prefer to act in identity-congruent ways, the identity-to-behavior link is often opaque because which identities come to mind and what they imply for current action are a function of the affordances and constraints in the current situation. Situations matter in part by influencing whether experienced difficulty in goal pursuit is interpreted as implying that the identity is important or impossible to attain (Oyserman, Bybee, & Terry, 2006; Oyserman & Destin, 2010). Prior experiments have demonstrated that manipulating students' interpretation of difficulty as implying

importance enhances the accessibility of their school-focused identities and increases academic task engagement (Smith, Novin, Elmore, & Oyserman, 2014).

Interpretation of experienced uncertainty is also required. Applying the IBM model and its emphasis on the interpretation of experience to certainty and uncertainty, situations can cue a feeling of certainty or of relative uncertainty about the self as well as a feeling of certainty or of uncertainty about the world outside oneself (i.e., one may or may not have the needed skills, and the path may be stable or unstable). Self-certainty and uncertainty is experienced relative to a particular possible identity or self-goal. Experiences of self-certainty and uncertainty likely run along a continuum from complete certainty (e.g., "I have what it takes to achieve this possible identity," implying the self as the agent of success) to complete uncertainty (e.g., "I don't have what it takes to achieve this possible identity," implying any source of success is outside the self). World-certainty and uncertainty likely run along a similar continuum from complete certainty (e.g., "the path to this possible identity is clear," implying external factors will assure success) to complete uncertainty (e.g., "the path to this possible identity is unclear," implying external factors will not assure success). For ease, these can be parsed into a positive sense of certainty ("I have or can have what it takes," "the path to get there is clear") and a moderate level of uncertainty ("I may not have what it takes," "the path to get there is not clear"), yielding four possible states (self- and world-certainty, self- and world-uncertainty, self-certainty with world-uncertainty, and self-uncertainty with world-certainty).

Feeling certain about the world and about the self should yield a confident sense that as soon as one gets going, one will succeed. Like the hare in the parable of the tortoise and the hare, a certain self in a certain world may underperform simply because this certainty leads to a sense that one can always focus later. On the other hand, feeling uncertain about the self should not be particularly motivating either, and may be sufficient to demotivate action, no matter how certain or uncertain one is about the path. This leaves the past option, feeling certain about the self but uncertain about the world. If the world is an uncertain place, attaining one's future identities may be difficult, but if one is confident that one has or could have the requisite skills, then difficulty is likely to be interpreted as task importance (Labroo & Kim, 2009). When interpreted in the context of feeling certain that one has the skills to succeed, feeling that the world is an uncertain place should highlight the need for action and lead to increased goal salience and goal-related effort and persistence.

An uncertain world signals that success is not guaranteed, so that putting in the effort that one is capable of is necessary for success. Thus, world-uncertainty when paired with self-certainty is a signal that applying additional effort can increase the likelihood of success. The domain in which one is motivated to act is likely to be linked to life situations, developmental phase, and immediate contextual cues. In our studies we focus on college students, for whom academics and future career may be more or less salient as a dominant motivational theme. IBM theory implies that even if academics and future career are salient, whether they come to mind as possible identities and whether one takes congruent action depends on if in context that possible identity feels relevant to current opportunities for action. Productive uncertainty in the context of academics and career should make relevant possible identities salient and increase the likelihood of seeing and seizing possibilities for future action.

Current Studies

We test these predictions by manipulating the source of experienced uncertainty, starting with Study 1 and the simple prediction that source of uncertainty matters, and then move on to test the combined effect of manipulating both self- and world-(un)certainty.

In Studies 2 and 3, we test our productive uncertainty prediction that world-uncertainty paired with self-certainty can create a motivated state that brings academic- and career-focused possible identities to mind and spurs action to attain these identities. In Study 1, we start simply by priming uncertainty about the world or about the self. This sets the stage by demonstrating that uncertainty about the self is more undermining of academic- and career-focused possible identities than uncertainty about the world, although both lead to accessibility of the construct of uncertainty. In Studies 2 and 3, we manipulate both self- and world-certainty and uncertainty. Following our opening example, we target certainty and uncertainty of college students about their prospects for 5 years in the future.

Study 1

Participants were randomized to either write about self-uncertainties or to experience uncertainty that did not implicate the self metaphorically (by rolling dice), or were given no task prior to the dependent measure. Metaphors such as "rolling the dice" imply that the process is due to luck or chance, not because of one's own skill (for reviews of the literature, see Landau, Meier, & Keefer, 2010; Meier, Schnall, Schwarz, & Bargh, 2012). The dependent measure was the number of academic- and career-focused possible identities and strategies to attain them that students generated. Academic- and career-focused identities are the most common responses to possible identity prompts in this age group and, when salient and combined with strategies, predict goal-focused action (for reviews, Oyserman, Elmore, & Smith, 2012; Oyserman & James, 2011; Seginer, 2009).

Sample and Method

First-year undergraduates ($n = 102$; 63 females) participated for course credit by completing a Qualtrics computerized survey study about students' vision of their future while seated in a private cubicle. Qualtrics randomly assigned participants to one of three conditions: self-uncertainty, $n = 32$; world-uncertainty, $n = 34$; or a no uncertainty manipulation control, $n = 36$. Cell sizes are uneven due to true randomization, which was used in all three studies rather than forcing equal cell sizes. In the self-uncertainty condition, participants read the following text adapted from Hogg, Sherman, Dierselhuis, Maitner, and Moffitt (2007): *Take a few moments to think about yourself, considering what you are like now and who you may become in the future, write down three things that make you feel most uncertain about yourself.* Participants were provided three numbered lines to write their responses. In the world-uncertainty condition, we had participants roll a pair of dice three times to prime the idea of uncertainty. Dice are commonly used in board games combining chance and skill. Participants read aloud the number attained on each roll and the experimenter recorded it without comment. In the control condition, participants proceeded directly to the dependent variable as described below.

Next, all participants were asked to respond to the following prompt: *Please take a moment to think about yourself five years from now. Where do you see yourself? In a short paragraph, please describe how you would like to be and how you would like not to be five years in the future. Please write some examples of the things you will be doing to meet the future goals that you were thinking of.* After this task, participants answered demographic questions.

Finally, students completed a manipulation check consisting of a form with the following instructions. *Please complete the word by filling in the missing letters and write the word in the space provided. Please work quickly and do not spend too much time on any one stem. If you cannot think of a word, move on. Please return this page to the experimenter when you are finished*. There were 12 word stems, 3 fillers that could only be

filled by neutral words, and 9 critical word stems that could be filled by uncertainty-related or neutral words. An example of a filler word stem is MI_ _ _ _ _ _, which could be filled out as *Michigan* (students were at the University of Michigan). An example of a critical word stem is DO_ _ _, which could be filled with neutral words such as *donut* or *doors*, or with an uncertainty-related word, e.g., *doubt*. Word stems were piloted to ensure that the uncertainty stems could be completed with either neutral or uncertainty terms.

Manipulation Check

The word completion task demonstrated that participants did not differ in how many word stems they completed ($F(2, 98) = .09$, $p > .9$), but rather in the number of word stems they completed with uncertainty words, $F(2, 98) = 6.80$, $p < .01$. Paired contrasts showed that control participants ($M = 17.8\%$, SD = 15.4%) completed fewer of the critical stems with an uncertainty word than did participants in the self- ($M = 33.8\%$, SD = 21.8%) and world-($M = 28.6\%$, SD = 17.3%) uncertainty conditions, p's $< .02$. Uncertainty words were just as accessible to self- and world-uncertainty participants, $p > .25$.

Preliminary Analysis

Before a detailed analysis, we examined the general content of students' responses to the possible identities prompt by using the online tool *Wordle* (Wordle.com). Excluding words that were repeats of the prompts, the most frequent words used in student responses were similar across conditions. The most common words were "school," "job," "life," "good" (self-uncertainty condition), "school," "job," "Michigan," "future" (world-uncertainty condition), and "school," "job," "Michigan," "college" (control condition), implying that across conditions students were focused on job and school (Michigan is a common shorthand form for the University of Michigan).

Next, two research assistants that were blind to condition and hypothesis used the coding scheme developed by Oyserman and Saltz (1993) to content-code responses. Inconsistencies were discussed to consensus. All participants generated at least one possible self-response. Most commonly possible identity responses focused on academics and career (e.g., "I would like to be attending law school at a highly ranked university," "I wouldn't want to be a dropout"), as did strategies to work on these possible identities (e.g., "maintain a high GPA," "doing research internships"). Academics and career responses accounted for almost 60% (56.7%) of possible identities ($M = 2.91$, SD = 1.32, range 0–6) and two-thirds (67%) of strategies ($M = 2.51$, SD = 1.22, range 0–6).[1]

Analysis Plan

We used analysis of variance (ANOVA) and covariance (ANCOVA), as detailed next, to examine the effect of condition on academic and career possible identities and strategies. Because the same pattern of condition effects was found if academic and career possible identity and strategy scores were analyzed separately, for parsimony, analyses presented below used the sum score of academic- and career-focused possible identities and strategies ($M = 5.42$, SD = 1.90). We ran analyses twice, once as an ANCOVA, controlling for the total number of possible identities and strategies generated, and once as an ANOVA without this control. The control allowed us to assess the salience of academic and career identities relative to other identities. We did not predict or find a gender difference, so gender was not included in analysis.

Results and Discussion

Assignment to condition affected how many academic- and career-focused possible identities and strategies students generated, both when controlling for how many possible identities and strategies they wrote, $F(2, 98) = 3.47$, $p = .035$, and without this control, $F(2, 99) = 4.03$, $p = .021$. Students in the self-uncertainty condition generated fewer academic- and career-focused possible identities ($M = 4.81$, SD = 1.60) than control condition students ($M = 5.76$, SD = 1.59, $p = .016$, $d = .60$) and students in the world-uncertainty condition (who rolled dice, $M = 5.64$, SD = 1.59, $p = .037$, $d = .52$). Control and world-uncertainty responses did not differ ($p = .76$).

We followed up with supplementary analyses to look for alternative explanations such as the possibility that self-uncertainty changed the valence of possible identities, perhaps driving up the number of negative possibilities and driving down the number of positive ones. However, we did not find such a pattern. There was neither a change in the number of negative feared academic- and career-focused possible identities ($F(2, 99) = .86$, $p = .43$) nor a change in the number of positive hoped for or expected academic- and career-focused possible identities ($F(2, 99) = 1.97$, $p = .15$). Instead, the overall reduction in the number of academic- and career-focused possible identities was due to declines in both feared and hoped for responses.[2]

Study 1 showed that while both uncertainty manipulations increased accessibility of uncertainty as a construct (as shown by the manipulation check), only self-uncertainty undermined accessibility of academic- and career-focused possible identities and strategies to attain them. The effect does not seem to be due to an increase in negative or a decrease in positive possible identities in the self-uncertainty condition, but rather to an overall reduction of focus on academics and career. Thus, although any uncertainty about the self may be demotivating for the career and academic focus of students, the same does seem to hold true for world-uncertainty. But are there circumstances where world-certainty helps to motivate (rather than just not demotivate). In Studies 2 and 3, we turn to the interplay between world- and self-certainty, predicting that when paired with self-certainty, world-uncertainty will enhance motivation. A limitation of Study 1 was that the uncertain world (rolling dice) and the uncertain-self (writing about one's self) manipulations differed greatly in format. In addition, uncertain-self participants thought about the self in both the manipulation and dependent measure, whereas other participants did not. Therefore, in Study 2, we used closely parallel texts in each manipulation that avoided these issues.

Study 2

Students were randomized to control or one of four experimental conditions. Accessible sense of world- and self-certainty and uncertainty were manipulated by having participants read one of four texts that integrated world- and self-certainty and uncertainty statements. The text formed the opening of the study, after which students wrote about their study plans and described their future self.

Sample and Method

First-year undergraduates ($n = 247$; 123 females) completed a Qualtrics computerized experiment about students' everyday college experience for course credit while seated in a private cubicle. Qualtrics randomly assigned participants to one of five conditions[3]: self-certainty/world-uncertainty, $n = 45$; self-certainty/world-certainty, $n = 65$; self-uncertainty/world-uncertainty, $n = 43$; self-uncertainty/world-certainty, $n = 51$; control,

$n = 43$. As presented in Table 1, certainty and uncertainty were manipulated by having participants read a passage adapted from Morrison and Johnson (2011) and Hogg et al. (2007). In the no-prime control condition, participants proceeded directly to the dependent variables.

Participants were asked how many hours (open-ended) they planned to spend *studying and working on academic projects over the next week (not including time spent attending class)*, embedded in filler items asking about social and recreational activities. The possible identities and strategies measure used in Study 1 came next, followed by demographic questions.[4]

Planned studying responses ranged from 1 to 72 hours. A few students gave such high estimates that they may have misread the instructions and included class time in their estimates. To ensure that a few extreme responses did not misrepresent results, the eight most extreme responses were recoded as $M + 2$ SD, reducing the high end of the range to 42 hours (6 hours of studying a day, 7 days a week), $M = 19.73$, SD = 9.63. Reported analyses use these trimmed data.[5]

Preliminary Analysis

As in Study 1, we ascertained that the general content of students' responses to the possible identities prompt did not vary by condition by using the online content analysis instrument, *Wordle* (Wordle.com). Across conditions, two prominent words were "school" and "job." Other common words were similar; "career" (in the control condition), "college," or "graduate" (in all experimental conditions). A few words were prominent only in some conditions, including "working" (in the self-certainty/world-certainty and the self-uncertainty/world-uncertainty conditions) and "good" and "life" (in the self-certainty/world-uncertainty and the self-uncertainty/world-certainty conditions).

Content-coding of responses followed the procedures of Study 1. Again, academic- and career-focused possible identities (e.g., "I'll be in graduate school for psychology"; "I don't want to be a drop-out"; "I'll be a hard worker at my job") and strategies to work on these possible identities (e.g., "studying hard," "seeking an internship," "developing a good work ethic") were the most common, at 46.1% of possible identities responses ($M = 2.70$, SD = 1.60, range 0–8) and 63.1% of strategies ($M = 1.98$, SD = 1.29, range 0–6), yielding a sum score of 9.39 (SD = 3.63).[6]

Results and Discussion

Assignment to condition influenced content of future identity in the predicted pattern. As can be seen in Figure 1, students assigned to the productive uncertainty (self-certainty and world-uncertainty) condition generated more academic- and career-focused possible identity responses than students in other conditions, both when controlling for how many possible identities and strategies they wrote (omnibus $F(4, 238) = 3.51$, $p < .01$, mean Cohen's $d = .52$, productive uncertainty vs. all other conditions contrast, $p = .003$), and without these controls, $F(4, 239) = 2.28$, $p = .061$.[7] Planned contrasts revealed that students in the productive uncertainty condition differed from other conditions (vs. self-uncertainty/world-uncertainty, $d = .65$, $p = .003$; vs. self-uncertainty/world-certainty, $d = .51$, $p = .014$; vs. control, $d = .65$, $p = .003$; the contrast with self-certainty/world-certainty was not significant, $d = .28$, $p = .16$).[8]

We followed up with supplementary analyses to explore alternative explanations of our results. As in Study 1, we examined whether condition influenced valence of academic- and career-focused possible identities, as indicated by the number of expected and feared possible identities generated, respectively. We found an effect for positive (expected,

TABLE 1 Self- and World-(Un)Certainty Primes

Condition	Study 2 prime	Study 3 prime
Self-certainty/ world-certainty	A just world and you can get ahead. Life is more predictable and controllable than people may think. The world usually operates according to meaningful rules and these rules are fundamentally fair. Further, it is often quite possible to learn and follow the rules needed to work toward goals in one's own life. Naturally, one often feels certain about the likelihood of achieving one's aims. Give an example of a goal you have and how the path to attain it is predictable and certain.	In many ways, the world is a very certain place. Moreover, one often feels quite certain about oneself.
Self-uncertainty/ world-uncertainty	A just world? Can you get ahead? Life is less predictable and controllable than people may think. The world does not usually follow meaningful rules and when it does, these rules are fundamentally unfair. Further, it is often difficult to learn and follow the rules needed to work toward goals in one's own life. Naturally, one often feels uncertain about the likelihood of achieving one's aims. Give an example of a goal you have and how the path to attain it is unpredictable and uncertain.	In many ways, the world is a very uncertain place. Moreover, one often feels quite uncertain about oneself.
Self-uncertainty/ world-certainty	A just world but can you get ahead? Life is both predictable and controllable and unpredictable and uncontrollable. The world usually operates according to meaningful rules and these rules are fundamentally fair. However, it is often difficult to learn and follow the rules needed to work toward goals in one's own life. Naturally, one often feels both certain and uncertain about likelihood of achieving one's aims. Give an example of a goal you have and how the path to attain it is in some ways predictable and certain and in other ways unpredictable and uncertain.	In many ways, the world is a very certain place. However, one often feels quite uncertain about oneself.
Self-certainty/ world-uncertainty ("productive uncertainty")	A just world? But you can get ahead. Life is both predictable and controllable and unpredictable and uncontrollable. The world does not usually operate according to meaningful rules and when it does, these rules are fundamentally unfair. However, it is often quite possible to learn and follow the rules needed to work toward goals in one's own life. Naturally, one often feels both certain and uncertain about the likelihood of achieving one's aims. Give an example of a goal you have and how the path to attain it is in some ways predictable and certain and in other ways unpredictable and uncertain.	In many ways, the world is a very uncertain place. However, one often feels quite certain about oneself.
Control	No prime	Today I ate breakfast.

$F(4, 239) = 2.65$, $p = .034$) but not for negative (feared, $F(4, 239) = 1.11$, $p = .35$) academic and career responses. Contrast analysis showed that participants in the productive uncertainty condition generated more positive academic- and career-focused

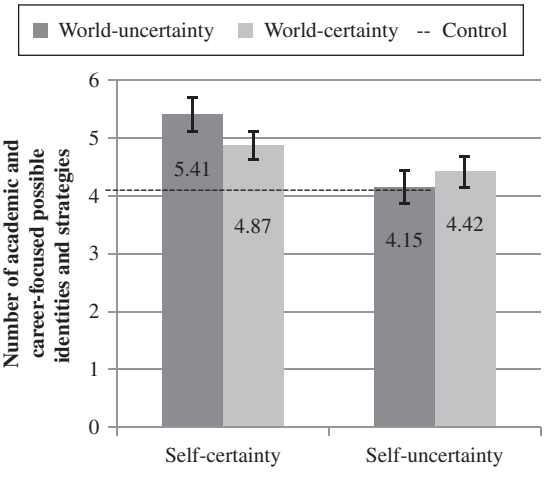

FIGURE 1 Study 2. Mean number of academic- and career-focused possible identities and strategies by condition (with standard error bars).

possible identities ($M = 2.23$, SD $= 1.23$) than participants in the other conditions (self-certainty/world-certainty, $M = 1.75$, SD $= 1.14$; self-uncertainty/world-uncertainty, $M = 1.58$, SD $= 1.12$; self-uncertainty/world-certainty, $M = 1.73$, SD $= 1.11$; control, $M = 1.51$, SD $= 1.08$, p's $< .035$).

Condition also affected planned study hours. As seen in Figure 2, in the productive uncertainty (self-certainty/world-uncertainty) condition, students planned to study more hours than in the other conditions, omnibus $F(4, 242) = 2.98$, $p = .02$, mean Cohen's $d = .48$, productive uncertainty versus all other conditions contrast, $p = .003$. Planned contrasts revealed that students in the productive uncertainty condition planned to study more than those in other conditions (vs. self-certainty/world-certainty, $d = .45$, $p = .02$; vs. self-uncertainty/world-certainty, $d = 0.50$, $p = .013$; vs. control, $d = 0.68$, $p = .001$; the contrast with self-uncertainty/world-uncertainty was not significant, $d = 0.28$, $p = .155$).

Taken together, the results of Study 1 suggest that uncertainty about the world alone does not undermine focus on academic and career possible identities, and the results of Study 2 suggest that the combination of uncertainty about the world and certainty about the self can focus students' attention on their academic and career possible identities. In Study 2, we found a positive effect of productive uncertainty (certainty about oneself combined with uncertainty about the world) on salience of academic- and career-oriented possible identities and strategies and on planned study hours. The effect on possible identities was due to an increase in the number of expected, rather than the number of feared academic- and career-focused possible identities.

While replicating the general findings from Study 1 on salience of academic and career possible identities, nonetheless, Study 2 has some limitations, which we address in Study 3. First, in Study 3, we use a behavioral measure rather than a planned behavior. Second, we use a different text as our prime to rule out the possibility that results are idiosyncratically related to a particular prime. In addition, Study 3 also helps address another limitation, which is that across our dependent measures, the predicted omnibus effect is significant and each paired contrast in the predicted direction, but for each dependent variable, one paired contrast is not significant. Which of the planned contrasts is non-significant differs by dependent measure,

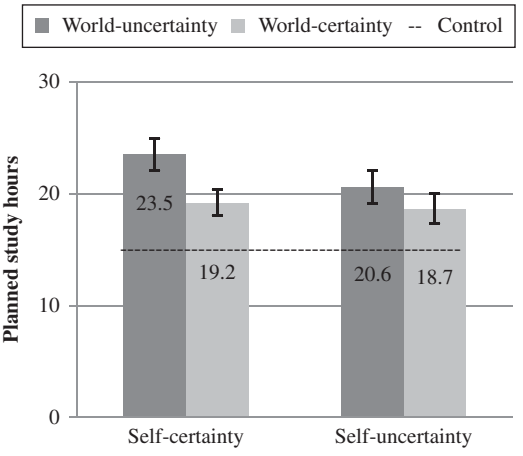

FIGURE 2 Study 2. Mean time allotted for academics during the next week by condition (with standard error bars).

implying that the lack of significance is due to error variance rather than a systematic similarity of one of the other conditions to the productive uncertainty condition.

To address these potential limitations, in Study 3, we focus on real-time rather than self-reported measures and further simplified our manipulation, such that source of un/certainty is more directly linked to either self or world. We modified our control condition so that all participants engaged in a task of some sort to provide a more stringent test of our hypotheses.

Study 3

Participants responded to a written prompt and then were given a choice between two options, playing an online game of their choice or working on their resume while they waited for the next phase of the study to begin. As in Study 2, the text was the manipulation. We predicted that participants induced to feel relatively certain about themselves but uncertain about the world would feel a need to "get going" on their future self and take the opportunity to work on their resume while other participants would not.

Sample and Method

Undergraduates ($n = 84$; 53 females, 1 missing gender information) completed for course credit what they were told was a two-part Qualtrics experiment, with the first part focused on autobiographical memory and the second part ostensibly about cognition on different types of tasks. Participants were seated in private cubicles and Qualtrics randomly assigned participants to condition (self-certainty/world-uncertainty, $n = 17$; self-certainty/world-certainty, $n = 18$; self-uncertainty/world-uncertainty, $n = 21$; self-uncertainty/world-certainty, $n = 16$; control, $n = 12$).[9] Unbeknown to them, the autobiographical memory task was the manipulation. Participants read a condition-specific passage (Table 1) and were asked to *take a moment to think of an experience that you've had that fits with the description in the passage and briefly describe the experience and how it made you feel*. Participants were then given a choice between two options (see below) for the remaining 20 minutes of the study. They were then excused (none were asked to go on to the cognition task).

Option 1: Complete an award-winning online tutorial to help you craft an irresistible resume. Research has shown that people who use this program to construct their resumes are more likely to get job and internship offers as well as succeed in applications to graduate schools.

Option 2: Play an online game of your choice from a large selection of top-ranked games. You can choose from our library of the newest, most popular, and most entertaining online games.

Results and Discussion

Data were fitted to a binomial logit model using generalized linear modeling. As predicted, productive uncertainty mattered for future-focused behavior. Most (82%) of students in the self-certainty/world-uncertainty condition chose the resume builder activity while less than half of students in the other experimental (48%) or control (17%) conditions did so, omnibus χ^2 $(4, N = 84) = 22.74$, $p < .001$, productive uncertainty versus all other conditions contrast, $p = .003$. This pattern is replicated in planned contrasts (see Figure 3): productive uncertainty versus self-certainty/world-certainty, $p = .011$; productive uncertainty versus self-uncertainty/world-uncertainty, $p = .005$; productive uncertainty versus self-uncertainty/world-certainty, $p = .092$; versus control, $p < .001$.[10]

To rule out possible alternative explanations that the effect was due to higher positivity or to more certainty, we coded the responses students gave to the manipulation for response valence (1, negative; 2, neutral; 3, positive) and whether the response conveyed certainty or uncertainty. Assignment to a self-certainty condition predicted both more positivity and more certainty (as detailed in the footnote), but neither valence ($\chi^2 (2, N = 84) = 1.60, p = .45$) nor certainty ($\chi^2 (1, N = 72) = .003, p = .96$) predicted behavior.[11] We interpret these results as further support of our IBM-based prediction that uncertainty about the path combined with certainty about oneself is productive because of what it implies about the need to engage in effortful action.

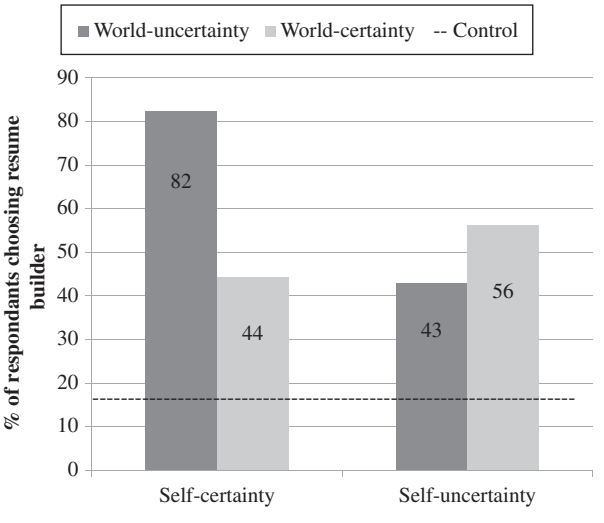

FIGURE 3 Study 3. Percentage of participants choosing resume builder option by condition.

General Discussion

These are uncertain times, the destination may feel clear—get a good job, one that is meaningful and fulfilling, but the path is uncertain, probabilistic, and subject to change rather than certain and stable. Across studies, we hypothesized that this kind of uncertainty would increase salience of academic- and career-focused future possible identities as well as planning and action toward these identities if students at the same time felt relatively certain that they had or could have the skills needed to make progress. Using IBM theory (Oyserman, 2007) as our framework, we called this *productive uncertainty*, a combination of self-certainty (feeling relatively certain that one has the skills and abilities to attain one's possible identities in a particular domain) and world-uncertainty (feeling that the path to the future is uncertain in that same domain). This kind of uncertainty is productive because it yields a motivating interpretation of difficulty—not knowing exactly what will happen can make the outcome more valued. The idea that difficulty can increase motivation is not new (Brehm & Self, 1989) and neither is the idea that how difficulty is interpreted matters (Oyserman & Destin, 2010). What is new is the idea that uncertainty can provide this impetus. To test our prediction, we induced college student participants to feel certain or uncertain about themselves and the world around themselves and assessed consequences for academic- and career-focused possible identities and relevant behavior. By manipulating each element separately, we were able to test their interactive effect.

In Study 1, we showed that self-uncertainty blocks accessibility of academic and career possible identities and strategies to attain them, whereas world-uncertainty does not. Then in Studies 2 and 3, we induced students to consider both themselves and the world outside themselves. First, we showed that the combination of self-certainty and world-uncertainty increased salience of academic and career identities and strategies (Study 2) and increased planned study hours (Study 2). Then, we showed that this combination also motivated real behavior (using a resume builder rather than playing online games, Study 3) in pursuit of those possible identities. Effects for other conditions were not consistent across dependent variables, implying that these conditions might sometimes matter and that other moderators of their effectiveness may exist.

Just as contexts modulate automatic evaluations generally (Gawronski & Cesario, 2013), world-certainty and uncertainty modulate the consequences of self-certainty. Productive uncertainty highlights that people simultaneously experience certainty about themselves and uncertainty about the path. This mix signals that obstacles are due to world hurdles rather than personal interest or skill, and therefore, one ought to start working on one's important self-goals immediately rather than later, as world processes may interfere and success is not guaranteed (despite one's capabilities). Other combinations of certainty and uncertainty do not highlight this impetus for action but instead demotivate through a lack of ability (self-uncertainty), a sense of complacency since world outcomes are guaranteed (world-certainty), or some combination of these.

Advancing Research on Self and Motivation

Our work complements a large body of research on long-term goals. Literature on the self and motivation has grappled with when people take action to attain their goals and what the obstacles in doing so are (Carver & Scheier, 1990, 1998). A number of possibilities have been tested. One argument is that people fail to act if their will has been depleted (Baumeister, Vohs, & Tice, 2007; Hagger, Wood, Stiff, & Chatzisarantis, 2010) or if they lack attentional focus (Kaplan & Berman, 2010). Another argument is that people fail to notice that now is the time to act or get stuck thinking "when" rather than "how" one will

act (Gollwitzer & Oettingen, 2013; Oettingen & Gollwitzer, 2009). Alternatively, motivation may increase due to mental contrasting, bringing to mind a desired future and mentally contrasting it with the present situation. This contrasting can promote goal pursuit if expectations of success are high; otherwise, this contrasting actually undermines action (Gollwitzer & Sheeran, 2006; Kappes, Singmann, & Oettingen, 2012; Oettingen, 2000). Other theories highlight dispositional factors in determining self-regulation; those with high self-regulatory capacity are action-oriented and have a higher likelihood of transforming intentions into behavior even in demanding situations, whereas those with low self-regulatory capacity are state-oriented, and tend to fixate on static motivational states and negative emotions (Diefendorff et al., 2000; Kuhl, 1984, 1994). Another set of theories focuses on juggling multiple goals; sometimes making progress itself facilitates switching to another goal (Carver & Scheier, 1990, 1998; Fishbach & Dhar, 2005; Fishbach, Dhar, & Zhang, 2006), and this may be moderated by how far the goal feels and one's emotional response to progress (Louro et al., 2007).

Our studies add another possibility, which is that people may fail to take immediate action if contexts do not provide the action impetus of productive uncertainty, operationalized as feeling simultaneously relatively certain that one has the skills to attain a possible identity and uncertain that world processes are in one's favor. Productive uncertainty addresses familiar situations—waiting too long to pull up one's grades or waiting too long to revise a paper—not because one does not want to, and not because one does not believe one can, but because of certainty that the path is clear so that as soon as one starts, one will be able to succeed. Lack of certainty about the path provides an impetus for action; therefore, action is dependent on the phenomenological experience of certainty and uncertainty about the self and the world.

Limitations and Future Directions

To test the effects of world- and self-certainty and self-uncertainty, we manipulated these experiences. In the world outside the laboratory, the experiences may not be fully orthogonal. For example, it may be that both kinds of certainty are likely to co-occur, as are both kinds of uncertainty, yielding failure to act. Our data cannot address the question of frequency of occurrence of each of the four world and self-certainty and uncertainty types we described.

It is possible that our effects were partially due to mood or to a positive experience of certainty. To begin to address this possibility, in follow-up secondary analyses, we looked for evidence that our results might be alternatively explained by positive valence or by the presence of certainty in responses. This was not the case. Although self-certainty sometimes increased positivity and certainty, adding positivity or certainty to our analyses did not change the pattern of results. We looked separately at the possibility that productive uncertainty differentially affects salience of feared or of desired possible identities. This does not seem to be the case; it is not that feared possible identities increase alone or that desired possible identities increase alone. Future research is needed to understand possible moderators. For example, feared possible identities might be especially likely to increase if uncertainty implies the need to avoid pitfalls. Alternatively, an uncertain world might induce an increase in salience of positive, desired possible identities if uncertainty implies that only truly valued possible identities should be attempted.

Although no set of studies can rule out all competing alternatives, we also looked for evidence of another competing explanation, which is that uncertainty increases the breadth of possible identities that come to mind. This might be the case if uncertainty signaled the

need to be flexible about where one might end up. This alternative hypothesis does not fit with our results. Our Wordle analysis showed that content of possible identities is quite similar across conditions. Participants in the productive uncertainty condition simply generated more academic- and career-focused possible identities than participants in the other conditions.

In the context of self-certainty, a dose of world-uncertainty may serve as a push to act now, since one has the needed abilities, but cannot predict what roadblocks might delay or derail efforts. The sooner one begins to take action, the more chances one has to correct course or try something else if one's initial attempts fail. Since, as we noted above, much theorizing focuses on failure to start, experiencing productive uncertainty is useful since it seems to increase both the salience of a possible identity and likelihood of taking goal-relevant action. Although we focused on academics, the positive effect of productive uncertainty should also apply to other domains such as pursuit of health goals or resilience in the face of trauma. Supporting people to acknowledge both their own capabilities and the uncertain nature of the world may be beneficial for inspiring continued goal-pursuit in a variety of domains (for conceptualizations related to trauma, see Aspinwall & Tedeschi, 2010; James, 2012; James, Noel, Favorite, & Jean, 2012). Uncertainty may be most motivating across domains when it makes one think of important self-goals and leads to planning and action, making goal attainment more likely.

Notes

1. Next most common possible identities were social-relational (14.9%), financial (13.3%), mental health (10.1%), and health and appearance (1.8%).
2. Condition did not affect number of possible identity responses ($M = 5.56$, SD = 2.36, range 1–11), number of strategies ($M = 3.93$, SD = 1.62, range 0–9), the sum of possible identity and strategy responses ($M = 9.49$, SD = 3.20), or the valence of possible identity responses (as measured by number of expected positive, $M = 4.26$, SD = 1.94, range 1–10, or feared negative, $M = 1.33$, SD = 1.38, range 0–7, responses), p's $> .4$.
3. Studies 2 and 3 are both 2 × 2 experimental designs with hanging controls, presented as 5-cell studies for ease of interpretation. As in Study 1, true randomization results in unbalanced cells.
4. In Studies 2 and 3, we asked students for their GPA. No effect of GPA was found, so it 6is not included in analyses.
5. Using raw scores did not change the pattern of results. Self-reported study hours correlated ($r = .15$, $p < .05$) with academic- and career-focused possible identity and strategy score.
6. In order of frequency, next most common possible identities were social-relational (26.9%), financial (5.0%), health and appearance (3.6%), and mental health (3.2%).
7. The same pattern of condition effects is found if possible self- and strategy scores are analyzed separately.
8. However, participants in the self-certainty/world-certainty condition did not differ from self-uncertainty/world-certainty condition participants ($p > .2$). They reported more academic- and career-focused responses than participants in the self-uncertainty/world-uncertainty ($d = .39$, $p = .058$) and control ($d = .27$, $p = .060$) conditions did. No other contrasts were significant (p's $> .5$).
9. Readers may again notice that the cell sizes are not even. As in Studies 1 and 2, this pattern is due to the randomization procedure and not due to loss of participants.
10. Control students played more (control condition vs. all other conditions contrast, $p = .013$; vs. certain-self/certain-world; $p = .081$; vs. uncertain-self/uncertain-world, $p = .086$; vs. uncertain-self/certain-world, $p = .016$).
11. Valence score was higher (more positive) in control ($M = 2.71$, SD = .47) and self-certainty (certain-self, certain-world $M = 2.44$, SD = .51, certain-self, uncertain-world

$M = 2.41$, SD = .62) condition texts than in self-uncertainty (uncertain-self, certain-world $M = 1.63$, SD = .72, uncertain-self, uncertain-world $M = 1.67$, SD = .66) condition texts. Certainty was more likely to be expressed in the self-certainty (certain-self and certain-world condition, 83.3%; certain-self and uncertain-world, 76.5%) conditions than in the self-uncertainty (uncertain-self and uncertain-world, 19.0%; uncertain-self and certain-world, 12.5%) conditions. Control condition participants all wrote about breakfast, which did not lend itself to certainty coding.

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