Research Article

The Case of the Transmogrifying Experimenter

Affirmation of a Moral Schema Following Implicit Change Detection

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ABSTRACT—*The meaning-maintenance model posits that threats to schemas lead people to affirm unrelated schemas. In two studies testing this hypothesis, participants who were presented with a perceptual anomaly (viz., the experimenter was switched without participants consciously noticing) demonstrated greater affirmation of moral beliefs compared with participants in a control condition. Another study investigated whether the schema affirmation was prompted by unconscious arousal. Participants witnessed the changing experimenter and then consumed a placebo. Those who were informed that the placebo caused side effects of arousal did not show the moral-belief affirmation observed in the previous studies, as they misattributed their arousal to the placebo. In contrast, those who were not informed of such side effects demonstrated moral-belief affirmation. The results demonstrate the functional interchangeability of different meaning frameworks, and highlight the role of unconscious arousal in prompting people to seek alternative schemas in the face of a meaning threat.*

In 1962, philosopher Thomas Kuhn published *The Structure of Scientific Revolutions*, a hugely influential treatise on the nature of scientific progress. Kuhn's central claim was that scientific endeavors are motivated not by a quest for truth per se, but rather by a general psychological impulse to construct coherent theoretical frameworks, or *paradigms*. To make his case, Kuhn turned to a psychological experiment conducted by Bruner and Postman (1949). Bruner and Postman had hypothesized that

visual perceptions are made coherent on the basis of implicit mental frameworks—paradigms—that may sometimes lead people to misperceive sensory experiences. Specifically, Bruner and Postman believed that participants who were presented playing cards with anomalous features (e.g., a black 4 of hearts) would not initially "see" those features. This is because participants would implicitly organize the sensory information according to the expected features of their preexisting playing-card paradigm (e.g., the black 4 of hearts is "seen" as a spade). As Bruner and Postman had hypothesized, most participants did not initially notice the anomalous features of the cards, instead perceiving the features as if they were in accordance with the participants' expectations. Curiously, some participants experienced "acute personal distress" (Kuhn, 1962/1996, p. 63) before they were able to explicitly detect the cards' anomalous features.

Kuhn understood Bruner and Postman's findings as pointing to a common psychological mechanism underlying the maintenance of *all* paradigms, whether they organize perceptions of playing cards or theories of particle physics. This insight provides the basis for the meaning-maintenance model (Heine, Proulx, & Vohs, 2006; Proulx & Heine, 2006), which posits a domain-general psychological mechanism for people's response to the violation of schemas. This model raises several important new questions about the perception of anomalies: Can people implicitly notice violations of perceptual schemas, even if they maintain no explicit awareness of such anomalies? Does an awareness of violated schemas produce arousal, and does this arousal motivate subsequent efforts to maintain meaning? Finally, does a common mode of arousal underlie meaning-maintenance efforts provoked by any kind of anomaly?

THE MEANING-MAINTENANCE MODEL

Human beings naturally abstract and construct mental representations of expected relations—meaning frameworks—that

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serve a broad array of domain-specific adaptive functions. For example, implicit schemas focus attention and allow for the encoding and retrieval of subsequent experiences (Wyer, Bodenhausen, & Srull, 1984), and scripts provide a basis for predicting and controlling one's environments (Baumeister, 1991; Lerner, 1980). Worldviews help people cope with tragedy (Vallacher & Wegner, 1987) and maintain self-esteem (Major, Kaiser, O'Brien, & McCoy, 2007), aid in the formation of culture (Tomasello, Kruger, & Ratner, 1993), and allow individuals to symbolically cheat death by adhering to the enduring values that cultures provide (Pyszczynski, Greenberg, & Solomon, 1997). When any such framework is threatened by contradictory beliefs or experiences, people naturally engage in behaviors aimed at ameliorating these threats. Piaget (1960) argued that threats to existing schemas evoke a feeling of disequilibrium, and that efforts to regain equilibrium constitute the superordinate motivation underlying cognitive development. Similarly, Festinger (1957) framed many social judgments as efforts toward dissonance reduction following behavior-belief contradictions. More generally, a domain-general meaning-making impulse—whether it is construed as a need for coherence (Antonovsky, 1979) or a need for cognitive closure (Kruglanski & Webster, 1996)—may underlie a host of domain-specific psychological phenomena.

The meaning-maintenance model expands the scope of these theories by proposing that whenever an individual's mental representations of expected associations (e.g., scripts, schemas, paradigms) are violated by unexpected experiences, this provokes an effort to regain a sense of meaning. Following from Piaget (1960) and Kuhn (1962/1996), most meaning-maintenance accounts propose that people deal with meaning violations in one of two familiar ways: accommodation or assimilation. Thus, it is argued that when people have an experience that does not make sense, they will either accommodate their meaning framework to include the unusual experience (e.g., "Bad things happening to good people? I guess it's not a 'just world' after all.") or assimilate the experience such that it no longer appears to violate their meaning framework (e.g., "I did that boring job for no reward? The job must have *actually* been fun and interesting."). Although over the long term people will primarily seek more lasting meaning through accommodation or assimilation, the meaning-maintenance model proposes that in the short term, or in instances when people are not consciously aware of a meaning threat, they will deal with meaning violations by means of a third mechanism: In the face of meaninglessness, people may affirm alternative meaning frameworks to restore the general feeling that their experiences make sense. We term this mechanism *fluid compensation* (cf. McGregor, Zanna, Holmes, & Spencer, 2001; Steele, 1988).

The meaning-maintenance model posits that the schemas people affirm in meaning-maintenance efforts may be *functionally interchangeable* with one another, such that affirming one schema (e.g., the self-concept) may be satisfying when an entirely separate schema is violated (e.g., a perceptual schema), even though these schemas may differ in content, function, or conscious activation (i.e., explicit vs. implicit activation). Various manipulations have demonstrated the substitutability of schemas in efforts toward fluid compensation following a given meaning threat. For example, in a number of studies, we asked participants to discuss feelings of personal alienation, fill out a rigged questionnaire suggesting that one's life is pointless (Heine, Proulx, MacKay, & Charles, 2008), consider dissonant aspects of their self-concept (Proulx, Chandler, & Hansen, 2008), read examples of absurdist literature, or evaluate surrealist art (Proulx, Heine, & Vohs, 2008). Following these meaning threats, participants were given the opportunity to affirm unrelated elements of their cultural worldview (e.g., by punishing a lawbreaker or criticizing someone who insulted their country; Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989). In each case, participants who had experienced the meaning threat demonstrated greater affirmation of their worldview than did participants in a control condition. These findings are in keeping with a growing body of work showing that people will affirm alternative frameworks following meaning threats, such as imagining that their home has been burglarized (Navarrete, Kurzban, Fessler, & Kirkpatrick, 2004), perceiving a temporal discontinuity (McGregor et al., 2001), feeling uncertain (Hogg & Mullin, 1999), imagining dust mites burrowing into their skin (Burris & Rempel, 2004), or being reminded of their own mortality (Greenberg, Porteus, Simon, & Pyszczynski, 1995; we note, however, that these other findings were not discussed in terms of meaning threats in the original published reports).

The specific aims of the following experiments were threefold: In Studies 1a and 1b, we wished to demonstrate the radical substitutability of one meaning framework for another following a meaning threat. We attempted to elicit the affirmation of one kind of schema (i.e., an explicitly held moral belief) following a threat to a completely different kind of schema (i.e., an implicitly perceived visual anomaly). We also aimed to demonstrate that compensatory affirmation following an implicitly perceived visual anomaly is commensurate with affirmation following an explicit meaning threat (i.e., reminders of one's mortality). According to terror management theory, people affirm other meaning systems when reminded of death; in particular, people become more punitive toward lawbreakers following a mortality-salience prime (Rosenblatt et al., 1989). We expected that a meaning disruption other than death would provoke identical compensatory affirmation efforts.

Second, we aimed to provide evidence that individuals are capable of implicitly detecting a visual anomaly even if they have no explicit awareness of the anomaly. In numerous change-blindness experiments involving real-world change-detection paradigms (e.g., Levin, Simons, Angelone, & Chabris, 2002; Simons & Levin, 1998), many participants have not reported any conscious perception of a change in the confederate with whom

they are interacting. A number of studies using the flicker paradigm (Rensink, 2000) have suggested that individuals may nevertheless implicitly perceive and compare representations of changing images (Fernandez-Duque & Thornton, 2003; Laloyaux, Destrebecqz, & Cleeremans, 2006, in press; Rensink, 2004), although some researchers have questioned this conclusion (Mitroff, Simons, & Franconeri, 2002). No studies, however, have provided evidence for the implicit perception of changes occurring during real-world interactions. We reasoned that if participants' attitudes toward a lawbreaker became more punitive following a surreptitious experimenter switch (because of a felt need to affirm the generally held moral schema that people must uphold the law), this would suggest that the visual anomaly was implicitly noticed and had provoked fluid-compensation efforts.

Third, we wished to explore the cognitive and affective processes that underlie efforts to affirm alternative meaning frameworks. Bruner and Postman (1949) had noted emotional arousal in many of their participants who could not consciously identify the anomalous playing cards. Piaget (1960) and Festinger (1957) both described arousal ("disequilibrium" and "dissonance," respectively) that was evoked by anomalous experiences. In Study 2, we investigated whether arousal was evoked by a meaning threat, and whether this arousal was implicated in subsequent meaning-maintenance efforts.

STUDIES 1A AND 1B

Method

Study 1a

Participants in Study 1a were 81 Canadian-born psychology undergraduates (53 females and 28 males; mean age = 19.49 years, SD = 2.80). In all conditions, participants entered the lab, were greeted by an experimenter, and were then randomly assigned to one of three experimental conditions. In the *control* condition, participants answered questions about their entertainment preferences (the same control questions used in many terror management studies; e.g., Greenberg et al., 1995). In the *changing-experimenter* condition, while participants answered these questions about entertainment, the female research assistant conducting the experiment was surreptitiously switched with another, identically dressed female experimenter (see Fig. 1). The first experimenter went to a filing cabinet to retrieve the next questionnaire, and after opening the filing cabinet, she stepped back and was replaced by the second experimenter, who shut the cabinet and continued the experiment (a video of the change can be viewed on the Web at http://www.psych.ubc.ca/~heine/MMMSwitch.wmv). In the *mortality-salience* condition, participants completed a standard mortality-salience manipulation by answering two questions about their own death (e.g., Rosenblatt et al., 1989). Previous studies have demonstrated that reminding participants of their eventual death

Fig. 1. The first experimenter from Study 1a and the experimenter who surreptitiously replaced her.

provokes compensatory affirmation of alternative meaning frameworks (Greenberg et al., 1995). We included this mortality-salience condition to compare its results with those of our changing-experimenter condition.

Participants were administered the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) to assess their explicit affect. They then read a hypothetical report about the arrest of a prostitute and were asked to set a bond for the prostitute as if they were a judge reviewing the case. The rationale for this latter measure is that people are motivated to maintain their cultural worldview and will seek to punish individuals who act in ways that are inconsistent with that worldview. This dependent measure has been used in a number of terror management and meaning-maintenance studies (e.g., Heine et al., 2008; Rosenblatt et al., 1989). Next, participants completed a demographics questionnaire. To determine whether participants in the changing-experimenter condition had noticed the experimenter change, we debriefed them by means of a short interview modeled after the method of Levin et al. (2002).

Study 1b

Participants in Study 1b were 46 Canadian-born psychology undergraduates (34 females and 12 males; mean age = 20.45 years, SD = 3.89). Study 1b was identical to Study 1a except that the gender of the experimenters was male, and there was no mortality-salience condition. To rule out the possible role of death-related thoughts in producing fluid compensation in the changing-experimenter condition (Schimel, Hayes, Williams, & Jahrig, 2007), we included a word-fragment task to determine if death-related thoughts were made accessible by the switch in experimenters. After completing the PANAS, participants were presented with a series of 20 word fragments (e.g., "coff_ _") from Schimel et al. (2007) and asked to complete the words. Six of these word fragments could be completed with death-related words (*buried*, *dead*, *grave*, *killed*, *skull*, and *coffin*) or neutral words (e.g., *coffee*). The remaining 14 word fragments could be completed only with neutral words (e.g., "tr_cks" could be

completed with *tricks* or *tracks*). Previous studies have reliably demonstrated the ability of this task to determine the elevated accessibility of death-related thoughts, as participants have produced more death-related words following mortality-salience primes than in control conditions (e.g., Greenberg, Pyszczynski, Solomon, Simon, & Breus, 1994). If the changing-experimenter condition similarly evoked death-related thoughts, participants in that condition should have produced more death-related words than those in the control condition.

Results

Across both studies, only 5 participants (10%) in the changing-experimenter conditions reported noticing that the experimenters had switched. These participants were not included in the following analyses. Gender was included as a factor in the analyses, but there were no significant main effects for gender, nor any significant gender-by-condition interactions.

In Study 1a, condition had a significant main effect on the amount of the bond set for the prostitute, $F(2, 74) = 4.49$, $p < .02$, $\eta^2 = .11$. A planned comparison (with assigned weights of 1, 1, and −2) showed that participants in the changing-experimenter and mortality-salience conditions set a higher bond than did participants in the control condition, $t(78) = 2.98$, $p < .01$, $d = 0.70$. Bond amounts in the changing-experimenter and mortality-salience conditions did not differ significantly ($p = .45$; see Fig. 2). The mean bond amounts are similar to those in other studies using this dependent measure and other manipulations of meaning threat (e.g., Heine et al., 2008; Proulx, Chandler, & Hanson, 2008; Proulx, Heine, & Vohs, 2008). Participants' scores on the Positive Affect subscale of the PANAS did not differ across conditions, $F < 1$. However, there was a significant difference in participants' scores on the Negative Affect subscale, $F(2, 74) = 3.17$, $p < .05$; participants in the

mortality-salience condition ($M = 18.4$) reported greater negative affect than those in the control and changing-experimenter conditions ($Ms = 16.1$ and 15.7, respectively). This last finding may be anomalous, as published studies of terror management theory typically have not reported elevated scores on either subscale of the PANAS in mortality-salience conditions (e.g., Greenberg et al., 1995).

In Study 1b, participants in the changing-experimenter condition set a higher bond for the prostitute than did participants in the control condition, $F(1, 38) = 8.48$, $p < .01$, $\eta^2 = .19$ (see Fig. 2). Participants' Positive Affect and Negative Affect scores on the PANAS did not differ significantly between conditions, both $Fs < 1$, nor did the mean number of death-related words completed in the word-fragment task (control condition: $M = 1.19$, $SD = 1.03$; changing-experimenter condition: $M = 1.04$, $SD = 0.97$), $F < 1$.

Discussion

As we had hypothesized, relative to participants in the control condition, participants who experienced the change in experimenters and did not notice it consciously were more punitive in their bond judgments. The findings from the changing-experimenter condition closely paralleled those obtained in the mortality-salience condition. In Study 1b, there was no evidence that compensatory affirmation observed in the changing-experimenter condition followed from an increase in death-related thoughts (although a more sensitive measure conceivably might show such an increase). We posit two general conclusions from these findings.

First, although most participants in our study did not report an awareness of the change in experimenters, our findings indicate that participants were nonetheless affected by what they did not explicitly perceive, suggesting that they perceived the change
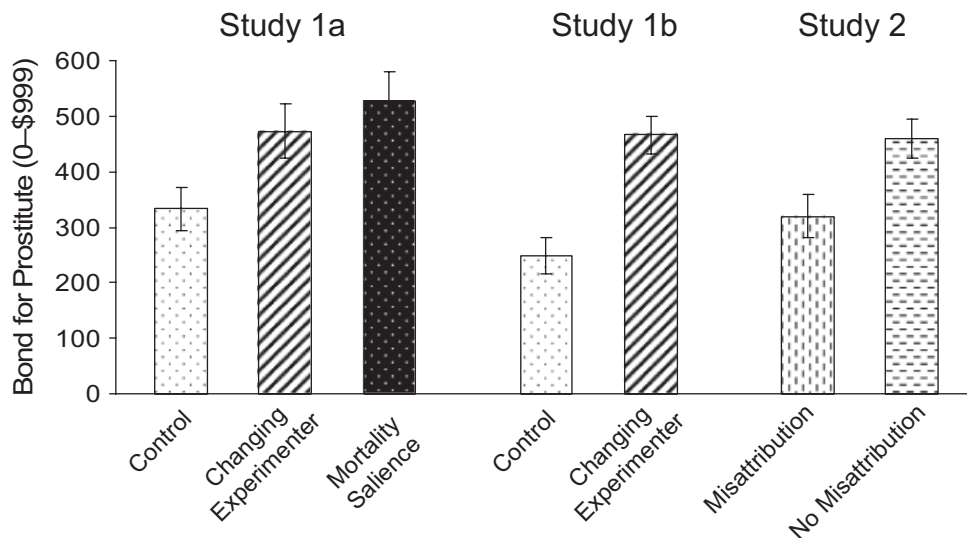

Fig. 2. Bond assigned by participants in Studies 1a, 1b, and 2, as a function of condition.

implicitly. Our interview debriefing presented many opportunities for participants to report consciously noticing the change (e.g., "Did you notice anything odd about the experimenter?" "Did you notice anything different about the experimenter?"). It should be noted that most participants appeared genuinely flabbergasted when, at the conclusion of the experiment, we informed them of the change. Also, of those participants who noted the change, the majority spontaneously reported the change immediately and called our bluff. Unlike previous studies demonstrating implicit change perception in a flicker paradigm (e.g., Rensink, 2004), our study demonstrates such perception in a real-world interaction.

Second, the increased punitiveness toward the lawbreaker in the changing-experimenter and mortality-salience conditions relative to the control condition is consistent with the meaning-maintenance model; people respond to threats to their meaning frameworks by affirming alternative frameworks. Moreover, in the changing-experimenter condition, the schema disruption (i.e., implicit perception of the changing experimenter) and the schema that was subsequently affirmed (i.e., punishment of a lawbreaker) were maximally unrelated. This suggests that schemas are functionally interchangeable with one another in efforts toward compensatory affirmation following a meaning threat. It appears that whatever meaning-maintenance mechanism applies to implicit perceptual schemas also applies to explicit moral schemas.

Nevertheless, participants in Studies 1a and 1b failed to report any emotional distress in response to the changing experimenter. This is not surprising, as it is rare for meaning threats elicited by reminders of one's own mortality (Rosenblatt et al., 1989) or by cognitive dissonance manipulations (Zanna & Cooper, 1974) to elicit directly measurable emotional arousal. It was for this very reason that Zanna and Cooper (1974) employed indirect means to determine the presence of arousal following a dissonance manipulation. By means of a "misattribution of arousal" experimental paradigm, (Schachter & Singer, 1962), Zanna and Cooper found that dissonance-reduction efforts could be extinguished if participants were given the opportunity to attribute any dissonance arousal they may have been experiencing—consciously or unconsciously—to a placebo pill. We conducted Study 2 with the aim of determining whether fluid-compensation efforts could be similarly extinguished if we gave participants an arousal placebo following the change in experimenters. Such findings would demonstrate the role of arousal in fluid-compensation efforts, and would provide further evidence suggesting that all meaning-maintenance efforts share a common cognitive-affective mechanism.

STUDY 2

Method

Participants were 52 Canadian-born psychology undergraduates (38 females and 14 males; mean age = 20.39 years, SD =

1.88). Participants entered the lab and were greeted by an experimenter, who informed them that they would be drinking "Salin," an herbal extract that may improve long-term memory recall. They were then randomly assigned to one of two conditions. In the *no-misattribution* condition, participants read a brochure informing them that Salin has no known side effects. In the *misattribution* condition, participants read a brochure informing them that Salin has the common side effect of mild arousal or anxiety (see Zanna & Cooper, 1974). All participants then observed the experimenter put drops of Salin (actually, food coloring) into a glass of iced tea that the participants drank. They were subsequently asked to complete a test of long-term memory that required them to write down as many brand names of cars as they could recall in 5 min. While they were completing this recollection task, the two experimenters from Study 1b were switched in the same manner as before.

As in Studies 1a and 1b, participants completed the PANAS and the prostitute-bond dependent measure. Next, they completed a demographics questionnaire and a manipulation check that asked them to report how anxious they felt, on a scale from 1 to 9. They were then debriefed.

Results

Three participants (6%) noticed the experimenter switch and were not included in the analyses.[1] Gender was included as a factor in all analyses, but had no significant effects on any of the measures. Participants in the misattribution condition set a significantly lower bond for the prostitute than did participants in the no-misattribution condition, $F(1, 45) = 4.85, p < .05, \eta^2 = .10$ (see Fig. 2). PANAS scores for positive affect and for negative affect did not differ significantly between conditions, both Fs < 1. Analyses of the manipulation check revealed that participants in the misattribution condition reported higher anxiety ($M = 4.40$, $SD = 2.34$) than did participants in the no-misattribution condition ($M = 3.08$, $SD = 2.36$), $F(1, 45) = 6.07, p < .02$, $\eta^2 = .12$. The conditions did not differ in the mean number of car brands participants could recall, $F < 1$.

Discussion

As hypothesized, participants were less punitive in their bond judgments if they were given the opportunity to misattribute their arousal to an alternative source than if they were not given such an opportunity. The bond set by participants in the misattribution condition was commensurate with the bond set in the control conditions of Studies 1a and 1b.

Given that the effect of the meaning threat was significantly reduced when participants in the misattribution condition were

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[1]We note that, across the studies, the percentage of participants who noticed the switch (8%) is lower than the percentage in previous studies that explored switched real-world confederates (e.g., 25% in Levin et al., 2002). We suspect that this is because our participants were occupied with questionnaires at the time of the switch, and because our experimenters were dressed identically.

able to misattribute their arousal to the "effect" of Salin, it can be inferred that unattributed arousal motivated meaning-maintenance efforts following the meaning threat in the no-misattribution condition.

The results of Study 2 mirror the findings of the original misattribution-of-arousal dissonance studies. They strongly suggest that the arousal underlying dissonance reduction is the same arousal underlying meaning-maintenance efforts in the face of a perceptual anomaly. Indeed, the meaning-maintenance model maintains that dissonance-reduction efforts constitute a domain-specific instantiation of a domain-general meaning-maintenance mechanism (Heine et al., 2006; Proulx & Heine, 2006).

GENERAL DISCUSSION

In later years, Postman confessed that his anomalous playing cards still made him feel "acutely uncomfortable" (Kuhn, 1962/1996, p. 64). Kuhn understood those cards, the discomfort they aroused, and the cognitive processes they initiated as constituting "a wonderfully simple and cogent schema for the process of scientific discovery" (p. 64). Kuhn argued that scientists initially react to the distress aroused by paradigm-incongruent observations in one of two ways: Either the anomalous observation is assimilated such that it no longer appears to contradict the existing scientific paradigm, or the scientific paradigm is accommodated to include the anomalous observation. The meaning-maintenance model proposes a third response to situations in which a schema is threatened and arousal is evoked: In the face of an anomaly, people may affirm unrelated but available schemas.

The findings from these studies provide support for two essential premises of the meaning-maintenance model and are not predicted by any other psychological theories (but see McGregor, 2006). First, people will respond to the violation of one meaning framework by affirming another. Meaning frameworks appear to be functionally interchangeable with one another, such that the affirmed schema need not bear any relation to the schema that was violated. Second, the meaning-maintenance model hypothesizes that all fluid-compensation efforts are initiated by a common affective motivator. As is the case with cognitive dissonance, fluid-compensation efforts following the switch in experimenters were significantly reduced if participants could misattribute the arousal to an alternative source. This demonstrates that arousal plays a role in meaning-maintenance effects. Of course, neither of these findings would have been obtained if participants had not implicitly detected the change in the experimenter.

Taken together, these studies significantly broaden the scope of what can be considered "meaning" in the cognitive and social psychological literatures, as they demonstrate a broad functional interchangeability of schemas in meaning-maintenance efforts. According to the meaning-maintenance model, meaning

threats outlined by cognitive dissonance theory (Festinger, 1957), system-justification theory (Jost, Banaji, & Nosek, 2004), social-identity theory (Hogg & Mullin, 1999), self-affirmation theory (Steele, 1988), worldview-verification theory (Major et al., 2007), and terror management theory (Greenberg et al., 1995) should be interchangeable in evoking efforts toward compensatory affirmation of alternative schemas. Future studies must determine what limits, if any, constrain the kinds of schemas that may be affirmed following a given threat to meaning.

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