Journal of Experimental Psychology: General
2013, Vol. 142, No. 2, 313–318

0096-3445/13/$12.00 DOI: 10.1037/a0028716

BRIEF REPORT

Steps, Stages, and Structure: Finding Compensatory Order in Scientific Theories

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Stage theories are prominent and controversial in science. One possible reason for their appeal is that they provide order and predictability. Participants in Experiment 1 rated stage theories as more orderly and predictable (but less credible) than continuum theories. In Experiments 2–5, we showed that order threats increase the appeal of stage theories of grief (Experiment 2) and moral development (Experiments 4 and 5). Experiment 3 yielded similar results for a stage theory on Alzheimer's disease characterized by predictable decline, suggesting that preference for stage theories is independent of valence. Experiment 4 showed that the effect of threat on theory preference was mediated by the motivated perception of order, and Experiment 5 revealed that it is particularly the fixed order of stages that increases their appeal.

Keywords: order, stage theories, compensatory control, predictability, illusory pattern perception

Supplemental materials: http://dx.doi.org/10.1037/a0028716.supp

Stage theories have been prominent in the social, behavioral, and life sciences since their inception. This is certainly true for psychological science; Freud's work on psychosexual stages was followed by many other examples. Stage theories in psychology assume that human development and adaptation move through an orderly and predictable series of steps (Baron, Earhard, & Ozier, 1995). Other examples besides Freud are Piaget's theory of intellectual development (Brainerd, 1972; Ginsburg & Opper 1979), Kohlberg's stages of moral development (1958), and Erikson's stages of identity development (1994). There is continuing debate and controversy in the behavioral and social sciences regarding the extent to which processes such as human development, societal change, and health are characterized by discontinuous steps (the assumption of stage theories) or are continuous (as presumed by continuum theories; see Abbott, 1995; Lerner, 2002; Stuart & Coltheart, 1988). Despite this controversy, the ubiquity of stage theories suggests that they have an appeal to theorists and their audience alike. In the current article, we argue that a desire for order and predictability may contribute to this appeal.

Perceiving order, or structure, in the world has been argued to be a fundamental human motivation (Kruglanski & Webster, 1996; Whitson & Galinsky, 2008). According to the compensatory control model (Kay, Whitson, Gaucher, & Galinsky, 2009), perceiving order can be accomplished in different ways. One way is to affirm the notion that one has personal control over life and future outcomes. Alternatively, people also employ other strategies to affirm order and prevent threatening perceptions of randomness. For example, when personal control is threatened, people bolster belief in external agents that control outcomes (such as an intervening God or powerful political system; Kay, Gaucher, Napier, Callan, & Laurin, 2008), impose patterns and causal inferences on noise (Foster & Kokko, 2009; Whitson & Galinsky, 2008), and display an enhanced belief in scientific progress (Rutjens, van Harreveld, & van der Pligt, 2010).

Recently, Shermer (2008) suggested that an important reason for the prominence of stage theories might be that they provide for our need to detect patterns and meaning in the world. Indeed, molding complex environmental and behavioral phenomena into an orderly series of stages enhances our sense of understanding, and, perhaps more important, the feeling that we can predict future outcomes. According to Carol Tavris, stage theories "impose order on chaos . . . and predictability over uncertainty" (as cited in Shermer, 2008,

This article was published Online First May 28, 2012.

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We wish to thank Jennifer Whitson for providing us with the modified snowy pictures task.

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p. 42). We aim to provide empirical evidence for the idea that stage theories harbor an order-restoring function and therefore gain attractiveness when people need to thwart perceptions of randomness. If this notion is correct, order threats should enhance preference for stage theories.

In sum, we hypothesized that threatening people's perceptions of order would increase preference for stage theories over continuum theories. First, in Experiment 1, we assessed how participants rate stage versus continuum theories in terms of providing order and predictability. Experiment 2 tested whether an order threat increases preference for a stage theory of grief. In Experiment 3, we focused on a stage theory of Alzheimer's disease, which provides *negative* predictability regarding the course of the disease and enabled us to test whether preference for stage theories is independent of valence. The final two experiments investigated preference for a stage theory of moral development and tested (a) whether the motivation to perceive order underlies changes in preference (Experiment 4) and (b) which specific aspect of stage theories (fixed order or fixed length of the stages) contributes to their appeal when order is threatened (Experiment 5).

Experiment 1

We conducted a first experiment to test whether stage theories are perceived to provide more order and predictability than continuum theories.

Method

Undergraduate students ($N = 37$; 23 females; M_{age} 23 years) were asked to rate two sets of theories, one on identity development and one on musical development. First, they read about Erikson's (1994) eight stages of identity development, followed by a brief description of his theory. Then, we presented the same stages again and subsequently described a theory on identity development stating that the order in which people go through the eight stages is not fixed (loosely based on Marcia, 1966). After each description, participants rated the theory on seven items (7-point scales) assessing how orderly and predictable they saw the two theories (Erikson order index $\alpha = .65$, Marcia order index $\alpha = .82$). Participants also rated the credibility of each theory on a 7-point scale. Next, the same procedure was applied to a stage theory and a continuum theory on musical development (based on Swanwick & Tillman, 1986, αs .81 and .87, respectively).

Results and Discussion

Paired-samples t tests revealed that the stage theories were rated as more orderly (but less credible) than the continuum theories (see Table 1). Experiment 1 thus shows that stage theories are perceived as providing more order and predictability than continuum theories, while at the same time people assign less credibility to them. This might explain the general preference for continuum theories that we will see in the remaining four experiments.

Experiment 2

Method

Participants. Undergraduate students ($N = 59$; 53 females; M_{age} 20 years) participated in exchange for course credit.

Procedure. To threaten order perceptions, we randomly assigned participants to a control-threat or no-threat condition.[1] We manipulated control by asking participants to recall and describe a negative situation over which they lacked (or had) control. Then, they were asked to provide three reasons supporting the notion that the future is (un-)controllable (Rutjens et al., 2010). Next, we presented a manipulation check, consisting of two items (7-point scales) gauging control over and the aversiveness associated with the described situation and two items gauging generalized feelings of control (e.g., "Are you the actor in, or the director of, your own life?", $r = .62$, $p < .01$). Subsequently, participants were presented with short descriptions of two theories on the development of grief: a continuum theory (James & Friedman, 1998) and a stage theory (Kübler-Ross, 1969). In her well-known theory of grief, Kübler-Ross described five stages of grief, from denial to acceptance. The continuum theory stressed the absence of a discernible and clear sequence of adaptation phases and argued that bereavement is different for each individual (depending on personality factors, demographics, and so on). We asked participants to choose the theory that they thought best explains the process of grief.

Results and Discussion

All participants in the no-threat condition preferred the continuum theory over the stage theory of grief, but control threat led to an 18% reduction of this default preference, $\chi^2(1) = 4.91$, $p = .027$, Cramer's $V = .29$. Thus, although the majority of participants still indicated a preference for the continuum theory, this preference was lower in the threat condition (see Table 2).

A third experiment was conducted to replicate these results with two modifications. First, we replaced the control-threat manipulation with a randomness prime (which constitutes an alternative means to manipulate order-threat, see Kay, Moscovich, and Laurin, 2010). Second, we employed a set of theories—on the development of Alzheimer's disease—in which the stage theory describes a process of deterioration rather than resolution (contrary to grief, where the final stage is acceptance), while the alternative theory was simultaneously less predictable and more hopeful. In this way, we aimed to test whether the appeal of predictability under threat applies to both positively and negatively valenced processes.

Experiment 3

Method

Participants. Undergraduate students ($N = 43$; 36 females; M_{age} 22 years) participated in exchange for course credit.

Procedure. Participants were randomly assigned to a randomness prime or negativity prime (Kay et al., 2010). The prime consisted of a scrambled sentences task, composed of 16 word sets (each consisting of between four and six words) in both conditions. Participants were presented an example and instructed on how to unscramble the word sets and create proper sentences (words

[1] This is a commonly used manipulation to induce perceptions of disorder; see, for example, Kay et al., 2008. Manipulation check results of Experiments 2, 4, and 5 are provided in Table 3.

Table 1
Ratings of Stage Versus Continuum Theories of Identity Development and Musical Development in Experiment 1

Variable	Stage theory *M*	Stage theory *SD*	Continuum theory *M*	Continuum theory *SD*	Test statistics
Identity development					
Orderly & predictable	4.93	0.83	3.61	1.00	$t(36) = 7.09$, $p < .001$
Credible	4.49	1.61	5.22	1.46	$t(36) = -2.60$, $p = .014$
Musical development					
Orderly & predictable	5.01	0.88	3.42	1.06	$t(36) = 6.37$, $p < .001$
Credible	4.81	1.39	5.51	0.96	$t(36) = -2.57$, $p = .015$

Note. All scores on 7-point scales.

should form a meaningful sentence; one word of each set being redundant). In the randomness condition, eight words of the total set were related to randomness (e.g., *disorder*, *chaos*). In the negativity condition, eight words were negative (e.g., *filthy*, *disgusting*).[2]

Next, after a brief introduction, two theories were presented. The stage theory described Alzheimer's disease progressing via five stages, from very mild to severe cognitive deterioration. This theory thus described a straightforward process of decline. The description of the continuum theory emphasized that there is no evidence for clearly discernible stages that occur in a fixed order and that there are large individual differences pertaining to the severity of the symptoms. Thus, the process takes place at different speeds and in different ways across individuals (depending on complex interactions of different predictors, from dietary pattern to genetic and social factors). It is important to note that the continuum theory description contained the hopeful possibility of living in relative health for a considerable number of years after being diagnosed. Both descriptions were based on Reisberg et al. (2003). Participants were asked to select the theory that provided the best explanation of the process of Alzheimer's disease.

Results and Discussion

Participants primed with randomness were more likely to choose the stage theory than those primed with negativity, $\chi^2(1) = 4.36$, $p = .037$, Cramer's $V = .32$. In the randomness condition, 46% of the participants preferred the stage theory over the continuum theory, whereas this was only 16% in the negativity condition. This finding corroborates the results of Experiment 2 and indicates that people seek order and predictability when threatened, even when the predictable outcome is negatively valenced and the alternative might have less negative, yet less predictable outcomes.

Table 2
Percentage of Participants Preferring a Stage Theory (ST) Over a Continuum Theory (CT) as a Function of Threat in Experiments 2, 3, and 4

Variable	Control-threat condition (%) ST	Control-threat condition (%) CT	No-threat condition (%) ST	No-threat condition (%) CT
Experiment 2 (grief)	18	82	0	100
Experiment 3 (dementia)	46	54	16	84
Experiment 4 (moral development)	48	52	18	82

Note. In Experiments 2 and 3, *p*s $< .05$; in Experiment 4, $p = .053$.

In Experiment 4, we aimed to replicate the results of Experiments 2 and 3 employing yet another set of theories. Moreover, this experiment focused on the underlying motivational process and our assumption that threat increases preference for stage theories because of the need to thwart perceptions of randomness and affirm order. To test this idea, we included a modified version of the snowy pictures task (Whitson & Galinsky, 2008; original by Ekstrom, French, Harman, & Derman, 1976). This task has been used to show that lacking control triggers illusory pattern perception, which functions as a compensatory control mechanism by imposing structure on the world (Whitson & Galinsky, 2008). If preference for stage theories is born out of the need to perceive order, then illusory pattern perception should mediate the effect of threat on theory preference.

Experiment 4

Method

Participants. Undergraduate students ($N = 38$; 23 females; M_{age} 21 years) participated in exchange for course credit.

Procedure. As in Experiment 2, participants were assigned to a control-threat or no-threat condition. Procedure and measures were identical, except for the inclusion of the modified snowy pictures task (consisting of 12 grainy embedded images and 12 nonimages; Whitson & Galinsky, 2008), which was presented after the manipulation checks. The stimuli were presented in mixed order, and participants were asked to indicate if they saw an image and subsequently describe what the image was. Illusory pattern perception was defined by adding the number of occasions participants reported an image where none existed. Next, descriptions of

[2] An example word set in the randomness condition is *orange at he random chose*. See Kay et al. (2010) for the full set of stimuli in English (the current research employed a Dutch translation of the stimuli).

Table 3
Manipulation Checks of the Control-Threat Manipulations Employed in Experiments 2, 4, and 5

Variable	No-threat condition		Threat condition		Neutral		Test statistics
	M	*SD*	*M*	*SD*	*M*	*SD*	
Experiment 2							
Control over situation	6.08	0.86	2.03	1.22			$F(1, 58) = 201.67$, $p < .001$, $\eta_p^2 = .78$
Aversiveness situation	5.72	0.79	6.03	1.14			$F(1, 58) = 1.36$, $p = .25$
Generalized control	5.26	0.71	4.65	1.05			$F(1, 58) = 6.38$, $p = .014$, $\eta_p^2 = .10$
Experiment 4[a]							
Control over situation	5.59	1.28	1.67	0.80			$F(1, 37) = 134.11$, $p < .001$, $\eta_p^2 = .79$
Aversiveness situation	5.65	0.86	6.29	1.06			$F(1, 37) = 3.83$, $p = .058$, $\eta_p^2 = .10$
Generalized control	5.24	1.02	4.67	0.89			$F(1, 37) = 3.39$, $p = .074$, $\eta_p^2 = .09$
Experiment 5							
Control over situation	5.70	0.87	1.58	0.81			$F(1, 57) = 350.66$, $p < .001$, $\eta_p^2 = .86$
Aversiveness situation	6.00	0.92	6.45	0.89			$F(1, 57) = 3.61$, $p = .063$, $\eta_p^2 = .06$
Generalized control[b]	5.06	1.03	4.60	1.21	5.35	0.93	$F(2, 81) = 3.49$, $p = .035$, $\eta_p^2 = .08$; $t(79) = 2.49$, $p = .015$[c]

[a] In Experiment 4, the effect of control threat on generalized feelings of control was marginally significant. Unexpectedly, threatened participants also rated the retrieved situation as somewhat more aversive than control participants did. Controlling for aversiveness by entering it as a covariate in the analysis of variance, however, rendered the effect of the manipulation on generalized feelings of control significant, $F(1, 37) = 4.37$, $p = .044$, $\eta_p^2 = .11$. [b] In Experiment 5, we also included a neutral third condition. The manipulation check of control over and aversiveness of the situation was not included in that condition, but two items measuring generalized control were included in all conditions. [c] A priori contrast analysis comparing threat (−2) with no-threat (1) and neutral (1) conditions.

two theories on moral development were presented. The stage theory was Kohlberg's (1958) theory of moral development (describing a fixed sequence of stages, resulting in an end stage of universal ethical principles). The alternative theory was based on Tavris' (as cited by Shermer, 2008) critique on Kohlberg's stage theory, which argues that moral development is different for each individual and should be regarded as a continuum rather than a series of stages. Participants indicated their preference and also indicated, on a 7-point scale, how strongly they endorsed their choice, from 1 (*not at all*) to 7 (*very much*).[3] The experiment ended with demographic measures, after which participants were thanked and dismissed.

Results and Discussion

Threatened participants more often chose the stage theory than did control participants, $\chi^2(1) = 3.75$, $p = .053$, Cramer's $V = .31$ (see Table 2). Moreover, threatened participants perceived more illusory patterns ($M = 4.38$, $SD = 3.63$) than control participants ($M = 2.18$, $SD = 2.10$), $F(1, 37) = 4.93$, $p = .033$, $\eta_p^2 = .12$. To further investigate the role of need for order in the effects of threat on theory preference, we conducted a mediation analysis. First, we transformed theory preference into a continuous variable by multiplying it with strength of endorsement. Next, we performed a bootstrapping analysis (Preacher & Hayes, 2004) with threat as predictor, theory preference (continuous) as dependent variable, and illusory pattern perception as mediator. A bootstrapping analysis of 5,000 samples confirmed mediation by illusory pattern perception, $p < .05$ (a point estimate of −1.14 was yielded, with a 95% confidence interval from −2.95 to −0.076, thus not crossing zero).

Replicating Experiments 2 and 3, this experiment shows that threat increases stage theory preference, this time in the realm of moral development, as well as illusory pattern perception (Whitson & Galinsky, 2008). Of particular interest to the current research is the finding that, as shown by mediation analysis, stage theory preference was enhanced because of the motivated search for order.

Experiment 5

We conducted a final experiment with three alterations: First, to be certain that control-threat drives the effects on theory preference, we added a neutral condition to the control-threat versus no-threat design used in Experiments 2 and 4.[4] Second, we slightly changed the way in which the theories were presented, such that both the stage and continuum theory were presented by first describing the various stages (see Experiment 1).[5] Third, to shed more light on which aspect of stage theories it is that increases their appeal when order is threatened, we manipulated two distinct characteristics of stage theories: order versus length of the stages. We employed the same sets of theories as in Experiments 3 and 4: two theories on moral development that now only differed in terms

[3] This allows us to compute a continuous theory preference variable, which makes it possible to test for mediation with theory preference as dependent variable.

[4] In the no-threat condition participants recalled a situation over which they had control and envisioned a controllable future. In the neutral condition, we avoided any reference to the concept of control altogether. Here, participants described their living room and subsequently listed three pieces of furniture they owned.

[5] Thus, the way the two theories (stage and continuum) were presented was identical and only differed with respect to a last paragraph of text in which order or length of the stages was manipulated. See the online supplement for the materials.

Table 4
Effects of Control Threat on Theory Preference in Experiment 5

Variable	Control threat ($N = 31$)	No threat ($N = 27$)	Neutral ($N = 24$)	Test statistics
Moral development				
Stage over continuum (order)	32%	4%	13%	$\chi^2(2) = 8.81$, $p = .012$, Cramer's $V = .33$
Preference × Strength of Endorsement	1.74 $(5.08)_a$	4.56 $(2.29)_b$	3.88 $(3.46)_b$	$F(2, 81) = 4.19$, $p = .019$, $\eta_p^2 = .10$
Alzheimer's disease				
Stage over continuum (length)	26%	19%	8%	$\chi^2(2) = 2.77$, $p = .25$, Cramer's $V = .18$
Preference × Strength of Endorsement	2.32 $(4.78)_a$	3.70 $(3.73)_a$	4.29 $(3.16)_a$	$F(2, 81) = 1.77$, $p = .18$, $\eta_p^2 = .04$

Note. Preference × Strength of Endorsement scores were calculated by recoding preference to −1 (stage theory) and 1 (continuum theory), multiplied by strength of endorsement of the choice. Thus, scores could range from −7 (strongest possible preference for the stage theory) to 7 (strongest possible preference for the continuum theory). Standard deviations are in parentheses. Different subscripts within relevant rows indicate significant differences as indicated by least significant difference post hoc tests.

of the *order* of the stages and two theories on Alzheimer's disease that now only differed in terms of the *length* of the stages.[6] This enabled us to determine which aspect of stage theories particularly contributes to their appeal.

Method

Participants. Eighty-two undergraduates (61 females; M_{age} 21 years) participated in exchange for course credit or money.

Procedure. Participants were randomly assigned to a control-threat, no-threat, or neutral condition. Those in the neutral condition were asked to describe their living room. After the manipulation checks (see Table 3), participants indicated their preference for the theories (and, as in Experiment 4, rated on a 7-point scale how strongly they endorsed their choice) and filled out demographic measures.

Results and Discussion

As can be seen in Table 4, we replicated the results of the earlier experiments for the theories of moral development, where the order of stages (fixed or not) was manipulated. However, we did *not* find these effects when only the length of the stages was manipulated: there was no effect of control-threat on theory preference in the domain of Alzheimer's disease.

Experiment 5 thus extends the findings of the previous experiments in two ways. First, we added a third neutral condition and showed that threatening control drives the effects (there were no differences between no-threat and neutral conditions on the manipulation checks and the dependent variables). Second, we found that control-threat enhances preference for stage theories only when the crucial difference between stage- and continuum theories lies in the extent to which the order of the stages is fixed. Predictability regarding length of the stages does not increase stage theories' appeal.

General Discussion

Five experiments provided experimental evidence for our hypothesis that stage theories gain attractiveness when perceptions of order are threatened. Employing different sets of theories, the present findings consistently show that threat enhances preference for the theory that describes an orderly sequence of stages. This effect presumably occurs because stage theories are perceived as more orderly and predictable (Experiment 1). Indeed, the effect is mediated by motivated perception of order (Experiment 4) and depends on whether or not the stage theory describes a fixed order in which the respective stages unfold (Experiment 5). Moreover, this effect is also found when the stage theory provides negative predictability (Experiment 3) and despite the fact that stage theories are perceived to be less credible (Experiment 1).

The current findings converge with those of both Kay et al. (2008; Kay et al., 2010) and Whitson and Galinsky (2008), who argued that randomness and threats to personal control trigger the motivation to restore order. The results of Experiment 4 provide direct evidence that the motivated search for order underlies the effects of threat on compensatory preferences. This finding adds to the work of Kay and colleagues on motivational mechanisms underlying threat compensation and compensatory beliefs in, for example, a controlling God or political system. The current research contributes to these findings by showing that threat triggers the motivation to perceive order (i.e., illusory pattern perception), which accounts for the observed compensatory preference shifts (i.e., increased preference for stage theories). The fact that participants in Experiment 3 preferred negative predictability over an alternative that was both more unpredictable and possibly more hopeful further attests to the powerful motivation to perceive order. Thus, when people experience the need to combat perceptions of randomness, it seems that they prefer "the devil they know."

Stage theories are ubiquitous in various sciences. Although the intention of this article is not to participate in the debate on the adequacy of these theories to explain and predict human behavior and life outcomes, we argue that part of their appeal lies in their ability to provide a sense of order. When randomness lurks, stage theories provide us with the means to let order and predictability prevail over chaos and uncertainty.

[6] In the last paragraph of the text, it was described that (for moral development) the order of stages is fixed for the majority of people (or not) or that (for Alzheimer's disease) the length of the stages is equal for the majority of people (or not).

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Received September 14, 2011
Revision received April 18, 2012
Accepted April 23, 2012 ■