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Opening the Creative Mind of High Need for Cognitive Closure Individuals through Activation of Uncreative Ideas

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Drawing on the integrative system theory of creativity combining the person, process, and press perspectives, this research offers the first evidence of how high-need-for-cognitive-closure (NFC) individuals' creative mind can be opened up, by making them become more cognizant of uncreative ideas as consensually invalid solutions to creative problems. A validation study was conducted to first establish the utility of a newly developed chocolate design task. In the second study, half of the participants were made aware of conventional chocolate designs by drawing these designs before generating a revolutionized design of chocolate; the other half did not have to draw out the conventional designs first. Results confirmed that, given the opportunity to cognize uncreative solutions, high-NFC participants who had a higher creative ideation potential became the most creative. Their low-NFC counterparts, however, did not seem to benefit from the trigger of uncreative solutions. The implication that holding onto a chronic motive to attain cognitive closure or epistemic certainty is not necessarily detrimental to creative performance was discussed.

Minds are like parachutes—they function only when open.—(James Dewar: Knowles, 2009)

Creativity is a highly prized skill. Its counterpart, innovation, responsible for overseeing the production and implementation of creative ideas, is often well sought after too. For instance, the US Environmental Protection Agency had earlier called for crowdsourcing of *out-of-the-box* innovative solutions for cleaning up BP's 2010 oil spill in the Gulf of Mexico (United States Environmental Protection Agency, 2011). CEOs of multinational corporations identified creativity as the most crucial factor for dealing with massive global shifts in business models and consumer demands (Tomasco, 2010). Even in daily life, individuals contemplate on what creative fusion dishes to make when hosting a dinner party or how to add creative elements to their living space to create a hint of postmodernism. Undoubtedly,

creativity is a valuable asset. It aids everyday transactions, as well as more global and pressing problems.

In the last 2 decades, the psychological science of creativity research has greatly advanced the field's understanding of creativity, the phenomenon that some people might perceive as mysterious or experience as a magical *aha* moment where sudden creative insight leap into the consciousness. The system theory of creativity studies the notion of creativity as a multifaceted construct, encompassing the person (e.g., creative predispositions), process (e.g., creativity-enhancing cognitive and motivational processes), and press (e.g., situational circumstances that influence creativity) perspectives in its investigations (Horn & Salvendy, 2006; Rhodes, 1961; Richards, 1999). Drawing upon this integrative framework, this article provides the first evidence that a high need for cognitive closure (NFC) is not always creativity dampening, as previous research has found (e.g., Ford & Kruglanski, 1995; Kruglanski & Freund, 1983). To understand the potential facilitative effect of cognitive closure on creativity, this article starts by outlining how the epistemic need for attaining cognitive closure motivates information search and processing for problem solving.

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NFC AND ADHERENCE TO CONVENTIONALIZED NORMS

Conceptualized by Kruglanski (1990), NFC is an epistemic motivational tendency to seize and freeze on ideas that come to mind early and easily. This leads to high-NFC individuals relying more on conventionalized norms and established knowledge, as they can afford a consensually valid interpretive frame to make sense of problems and arrive at firm answers (e.g., Chiu, Morris, Hong, & Menon, 2000; Ford & Kruglanski, 1995; Kruglanski & Freund, 1983). Individuals with high levels of NFC often experience an acute need for epistemic certainty, which is a motivated state to maintain high confidence in their chosen solution or course of action as correct. Once settled with the presumably best solution or action, they are less likely to seek out alternative solutions or entertain diverse perspectives, thereby hampering their creativity. Interestingly, Chirumbolo and colleagues (Chirumbolo, Livi, Mannetti, Pierro, & Kruglanski, 2004; Chirumbolo, Mannetti, Pierro, Areni, & Kruglanski, 2005) reasoned that this lack of exploration of alternative solutions, due to the need to be highly certain at the one best solution, is what restricts a high NFC individual's ideational fluidity,¹ resulting in lower number of ideas generated.

Research evidence speaks to these propositions. In a series of studies, Fu and colleagues (2007) showed that conformity to the familiar cultural norms is an important source of closure provider with high consensual validity, particularly relevant for people high in NFC (see also Chirumbolo et al., 2004; Chirumbolo et al., 2005). In another study, it was found that among both American and Hong Kong Chinese college students, those with higher levels of NFC were less likely to access normatively inaccessible exemplars in a conceptual domain. For example, they were more likely to generate *doctor*, a normatively accessible exemplar for the conceptual domain of occupation, but not a normatively inaccessible exemplar such as *optician* (Ip, Chen, & Chiu, 2006).

Given these findings, it follows that if high-NFC individuals are less open to unfamiliar foreign conventions and normatively inaccessible ideas, they will be less likely to capture the creative benefits by appropriating intellectual resources from other cultural sources. A recent study by Leung and Chiu (2010) tested this hypothesis. To examine how receptive American students, with different degrees of multicultural

experiences, were to foreign ideas, the researchers had them develop an improvised idea about happiness into a creative one by allowing them to sample a limited number of foreign and local happiness-related sayings. Participants, randomly selected, were either put in a high or low time pressure situation when performing the creative expansion task. The high time pressure setting was one that participants were constantly reminded to keep to the time, a standard procedure to temporarily activate a greater NFC; the low time pressure setting imposed no time constraint on completing the task. As predicted, among participants with more multicultural experiences, those who were induced a lower level of NFC under low time pressure were less likely to freeze on familiar local sayings and more likely to recruit foreign sayings to creatively expand the improvised idea. Under high time pressure, however, even individuals with multicultural experiences were unmotivated to seek out foreign ideas to inspire their creativity.

HIGH NFC: ESCHEWING THE INVALID AND SEIZING ON THE VALID CLOSURE PROVIDER

As discussed, widely shared norms and knowledge in one's familiar culture provides people a consensually validated way to approach problems. However, the same set of norms and knowledge might no longer be applicable as a valid closure provider in a foreign cultural context. It is thus reasonable to argue that individuals with higher needs for epistemic closure would be particularly sensitive to, and adhere more to, local conventions when they are navigating in different cultural contexts. In other words, they would readily reorganize their epistemic strategy to seize on a new set of consensually valid knowledge when they are in a foreign culture, even though this set of knowledge schema is deemed consensually invalid in their own culture.

There is general support for this contention. In a series of studies, Kosic, Kruglanski, Pierro, and Mannetti (2004) investigated the acculturation strategies of immigrants in Rome, Italy, and also assessed their individual NFC. The researchers argued that when immigrants first settle in the host country, their initial reference group upon arrival serves as an important closure provider to ease their epistemic uncertainty. For the new immigrants who indicated that their initial reference group was made up of mainly their co-ethnics, those with higher (vs. lower) levels of NFC were more inclined to still adhere to the norms in their native culture and assimilate less slowly to the Italian culture. The reverse was true for the immigrants whose initial reference group was made up of mainly host nationals (i.e., Italians), with those having higher (vs. lower) levels of

¹Although ideational fluidity described here is seemingly similar to ideational fluency, it encompasses more than the ability to generate a large number of ideas. Our understanding of ideational fluidity in Chirumbolo and colleagues (2004) follows that of Slepian and Ambady (2012), where ideational fluidity encompasses flexibility and the flow of creative thoughts.

NFC adhered more strongly to local Italian cultural norms and better integrated into the host country.

Another study by Chao, Zhang, and Chiu (2010) provided further evidence. In the study, European American students were asked to assume the role of a drug store manager handling a health dispute between a pharmacist and a customer in one scenario and assume the role of a department head handling a research authorship dispute between two university professors in another. The conflicts either happened in the United States, where the store manager and department head were currently working, or in China where they had been recently relocated. A pretest established that American students were aware of the differential cultural norms of conflict resolution in American and Chinese contexts, with Americans more likely to seek out diagnostic information for finding out the truth and Chinese more likely to seek out relational information for analyzing possible consequences that impact the intricate relationships among different parties. As expected, high (vs. low) NFC participants were more likely to follow the prescribed norms in the local culture; they tended to seek out more diagnostic information if the conflict took place in the United States and seek out more relational information if the conflict took place in China.

Overall, research findings are suggestive of high-NFC individuals' tendencies to approach problems and to make sense of everyday experience in a consensually valid way that is largely context-dependent. In this light, our research proposes a way to open up the creative mind of high-NFC individuals by making them aware of those uncreative ideas as consensually invalid solutions. Thus, it is hypothesized that if high-NFC individuals are led to cognize uncreative ideas when working on a creative task, they will come to better realize that such uncreative ideas are consensually invalid closure providers to the problem and will, therefore, generate more definite creative answers to attain valid closure to the task. Further, it is hypothesized that this *creative-mind opening* hypothesis will be more pronounced among high-NFC individuals who possess a higher creative predisposition. It is because after bringing into awareness those uncreative solutions, the creative nature of high-NFC individuals might further aid their creative generations.

STUDY 1

Study 1 was a pilot study, with the purpose of validating a newly developed chocolate design task. This task was aimed to provide an easily coded and relatively objective method of measuring creative performance.

Method

Participants

This study was conducted in a university in Singapore. Using the university's subject pool system, 35 undergraduate students (29 women; M age = 20.68, SD = 1.12) were recruited for this study and received course credits. Of the participants, 82.9% were Chinese; the others were Malay (2.9%), Indian (2.9%), Caucasian (2.9%), or mixed races (8.7%). Before the start of the study, participants read and signed the informed consent form.

Procedure and Measures

Participants completed a survey booklet, which contained a creativity task (chocolate design task), the Need for Cognitive Closure Scale, the Openness to Experience Scale, the Runco Ideational Behavior Scale, and a demographics questionnaire.

Chocolate design task. In this creativity task, participants were asked to draw a creative chocolate design. They read the following instruction, which was partly adopted from Vadino's (2006) article:

In light of revolution, chocolate confectioners are starting to move their designs away from traditional chocolate. "Chocolate in Belgium is an icon, like pasta in Italy. But why do we feel obliged by tradition? We must disturb the traditional shapes. We must create new combinations, new ingredients," says Giovanna Massini, a researcher who is leading this chocolate design initiative in Brussels, Belgium. Suppose you are a member of Giovanna's research lab; your task is to revolutionize the design of chocolate.

Participants then drew one new chocolate design in the space provided. The task took approximately 10 min.

Two independent coders, blind to the research purpose, coded the drawings across different design domains. These domains include: (a) the chocolate is of unconventional overall shape (e.g., a microphone shaped chocolate), (b) the presence of unconventional shape within the chocolate itself (e.g., shapes of eyes and nose on the chocolate), (c) the presence of nonchocolate edible ingredients (e.g., chili), (d) the presence of inedible ingredients (e.g., photograph), (e) whether the design implicates unconventional matter states of chocolate (e.g., chewable chocolate), (f) the presence of an additional function the chocolate serves (e.g., a greeting card made out of chocolate), (g) the presence of a filled center (e.g., filled with syrup), and (h) whether there is an elaboration about the filling (e.g., the filling contains milk, caramel, or liquor). A creativity score (ranging from 0 to 8; interrater agreement = .84) was derived by

summing the points scored from each domain, with a higher score representing a chocolate design that deviated more from the conventional design. Coding inconsistencies were identified by domain and a third coder recoded them. These are then settled by taking the domain score that was agreed by two out of the three coders and used to compute the composite score. Notably, this task relied on a relatively objective approach to assess creativity as coders mainly identified the presence or absence of each unconventional attribute.

As a cross-validation of this objectively coded creativity score, after completing the coding of all designs, the coders also judged the overall creativity level of each drawing based on their subjective evaluation on a scale from 1 (*not creative at all*) to 7 (*extremely creative*). Interrater reliability was moderately high ($r = .55$). The two measures of creativity were positively correlated ($r = .64, p = .01$).

Runco ideational behavior scale. To test for convergent validity of the chocolate design task, the creative ideation scale (Runco, Plucker, & Lim, 2001) was used, which describes actual behaviors that clearly reflect an individual's use of, appreciation of, and skill with creative ideas. The scale contains 23 items (e.g., "I often get excited by my own new ideas;" Cronbach's $\alpha = .91$) presented with a 5-point Likert scale, ranging from 1 (*never*) to 5 (*very often*). A positive correlation between ideational creativity and creative performance on the chocolate design task was expected.

Need for cognitive closure scale. As a discriminant validity test of the task, the 8-item *close-mindedness* subscale of the NFC Scale was used (Kruglanski, Webster, & Klem, 1993). A sample item is "I dislike questions which could be answered in many different ways" (Cronbach's $\alpha = .59$) and is answered with a 6-point Likert scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). As it is reasonable to argue that individuals who can come up with a new chocolate design are less likely to be close-minded, it was predicted that the correlation between close-mindedness and creative task performance is moderately (but not strongly) negative.

Openness to experience scale. Taken from the NEO-Five Factor Inventory (Costa & McCrae, 1992), this 12-item subscale is answered with a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Participants answered questions such as "I often try new and foreign foods" (Cronbach's $\alpha = .64$). Previous research documented that creative individuals tend to be more open to new experiences (e.g., Feist,

1998; King, Walker, & Broyles, 1996), therefore a moderately positive correlation between openness and creative performance was expected.

Results

The analyses reported here were not tests of hypotheses but tests of validity. As expected, there was a positive correlation between the Runco Ideational score and the creativity coded score of the chocolate design ($r = .28$). Also, the creativity coded score was negatively correlated with close-mindedness ($r = -.38$), and mildly positively correlated with openness to experience ($r = .12$). On the whole, both convergent and discriminant validities were established for the chocolate design task, which was adopted in Study 2.

STUDY 2

With the chocolate design task validated, the main study was conducted to test the person \times process \times press interaction predicting that high-NFC individuals, whose motivation to attain consensually valid solutions is strong (process), can perform creatively if they are led to be aware of uncreative solutions (press) and have the capacity to produce creative products (person).

Method

Participants

Through the university's subject pool system, 56 undergraduate students were recruited at a Singapore university (33 women; M age = 22.36, $SD = 1.55$). In the sample, 85.7% of the participants were of Chinese ethnicity, the rest were Indian (1.8%), Vietnamese (7.1%), Filipino (3.6%), or Cambodian (1.8%). Participants received course credits for their participation. Before the study began, all participants read and signed the informed consent form.

Procedure and Measures

Participants completed a survey booklet, which contained the chocolate design task, the Runco Ideational Behavior Scale, the abridged Need for Cognitive Closure Scale, and a demographic questionnaire.

Chocolate design task. After reading the same instruction of the chocolate design task used in Study 1, participants were randomly assigned to one of the two conditions. Participants in the *uncreative-cognizant* condition were first told to recall and draw what they thought were commonly agreed upon conventional

designs of chocolate before drawing their creative chocolate design; participants in the *uncreative-incognizant* condition were only told to draw their creative chocolate design. The scoring procedure was the same as Study 1. The coded scores had high inter-rater agreement (percentage agreement = .91) and a third coder resolved the few inconsistencies.

Runco ideational behavior scale. To measure individuals' creative potential, the same creative ideational scale in Study 1 was used (Cronbach's $\alpha = .92$).

Need for cognitive closure scale. An abridged NFC scale (Roets & Hiel, 2011) containing 15 items was used. A sample item is "I dislike questions which could be answered in many different ways," (Cronbach's $\alpha = .89$) answered on a 6-point Likert scale, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). Individual differences in the NFC were measured to determine the individual's motivational strength to seek epistemic certainty.

Results

With the method of Mahalanobis distance, one extreme outlier with a distance of 32.79 ($p = .001$) was detected. This outlier was removed before conducting further data analyses.²

Examining the traditional chocolate designs participants drew in the uncreative-cognizant condition, all participants drew a chocolate of the shape of a cuboid. Other shapes included sphere (81.48%), water drop (similar to Hershey's Kiss; 22.22%), heart (18.5%), pyramid (18.5%), and oval (3.7%). To check if the kinds of uncreative chocolate designs participants generated differed as a function of the levels of their NFC and creative ideation as well as their interaction, binary logistic regressions on whether or not participants drew a particular shape of chocolate (the analysis on whether or not participants came up with the cuboid shape was skipped because all of them generated it) were ran. All the models were statistically insignificant, $\chi^2(3, N = 27) < 3.73, ns$. This confirmed that the kind of chocolate designs consensually agreed to be uncreative that were generated by participants in the uncreative-cognizant condition was not dependent on their levels of NFC and creative ideation.

Square root transformation was applied to the creativity coded scores to normalize the score distribution, before conducting a regression analysis to test the

²When the outlier was included, the expected three-way task condition \times NFC \times creative ideation interaction was still significant ($\beta = 1.02, t(48) = 2.72, p = .01$).

hypothesized three-way interaction with task condition (uncreative-cognizant vs. uncreative-incognizant), NFC score (mean centered), ideational creative behavior score (mean centered), and their interaction terms on the transformed creativity coded scores. The overall model was significant, $F(7, 47) = 2.20, p = .05, R^2 = .25$. A marginally significant two-way interaction between NFC and creative ideation was found ($\beta = -.49, t(47) = -1.93, p = .06$). Of import, this two-way interaction was qualified by the predicted three-way interaction ($\beta = 1.32, t(47) = 2.87, p = .01, \eta_p^2 = .15, P_{rep} = .998$; see Figure 1). No other effects were significant, $t < 1.21, ns$.

To understand the nature of the three-way interaction, two regressions at high (one SD above mean) and low (one SD below mean) levels of NFC were performed separately. The task condition \times creative ideation interaction was significant at high levels of NFC ($\beta = 1.31, t(47) = 2.54, p = .01$), but did not reach significance at low levels of NFC ($\beta = -.74, t(47) = -1.71, p = .09$). These results suggest that among high-NFC participants (but not among low-NFC participants), the effect of creative ideation on creative performance depends on whether participants were made aware of the uncreative ideas or not.

In follow-up analyses, at high levels of NFC, it was found that when conventional designs were made accessible, participants with higher (vs. lower) creative ideation performed the most creatively ($\beta = 1.16, t(23) = 2.70, p = .01$); when conventional designs were not made accessible, participants with different levels of creative ideation did not differ in their creative performance ($\beta = -.15, t(24) = -.55, p = .59$).

Recall that at low levels of NFC, the interaction between task condition and creative ideation was found to be insignificant; the effect of creative ideation on creative performance did not appear to depend on whether or not participants were made aware of the

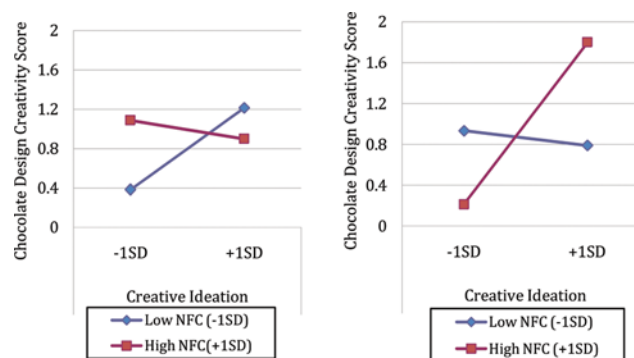


FIGURE 1 Chocolate design creativity coded score (square root transformed) as a function of task condition (uncreative-incognizant vs. uncreative-cognizant), need for cognitive closure (at 1 SD below or above mean), and creative ideation (at 1 SD below or above mean), Study 2. (Figure is provided in color online.)

uncreative ideas. If there is anything, when conventional designs were not made accessible among low-NFC participants, creative ideation was positively associated with creative performance ($\beta = .61$, $t(24) = 2.15$, $p = .04$); when conventional designs were made accessible, participants performed similarly at high or low levels of creative ideation ($\beta = -.13$, $t(23) = -.41$, *ns*).

GENERAL DISCUSSION

By bridging the person, process, and press perspectives of creativity in an integrative paradigm, the present research offers the first evidence that high-NFC individuals who are strongly motivated to seek epistemic certainty (or to maintain high confidence in their chosen solution or course of action as correct) might not always suffer in their creative performance. To the extent that these individuals are given the opportunity to be cognizant of uncreative solutions to a creative generation task and that they have the potential to act creatively, their creative performance can be bolstered, probably because they are made aware of uncreative ideas as consensually invalid solutions and thereby they exert more efforts to arrive at consensually valid creative ideas. Their low-NFC counterparts, however, did not seem to benefit from the trigger of uncreative solutions. Adding to prior research that high NFC is generally associated with lower creative capability (e.g., Ip et al., 2006; Leung & Chiu, 2010), our research has expanded the field's understanding of how the potentially creative mind of high-NFC individuals can be opened by first alerting them to the uncreative examples and allowing their high need for attaining cognitive closure to motivate them into seeking creative ideas.

Our findings that high-NFC individuals could overcome their tendency to seize and freeze on early uncreative ideas and perform creatively after they are made aware of uncreative ideas has one interesting implication. It might hint at the possibility that these individuals could arrive at creative solutions through the *persistence* route. According to the dual pathway model to creativity proposed by De Dreu, Baas, and Nijstad (2008), two qualitatively different processes may result in creativity: the flexibility pathway and the persistence pathway (see also De Dreu et al., 2008). The flexibility pathway leads to creative problem solving by overcoming functional fixedness and facilitating new connections among seemingly distant ideas. The persistence pathway, on the other hand, focuses on approaching creative solutions through hard work and constant systematic probing of alternative ideas. After being cognizant of uncreative solutions, high-NFC individuals might focus their attention to persistently search for alternative solutions until reaching one that they perceive as a normatively prescribed creative answer. Future research

can explore the differential roles of cognitive flexibility and cognitive persistence in facilitating the creative potential of individuals with high levels of NFC.

In a related vein, cognitive persistence displayed by high-NFC individuals might manifest in their search for specific closure. According to Kruglanski (1990, 2004), there are two types of motivating closure: nonspecific and specific closure. The *need for nonspecific closure* motivates an individual to freeze on any unambiguous and firm knowledge about an issue, irrespective of the knowledge content. The *need for specific closure*, on the other hand, motivates an individual to seek out a specific piece of knowledge required to stop information search. In this light, it is probable that when high-NFC individuals are led to recognize those uncreative traditional chocolate designs, they are motivated to seek specific closure and go down the persistence pathway to continue with their creative productions.

Finally, our findings also speak to when and for whom activating existing ideas in creative productions could boost creative performance. Research on design fixation showed that making old ideas or examples accessible before people engage in creative generations is detrimental to the idea's creative quality (e.g., Perttula & Liikkanen, 2006; Smith, 2003; Smith & Blankenship, 1991; Smith, Ward, & Schumacher, 1993). This fixation effect limiting creative quality might pan out for the low-NFC participants, as they did not seem to benefit from the trigger of uncreative ideas relative to those with higher NFC.

Although this research has supported the hypothesis, there are limitations that need to be acknowledged. First, the sample across the two studies only consisted of university undergraduate students. Although it is unlikely that the proposed NFC mechanism of college students differs from that of the nonstudent population, researchers of future studies are encouraged to recruit a nonstudent sample to further establish external validity. Second, in both studies the main creativity task was a newly created chocolate design task. This task was developed in order to have a relatively more objective way of assessing creativity, with raters independently coding each drawing according to the same set of questions to produce a composite creativity score. Although Study 1 had confirmed the task's discriminant and convergent validities, more extensive usage of the task in future studies is required to extend its reliability and validity evidence. Third, another direction for future research is to generalize the current findings to other creative idea generation tasks. The chocolate design task was developed to create a context to help individuals cognize uncreative or traditional designs (or not). It would be interesting to adapt existing creativity tasks (e.g., generating new uses of a brick in the Unusual Uses Test; Torrance, 1974) and alert individuals to uncreative examples (e.g., using bricks to build walls) before

engaging them in creative generations. This will attest to the generalizability of current findings by examining the same hypothesis in another creativity task context.

In conclusion, although previous research has shown that individuals with a strong need to seek epistemic certainty, either chronically or situationally induced, are generally less creative and display more cultural conformity, this may not be necessarily true in situations where high-NFC individuals are led to be aware of what constitutes consensual validity. To the extent that they are able to recognize uncreative solutions as consensually invalid solutions, their mental set can be lifted to reconsider more creative alternatives. Setting out as the first to test this hypothesis, the current research has also tested the applicability and utility of the integrated framework of the person, process, and press perspectives in the psychological study of creativity. Future research can begin to extend the current findings to other creative tasks and to the different stages of creative productions (e.g., idea generation vs. idea selection).

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