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When do they push the right buttons?

Need for closure and the role of perceived control in situations of uncertainty

Abstract

The present research examined the role of heightened perceived control as a strategy to cope with uncertainty in need for closure (NFC). We assume that in the situation of uncertainty, NFC is associated with using strategies that heighten perceived control. To test this assumption we run two studies using a causal learning paradigm wherein participants' goal was to find out whether clicking a button had any effect on a triangle lighting up with no specific instructions on how to approach the task. Two within-subject factors, i.e., certainty schedules and type of interval, were introduced to vary the uncertainty experienced in the task. In Study 1 (N=45) we demonstrated that the task indeed induced varying degrees of uncertainty depending on these factors and that NFC related to more presses (i.e., effortful means). In Study 2 (N = 94) we demonstrated also that high NFC was associated with more presses which was linked to heightened perceived control.

Keywords: need for cognitive closure, perceived control, uncertainty

When do they push the right buttons?:

Need for closure and the role of control perception in situations of uncertainty

Introduction

In our everyday lives, we are often engaged in making decisions, inferring causes for certain events and behaviours or pursuing important goals. These psychological processes more often than not are accompanied by a degree of uncertainty which can sometimes be an unpleasant experience. Kruglanski and colleagues (Ford & Kruglanski, 1995; Kruglanski & Webster, 1996; Kruglanski et al., 2009) argued that this uncertainty would increase the motivation to reduce it by finding an answer on the issue at hand through rapid formulation of a hypothesis and its validation, as opposed to enduring further ambiguity (Kruglanski & Webster, 1996). This motivational tendency is termed *Need for Cognitive Closure* (NFC). For over forty years researchers intensively examined the way high in NFC people alleviate potential distress of uncertainty (for overview see Roets et al., 2015). As a result of coping with uncertainty, research has shown that high NFC individuals make more stereotypical judgments (e.g., Dijksterhuis et al., 1996), prefer consistent over inconsistent images (Gocłowska et al., 2017), prefer religious fundamentalists (Brandt & Reyna, 2010; Kossowska et al., 2016) and endorse conservative beliefs (Kossowska & van Hiel, 2003). Another way people tend to cope with uncertainty is by maintaining or restoring one's personal control (Fritzsche et al., 2013; Langer, 1975). While Kossowska and colleagues (2017) theoretically discussed the potential role of perceived control in dealing with uncertainty, there is very little and close to no empirical work showing this effect which our present research aims to establish.

Perceived control as a strategy to deal with uncertainty

It is well demonstrated that people are motivated to perceive themselves as having control in over their daily lives (e.g., Landau et al., 2015). But sometimes, some

circumstances could lead to experiencing a lack of control and could be threatening. For instance, Bukowski et al., (2018) examined the influence of unemployment and economic uncertainty as a source of lacking control in intergroup evaluations. When people are threatened, they are motivated to restore their sense of control and certainty (Fritzsche et al., 2013; Langer, 1975). Similarly, for example, the threat of a terrorist attack would be seen as a threat to one's own mortality, and according to terror management theory (TMT; Greenberg et al., 1997) people who experience such threat would try to regain their sense of perceived control by enhancing their self-esteem (Pyszczynski et al., 2004; Schmeichel et al., 2009). Also, according to compensatory control theory (Kay et al., 2009), people desire control by making it part of a larger motivation to see the world as structured, orderly, and predictable. The theory further explains that when one's control is challenged, people can cope by looking for external sources of control—that is, structure in the physical and social world (Kay et al., 2009; Shepherd et al., 2011; Whitson & Galinsky, 2008). Recently, Landau et al., (2015), suggested a framework of compensatory control strategies wherein they proposed that when an experience of uncertainty leads to a perceived lack of control, people will be motivated to restore control by either seeking or preferring simple, clear and consistent interpretations of the world or by bolstering one's personal agency. The authors explained this with an example wherein a person's confidence can either rely on one's personal agency (that is, belief that they have the resources to cope with a new situation) or rely on the notion that this person interprets their environment as predictable and structured to help cope with an uncertain situation. Early work by Edwards and Weary (1998) suggested that in the face of causal uncertainty, people are motivated to seek out, interpret and process information that would help gain causal knowledge about the world and make appropriate decisions. Thus, we can certainly argue that the experience of uncertainty is related to experiencing a lack of control and bolstering one's sense of control can indeed be seen as a strategy to deal with

uncertainty. We thus expect that high NFC (vs. low) individuals would heighten their sense of perceived control in an experimentally evoked uncertain situation.

Means to perceived control and uncertainty

We argued that high NFC individuals would use perceived control, when heightened, as a strategy to deal with uncertainty. However, the question is how they would incorporate this strategy. Several studies have demonstrated that high NFC individuals usually prefer the ‘tried and tested’ way of engaging in simple and effortless means to attain the goal of certainty. However, recently, researchers suggest that if such simple means are perceived as inefficient or made unavailable to the goal of closure, high (vs. low) NFC individuals would be more likely to search for alternative, usually more effortful, ways to accomplish their epistemic goal (e.g., Jaśko et al., 2015; Kossowska et al., 2016; Sankaran et al., 2017; Szwed et al., 2017; Szumowska et al., 2018). In a recent review by Kossowska et al., (2018), it was argued that high NFC individuals are indeed motivated to achieve the goal of certainty and may adapt means to do so depending on the instrumentality of the means to reach the goal of closure. The authors suggest that if by engaging in effortful means, it ‘makes more sense’ to attain closure, high NFC individuals would indeed engage in effortful processes. In other words, because NFC defines a goal state, individuals high on this dimension would be particularly motivated to search for the ‘best’, that is, the most instrumental, means to attain closure. In contrast, low NFC individuals who are more tolerant to uncertainty are less motivated to search for alternative and certainty-affording means as they do not feel uncomfortable remaining in the state of uncertainty.

Thus, in this paper we argue that in situations of uncertainty, when there are no clear rules provided to guide the action or when there is no clear knowledge about how to act or not to act in this situation, high (vs. low) in NFC individuals would resort to effortful means to heighten one’s perceived control, thus deal with this situational uncertainty. This

assumption has been depicted as a conceptual model in Figure 1. The present research is the first to show the relationship between NFC, effortful means and heightened perceived control.

Overview

In the present research we examined the role of heightened perceived control as a mechanism to cope with uncertainty by utilising effortful means among high (vs. low) NFC individuals. Our focus is on high NFC individuals as we argue that the goal to attain certainty is important for high NFC individuals and therefore the motivation to cope with uncertainty is especially strong. We tested this assumption in two studies using a causal learning paradigm (Sankaran, Greville & von Hecker, in prep). In this paradigm a triangle and a button placed below on the screen were presented to participants who were asked to find out whether clicking the button had any effect on the triangle lighting up. There were no specific instructions as to how to approach the task. Furthermore, in this within-subject design, two factors were introduced to vary the uncertainty experienced in the task. The first factor, schedules of certainty (80 -high, 50-average, and 20-low) was determined based on the probability of the blinking outcome following the pressing action. We also included the manipulation of the *type of interval* (fixed vs. variable) between pressing the key pressing action and the triangle lighting up. In the fixed condition, the interval (in case of an effective pressing act) was always the same, held at a constant value of 2s. In the variable condition, the interval was random between 0 and 4 seconds. The main aim of Study 1 was to demonstrate the effectiveness of these types of uncertainty manipulation. In Study 1 we measured uncertainty after a control rating by asking participants to indicate with an 'X' how certain or uncertain they felt at that moment on a line on a sheet of paper. This study was designed to primarily confirm the manipulation as influencing perceptions of certainty. In Study 2, we tested if high (vs. low) NFC individuals use effortful means, that is, press the

button more and, as a result, show higher perceived control in conditions of greater uncertainty. In addition, we expected that the total number of presses would mediate the perception of control in conditions of greater uncertainty.

For both studies, we ran an a priori power analysis (G*Power 3.1, Faul, Erdfelder, Buchner, & Lang, 2009) to detect a medium effect size of .25 at a power of .80 (Cohen, 1988). For both studies it was determined that a sample of 40 participants would be required for a repeated measures ANOVA with within-between interactions. The number of groups was listed as 2 with 6 repetitions as per the design. In fact, our task was adapted based on the causal learning paradigm and temporal predictability (e.g., Greville & Buehner, 2010) wherein their sample size was 30. Thus, for the first study, we recruited 45 participants and for the study 2, our sample size (N=94) was more than sufficient to detect the medium effect size of .25 and power at .80. Since we were interested in estimating the whole mediation model rather than single coefficients, we decided, for the main study, to recruit more participants than suggested by the power analysis. The experimental procedure was in accordance with the ethical principles of the 1964 Declaration of Helsinki (World Medical Organization, 1996) and was approved by the local Research Ethic Committee. The written informed consent was obtained from the participants.

Study 1

In Study 1, we wanted to test effectiveness of types of uncertainty manipulations using a cause-effect paradigm. The conditions of uncertainty were determined in the within-subject design with two factors – *certainty schedule* (80 -high, 50-average, and 20-low) which was determined based on the probability of the blinking outcome following the pressing action. The second factor was *type of interval* (fixed vs. variable) between the key pressing action and the triangle lighting up. For the high uncertainty conditions, separately in both experimental factors, that is, certainty schedule and type of interval, we predicted that

perceived uncertainty would be higher at higher (as opposed to lower) respective levels of scheduled uncertainty.

Method

Participants. A total of 45 (age $M = 23.71$, $SD = 4.14$; 38 female) participants took part in the study. Participants were recruited via community announcements. Each participant was paid 10 PLN (2 Euros approx.). The study was conducted in the lab with one participant per session, on individual computers. All data were submitted to the Tukey criterion based on excluding participants with values larger (smaller) than the upper (lower) quartile by 3 times the interquartile range in the overall sample's distribution of latencies (see Clark-Carter, 2004, Chapter 9). On this basis, no participant was excluded from the analyses.

Measures.

Need for Cognitive Closure

NFC was measured using the Polish translated short version of the revised NFC scale (Roets & Van Hiel, 2011) which comprises 15 items from the original scale (Webster and Kruglanski, 1994). A sample item is "I don't like situations that are uncertain." Participants marked their response on a scale from 1 (completely disagree) to 6 (completely agree). The overall scale's validity was $\alpha = .70$, $M = 3.70$, $SD = 6.86^1$.

Control Perception Task

Participants were instructed that the aim of the experiment was to judge the extent to which their actions could cause something to happen on the computer screen. This task was modified based on a causal learning paradigm (Sankaran, von Hecker & Greville, in prep)

¹ The NFC short scale of 15 items (Roets & Van Hiel, 2011) is argued to be comparable to that of the original version and thus this scale was used in this study.

wherein a triangle was presented in the center of the screen and a button below it was labelled PRESS. The aim was to press the button to find out whether or not the pressing of the button resulted in the triangle lighting up. No specific instructions as to how to approach the task were given; that is, participants were instructed to press the button as many times they wanted, and in any sequence. Participants were also specifically instructed to press and immediately release the button, rather than press and hold. They were informed that sometimes the triangle would flash after the button was pressed and sometimes it would not. The triangle would also light up on its own accord. They were reminded that it was important to press at least a few times during every trial in order to provide an informed judgement and that just one button press would likely not be sufficient to ascertain a reasonable judgment.

For the *certainty schedule* manipulation (see also Shanks & Dickinson, 1991; Wasserman, Chatlosh & Neunaber, 1983), a high certainty schedule meant that the blinking outcome following the pressing action occurred in 80 percent of the key presses; an average certainty schedule meant that the blinking outcome following the pressing action occurred in 50 percent of the key presses; and a low certainty schedule meant that a blinking outcome following the pressing action occurred in 20 percent of the key presses. This constituted a linear increase from certainty to uncertainty. For the *type of interval* manipulation (fixed vs. variable), the fixed condition meant the interval between pressing the key pressing action and the triangle lighting up (in case of an effective pressing act) was always the same (= 2 seconds). In the variable condition, the interval was random between 0 and 4 seconds; with any possible interval equally likely to occur. Each participant was exposed to 6 trials in a random order – high certainty fixed, high certainty variable, average certainty fixed, average certainty variable, low certainty fixed and low certainty variable. Each trial lasted for 1 minute. In total, the experiment lasted around 10 minutes.

Dependent measures

The first DV was the *total number of key presses* made before making the judgment of whether the press had an effect on the triangle lighting up. The key pressing frequency was interpreted as the means to heighten perceived control in order to reduce uncertainty. The more presses, the more information search would take place. The second DV was that of *perceived control* wherein, at the end of every trial, participants were asked how effective they thought pressing the button was at making the triangle light up. This variable was measured on a rating scale ranging from 0-100, with 0 indicating that the button press on the triangle lighting up was completely ineffective and 100 indicating that the button press on the triangle lighting up was maximally effective. The index used here was derived by calculating the difference between the above rating and the actual certainty schedules administered, based on 80%, 50% and 20% probability. Thus, for example in case of scheduled 50% probability contingency, if a participant judged this action–outcome effectiveness as lower than the actual probability, the difference between the perceived judgment and actual outcome would imply that the participant perceived lesser control than they actually had. If the participant judged the action-outcome effectiveness as higher than the actual probability, then the difference would imply that the participant perceived more control than they actually had. We argue that this measure especially captured perceived control because we asked participants to make a judgment to what a degree their actions influenced the outcome. High scores were therefore interpreted as high perceived control. The last DV measured was that of *perceived uncertainty* wherein, at the end of every trial after making judgments of control, participants were asked to what extent they felt uncertain at a given moment. For this measure, we used a paper and pencil method. Once the participant answered the question about perceived control on the computer, they were reminded on screen and by the experimenter to answer the question regarding perceived uncertainty on paper. They were

presented with one line on a single sheet of paper about 11.5cm long. On that line participants were asked to mark with an 'X' regarding how certain or uncertain they felt at that moment. They were informed that marking 'X' on the left side of the line indicated stronger certainty while marking 'X' on the right side of the line indicated stronger uncertainty. All DVs were measured after each trial.

Results & Discussion

Data in each of the sections were trimmed according to Tukey's criterion (i.e., 3 times the interquartile range above or below the upper or lower quartile, respectively, in the participant sample's distribution of average values in the dependent variable).

Uncertainty

No participant was excluded from analysis ($N = 45$). The final model used for analysis (for details concerning our strategy of statistical modelling see Appendix A) contained fixed effects for schedules of certainty (80%, 50%, 20%), type of interval (fixed vs. variable), their interaction, as well as NFC as continuous predictor, its interactions with the two design factors as well as the three-way-interaction. There was a significant effect for schedules of certainty, $F(2,215) = 3.98$; $p = .02$, showing higher levels of uncertainty for average schedule, $M_{average} = 37.46$, as compared to high schedule, $M_{high} = 29.93$, $t(215) = -2.38$, $p = .04$, and higher uncertainty for low schedule, $M_{low} = 37.85$, as compared to high schedule, $t(215) = -2.50$, $p = .04$, as established by Holm-corrected simple effects. Type of interval had a significant effect, $F(2,215) = 6.57$; $p < .01$, with variable intervals, $M_{variable} = 38.40$, producing more uncertainty than fixed intervals, $M_{fixed} = 31.77$. The interaction between control schedule and type of interval was significant as shown in Figure 2, $F(2,215) = 3.21$; $p = .04$. As Holm-corrected simple effects revealed, this was mainly due to the difference between fixed and variable intervals being significant at high scheduled levels of control, $M_{high/fixed} = 23.17$, versus $M_{high/variable} = 36.68$, $t(129) = -3.27$, $p = .004$. The same difference

was insignificant at average levels of control, $M_{average/fixed} = 38.55$ versus $M_{average/variable} = 36.37$, $t(129) = .52$, $p = .59$, and marginally significant at low levels of control, $M_{low/fixed} = 33.57$ versus $M_{low/variable} = 42.13$, $t(129) = -2.07$, $p = .08$. No further effects were significant. The results thus confirmed our general assumption about the linear effect of increasing uncertainty for schedules of certainty. 80% high schedule had the least amount of uncertainty experienced compared to 50% and 20% schedules. Thus, we can confirm that when the button press resulted in the triangle lighting up 80% of the time participants were more certain (or less uncertain) compared to when the cause-effect relation occurred only 50% and 20% of the time. The uncertainty of the task was further confirmed with the type of interval, wherein the variable interval induced more uncertainty than the fixed interval. Thus, when the triangle blinked after a button press randomly between 0 and 4s, people experienced more uncertainty. This is also in line with the work by Greville & Buehner (2010) wherein they argue that the variable condition creates temporal uncertainty about the cause-effect relation and that any kind of causal learning could be affected by the uncertainty created by the variable condition. Furthermore, the interaction also adds strength to the argument about the conditions that specifically induce uncertainty, that is, average and low schedules of certainty in combination with a variable time interval would create the situation of highest uncertainty. The interaction effects with NFC were probably not significant owing to the sample size.

Key presses

No participant was excluded as outlier, so $N = 45$. The final model had the same fixed effect structure as above. There was a significant effect for NFC, $F(43,27) = 5.40$; $p < .02$, showing higher NFC levels being associated with more frequent key pressing, $\beta = 1.04$, $M_{presses/-1SD(NFC)} = 16.27$, $M_{presses/+1SD(NFC)} = 45.58$. The results thus showed that high NFC individuals, across all variations of uncertainty in general pressed more, indicating more information search, thereby engaging in effortful means to possibly attain certainty in the

task. The task could be interpreted as an uncertain environment as shown in the results above. The task instructions also did not have any clear rules on how to approach the task, wherein participants were instructed to press however they wanted and in whatever sequence. This lack of clarity probably further reinforced the uncertain nature of the task and therefore, just to be sure, high NFC individuals pressed more. The need to search for more information here is in line with previous research (e.g., Jaśko et al., 2015; Kossowska et al., 2016; Sankaran et al., 2017; Szwed et al., 2017; Szumowska et al., 2018) wherein it was argued that high NFC individuals who are motivated to achieve the goal of certainty, might do so by engaging in effortful means, if it ‘makes more sense’ to attain closure this way. Sankaran et al., (2017) in their research also showed that if the simple, clear strategy to attain closure was not available, high NFC individuals would resort to more effortful means to attain closure. In this case, the rules were ambiguous to the effect that participants were instructed to press as many times as possible to ascertain a relationship. The lack of structure in the instructions could be seen as an exit route that was not easily available, as supposed to if they had been told to press 15 times to determine the relationship.

Control perception

The final model (N = 45) used for analysis had the same fixed effect structure as the one just reported for key presses. The effect for NFC was not significant. As a speculation, this lack of significance was possibly due to a particular design feature. After people made control judgments, they were asked to write how certain or uncertain they were. Participants were instructed that they would have to answer these questions at the end of every trial. Perhaps the certainty judgments influenced their control judgments in the following trials. This is merely a speculation, but at this stage it is hard to interpret the reason for the insignificance.

Summary

In terms of our research questions, we can summarize Study 1 as follows. 1. The experiment was conclusive and supportive of the main hypothesis as to uncertainty perceptions: Higher levels of experienced uncertainty were found for average and low levels of scheduled certainty. 2. The experiment was conclusive and supportive of the main hypothesis as to the number of key presses: High NFC participants pressed more frequently. 3. The experiment was inconclusive as to control perceptions: NFC had no significant predictive power. As a post-hoc interpretation we believe that, due to the design, uncertainty perceptions may have influenced control perceptions. Therefore in Study 2, the design was changed to only include key presses and perceived control as DV's.

Study 2

In Study 2, we wanted to replicate the above results and at the same time change the design to address control perceptions again. This time, no uncertainty measure preceded the measurement of perceived control. As our predictions concerning NFC had been confirmed in Study 1 with respect to uncertainty perceptions in the cause-effect relation. Again, we predicted that high (vs. low) NFC individuals would press more often but now also would show higher perceived control particularly in conditions of increased uncertainty, that is, in the 50% and 20% probability and in the variable type of interval conditions. Additionally, we predicted that the total number of presses would mediate the relationship between NFC and control perception.

Method

Participants. A total of 94 (age $M = 20.79$, $SD = 4.93$; 10 male) psychology undergraduate students were recruited from Cardiff University. They were awarded course credits for their participation in the study. The study was conducted in the lab with one or

two participants per session, on individual computers. Data in each of the sections were trimmed according to Tukey's criterion (i.e., 3 times the interquartile range above or below the upper or lower quartile, respectively, in the participant sample's distribution of average values in the dependent variable) thereby reducing the total number of participants to 94. Five other participants were removed on perceived controllability. They had either very high or very low perceived control judgments. The final sample consisted of 90 (age $M = 20.74$, $SD = 4.93$; 11 male) participants.

Measures

Need for Cognitive Closure

Same as in Study 1.

Control Perception Task

The design to measure perceived control was identical to that used in Study 1.

Dependent measure

We used *total number of key presses* and *perceived control* as dependent variables.

Results & Discussion

Key presses

The final model used for analysis contained fixed effects for control schedule (80%, 50%, 20%), type of interval (fixed vs. variable), their interaction, as well as NFC as continuous predictor, its interactions with the two design factors as well as the three-way-interaction. There was a significant effect for NFC, $F(1, 93.35) = 4.69$; $p = .03$, showing higher NFC levels being associated with more frequent key pressing, $\beta = 3.60$, $M_{presses/-1SD(NFC)} = 31.66$, $M_{presses/+1SD(NFC)} = 43.70$. No other effect was significant. This replication of the effect thus adds strength to the argument that high NFC individuals in general searched for more information when the task environment incorporated properties of uncertainty. As described earlier, the variability of uncertainty in the task with schedules of certainty and type of

interval, along with the unstructured instructions, motivated high NFC individuals to use effortful means to attain certainty. As the instructions stated “You can press how many ever times you want and in whatever sequence”, perhaps high NFC individuals were motivated to press more to ascertain any sort of causal relationship.

Control perception

The final model used for analysis had the same fixed effect structure as the one just reported for key presses. First, control schedule had a significant main effect, $F(2, 99.16) = 11.95$; $p < .001$, indicating that participants, although they generally perceived to have less control than they actually had (negative average values at all factor levels), this underestimation was more pronounced at high ($M_{high} = -16.28$) than low schedules ($M_{low} = -5.98$), and more pronounced at average ($M_{average} = -12.74$) than low schedules, as Holm-adjusted post-hoc comparisons revealed. Second, variable interval trials yielded significantly more underestimation of control than fixed trials, $F(1, 279) = 11.28$; $p < .001$. Thirdly, as indicated by a significant interaction between control schedule and type of interval, $F(2, 279) = 6.02$; $p = .003$, this difference was only significant at high schedules ($M_{variable} = -22.64$, $M_{fixed} = -9.92$), but not at average ($M_{variable} = -13.87$, $M_{fixed} = -11.61$) or low schedules ($M_{variable} = -6.28$, $M_{fixed} = -5.68$). Finally, control schedule, type of interval and NFC entered a significant three-way interaction, $F(1, 279) = 4.34$; $p < .01$ (see Figure 3). In particular, for average schedules but not for the other two schedule types, higher NFC levels were associated with higher perceived control at variable than at fixed intervals, whereas the opposite, that is, higher perceived control at fixed than variable intervals, was the case for lower NFC levels, $\beta = -3.21$. Our results are thus in line with what we predicted wherein high NFC individuals showed heightened perceived control in schedules of increasing uncertainty. As seen in the figure, in the 80% condition, both high and low NFC individuals showed more perceived control in the fixed condition and less perceived control in the

variable condition, a trend based on interval type similar to what Greville and Beuhner (2010) had found in their work. Next, in the 50% condition, where the uncertainty increased, there were no differences between high and low NFC in the fixed condition, however, there was a significant difference between the two in the variable interval, wherein high NFC showed heightened perceived control compared to low NFC. Again, we see that low NFC individuals show the same trend as in the 80% condition, wherein they show less perceived control in the variable interval compared to fixed interval. However, for high NFC, as in the 50% condition, the button press results in the triangle lighting up only 50% of the time, might have seen that schedule as more uncertain and, as combined with the variable condition, might have experienced a particularly high level of uncertainty. Thus, high NFC individuals indeed showed heightened perceived control, as a result of their strategy in coping with the task-induced uncertainty. In the 20% condition, which is assumed to induce most uncertainty, in general everyone showed heightened control; perhaps owing to the extreme uncertainty the condition induced. In line with these findings, we can argue that the increase in uncertainty is related to a coping strategy, in this case, key presses resulting in a heightening of one's perceived control. When people are threatened, they are motivated to restore their sense of control and certainty (Fritzsche et al., 2013; Langer, 1975) and thus an increasing uncertainty may motivate an individual attempt at restoring control.

Mediation

Finally, to test whether button presses are the underlying mechanism of information search explaining NFC's effect of perceived control, we tested a mediation model in which NFC was the predictor, the number of presses was the mediator and perceived control was the dependent variable. More specifically, we argue that under conditions of uncertainty, high NFC individuals (vs. low) would be motivated to press more, thereby resulting in heightened levels of perceived control. Thus, we predict this effect only for the 50% and 20% schedules

of certainty (but not in the 80% condition, in the light of a likely ceiling effect). Furthermore, we also argue that the type of interval also contributed to the experience of uncertainty, wherein the variable condition was appraised as more uncertain than the fixed. Thus, the conditions of uncertainty applied to the mediation model were the 50% variable and 20% variable conditions. The mediation was conducted using the PROCESS program (Hayes, 2013) with 20,000 bootstrapped samples, the model depicted in Figure 4 and 5. For the 50% variable condition, the results showed that NFC significantly predicted total presses made in the 50% variable condition ($b = .683$, $t = 2.41$, $p = .018$, 95% CI [.121, 1.245]) and total presses made in the 50% variable condition predicted perceived control in the 50% variable condition ($b = .372$, $t = 3.76$, $p < .01$, 95% CI [.176, .568]). The indirect effect of NFC on perceived control in the 50% variable condition was also significant ($b = .254$, 95% CI [0.077, 0.526]) thus suggesting that the higher NFC, the greater their perceived control due to by pressing more. Similarly, for the 20% variable condition, the mediation results were replicated wherein high NFC showed heightened perceived control when they pressed more ($b = .095$, 95% CI [0.0167, 0.240]). We can thus argue that in the conditions of increasing uncertainty, that is, 50% variable and 20% variable condition, high NFC individuals (vs. low) tended to press more; or, in other words, searched for more information and explored the possibilities to ascertain a causal relation. This mediation thus confirms our general prediction that high NFC individuals indeed invest more effort in dealing with uncertainty. This is indeed in line with several studies conducted showing that high NFC individuals would indeed use effortful means to achieve certainty (see Kossowska et al., 2018 for a review). The lack of clear rules or structure in the task indeed ‘convinced’ high NFC individuals to search for more information as that would have been appraised as the most effective strategy.

General Discussion

In the present research we were interested in examining the role of heightened perceived control in dealing with uncertainty amongst NFC individuals. We also examined whether the relation between NFC and perceived control would be related to engaging in effortful means to attain the goal of certainty. In Study 1, we found that as predicted, scheduled certainty levels were related to uncertainty perceptions: The 80% schedule was found to be seen as least uncertain, compared to the 50% and 20% schedules, in judging the cause-effect relation. Participants also judged more uncertainty in the variable interval type, compared to the fixed interval type (see Greville and Beuhner, 2010 for the argument that variable interval types may induce temporal uncertainty). Study 1 also revealed high NFC participants to press the response key more often, on average. Participants had received the instruction that they could press the button in whatever way they wanted and as many times they wanted, to make a judgment. Such an instruction may have induced uncertainty and high (vs low) NFC individuals might have been more sensitive to it. We argued earlier that the lack of structure, of a clear rule or knowledge about the task, or in other words, lack of available simple means to attain the goal of certainty would motivate high NFC individuals to search using more effort, as shown in the research of Sankaran et al. (2017). High NFC individuals compared to low NFC individuals were thus motivated to search for the ‘best’, that is, the most instrumental, means of closure-attainment, in this case, press more to ascertain the cause-effect relation. Perhaps if a simple route was made available, for instance, if a rule was imposed stating that participants were required to press the button only a certain number of times to make the judgment, high NFC individuals might follow that rule to achieve closure. The assumption to make a quick decision based on a rule is consistent with the original work by Kruglanski & Webster (1996). We can thus conclude that Study 1

indeed established the overall uncertainty induced in the paradigm, which is crucial for our manipulation in Study 2.

In the Study 2, as expected, we replicated the effect found in Study 1: High NFC individuals pressed more on average than low NFC individuals did, that is, they engaged in more information search overall. This result adds strength to the idea that high NFC in general resorted to effortful means to make an informed decision. Again, in line with Sankaran et al. (2017) the findings show that high NFC individuals exerted more effort when there was no ‘easy way out’ or simple means to attain closure.

Furthermore and different from Study 1, perceived control yielded meaningful results, presumably now as not influenced by preceding ratings of perceived uncertainty (as done in Study 1). Whilst there was no main effect of NFC on average perceived control, there was a significant three-way interaction between NFC, certainty schedule, and type of interval. It is possible that the experimental situation allowing for unlimited presses was particularly appealing to high NFC individuals who would then be free to search for more information to ascertain the cause-effect relation between the press and the triangle lighting. Therefore, for high NFC individuals, in a task with uncertain elements, closure would only be achieved by carefully assessing the task and engaging in more information search, in order to make a causal judgment. High and low NFC individuals in general followed the trend of the main effect of interval type at the 80% schedule condition which was the schedule of highest certainty. Both groups show heightened control perception in the fixed condition and lowered control perception in the variable condition, a trend in line with results from Greville and Buehner (2010). Low NFC showed the same trend for the 50% condition, however high NFC individuals showed heightened perceived control regardless of the type of interval. Thus, it appears possible that in the 50% variable condition (i.e., an uncertain condition as shown by the uncertainty ratings from Study 1) high NFC individuals would heighten their

perceived control to cope with uncertainty and restore control (see Fritzsche et al., 2013; Langer, 1975). Edwards and Weary (1998) also suggested that in the face of causal uncertainty, people are motivated to seek out, interpret and process information that would help gain causal knowledge about the world and make appropriate decisions, and in this case, make higher judgments of control. Thus, the three-way interaction between NFC, schedules of certainty and interval type is perhaps driven primarily by the 50% condition, as it was not evident whether the button press reliably had an effect on the triangle lighting up or not. Low NFC individuals were less affected by this unpredictability than high NFC individuals. In the 20% condition, the most uncertain condition, both high and low NFC showed heightened control perceptions. This further reiterates the general idea that people heighten their sense of control when faced with situational uncertainty (Kay et al., 2009; Kay, Shepherd et al., 2011; Landau, Kay & Whitson, 2015, Whitson & Galinsky, 2008).

Finally, the mediation model showed that the number of presses mediated the relationship between NFC and control perception under the two uncertain conditions, 50% variable and 20% variable. This result is crucial to our argument since it directly shows that effortful means lead to heightened perceived control. Previous research (see Kossowska et al., 2018 for a review) indeed shows that high NFC (vs. low) individuals do search for alternative, usually more effortful ways to accomplish their epistemic goal under certain conditions, such as the unavailability of simple means. The present research, however, is the first to show the relationship between NFC, effortful means and heightened perceived control. As seen from the model in Figure 1, it can be argued that effortful means, in this case, owing to the lack of clear structure, would help deal with uncertainty through the mechanism of heightened control. Researchers have indeed examined the way high NFC people alleviate the potential distress of uncertainty (for overview see Roets et al., 2015), for instance, by making more stereotypical judgments (e.g., Dijksterhuis, van Knippenberg,

Kruglanski, & Schaper, 1996), preferring religious fundamentalists (Brandt & Reyna, 2010; Kossowska, Czernatowicz-Kukuczka, & Sekerdej, 2016) and endorsing conservative beliefs (Kossowska & van Hiel, 2003). This research contributes to yet another way of coping with uncertainty, in this case heightening one's perceived control. It is acknowledged that Study 2 did not measure uncertainty, as we had reason to believe that measuring perceived uncertainty and perceived control in the same design could lead to unwanted interference between the two measures (post-hoc interpretation of our findings in Study 1). Having measured control perceptions in Study 2, we see the pattern of results in joint consideration of both experiments. In Study 1 perceived uncertainty patterns were conclusively found to be a function of varied certainty schedules. As the main components of the paradigm stayed the same in Study 2, we assume that these perceptions were likely to have established there in the same way. We submit that in this comprehensive view, our research ties the link between NFC and perceived control (Studies 1 and 2) which has not been done so far.

The present research however still does have some limitations. For one, there was no measurement of uncertainty or manipulation of the same before and after the task and to test an actual reduction in uncertainty this aspect should be looked into. There is certainly a need to replicate this model with different measures, such as, an explicit measure of the control perception. It would also be interesting to test the model on a more behavioural or attitudinal consequence. For instance, the experience of uncertainty would, in high NFC individuals, possibly lead to searching for more information so they would then heighten their perceived control, which would in turn impact their social behaviour. Would this be a mechanism that could drive more stereotypical judgments? Perhaps, the heightened control would be sufficient to alleviate the uncertainty distress and then, provided that high NFC individuals would not be experiencing uncertainty, they would potentially resort to more simplistic and heuristic type of making judgments. So far, most research has tested the effect of A (NFC) to

C (behavioural/attitudinal outcomes), perhaps heightened perceived control is the missing B link. Therefore, it is indeed essential to examine the process further.

Thus, in summary, to answer the question, taking into account the results of both Study 1 and 2, when do high NFC individuals press the right buttons? They do so (i) under conditions of situational uncertainty as shown in (ii) when there are no simple means to attain closure. High NFC individuals indeed searched for and explored more information in their attempts to ascertain the right judgment. In doing so, they again showed heightened perceived control but only in conditions of situational uncertainty. We can thus conclude by saying that high NFC individuals use heightened perceived control as an outcome of an effortful strategy, in this case using key presses in order to deal with uncertainty.

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APPENDIX

Appendix A: Modelling of effects

In order to determine which random effect structure to assume, we used linear mixed models with random effects for participants. Model comparisons were performed in a two-step procedure. In the first step, we fitted three models for each data type (a1, a2 and a3 for key presses, perceived control, and uncertainty data). All of these models had the same fixed effect structure, that is, control schedule (80%, 50%, 20%), type of interval (fixed vs. variable), as well as their interaction. Need for closure (NFC) was entered as a continuous predictor, together with its interactions with control schedule and type of interval, including the three-way-interaction. All models had a random intercept for participants. Models of type a3 had only this intercept, so these models are minimal. Models of type a1 also had a random slope for control schedule as function of participant, whereas models of type a2 had a random slope for type of interval instead. These models were then compared using the Chi square difference statistic $\Delta\chi^2$. Models of a given type 1 or 2 were compared with the corresponding model of type 3, the minimal model. If there was a significant difference in fit, the particular type of random slope as specified in the non-minimal model under comparison was then retained for the final model, afinal.

In a second step, these final models were assembled and run-in order to evaluate the respective fixed effect structure from those models. This strategy thus considers random intercepts and random slopes for the main effects of the experimental design. The analyses employed the statistical programming language R (R Core Team, 2016), using the package lme4 (Bates, Maechler, Bolker, & Walker, 2015) and afex (Singmann, Bolker, Westfall, & Aust, 2018).

Study 1 – Model Comparisons***Uncertainty:***

Model	<i>df</i>	<i>AIC</i>	<i>BIC</i>	<i>loglik</i>	<i>deviance</i>	$\Delta\chi^2$	Δdf	<i>p</i>
a3	12	2494.3	2537.4	-1235.1	2470.3			
a1	17	2498.5	2559.7	-1232.2	2464.5	5.7927	5	0.3269
a2	14	2498.0	2548.3	-1235.0	2470.0	0.3002	2	0.8606

afinal: No random slopes as a function of participants were kept.

Key presses:

Model	<i>df</i>	<i>AIC</i>	<i>BIC</i>	<i>loglik</i>	<i>deviance</i>	$\Delta\chi^2$	Δdf	<i>p</i>
a3	12	2318.2	2361.4	-1147.1	2294.2			
a1	17	2302.7	2363.9	-1134.3	2268.7	25.528	5	0.0001 ***
a2	14	2321.8	2372.2	-1146.9	2293.8	0.4074	2	0.8157

afinal: Random slopes for control schedule as a function of participants were kept.

AIC = Akaike's Information Criterion; BIC = Bayesian Information Criterion

Perceived control:

Model	<i>df</i>	<i>AIC</i>	<i>BIC</i>	<i>loglik</i>	<i>deviance</i>	$\Delta\chi^2$	Δdf	<i>p</i>
a3	12	2606.2	2649.3	-1291.1	2582.2			
a1	17	2606.6	2667.8	-1286.3	2572.6	9.5822	5	0.08798
a2	14	2610.1	2660.5	-1291.1	2582.1	0.0486	2	0.976

afinal: Random slopes for control schedule as a function of participants were kept.

Study 2 – Model Comparisons***Key presses:***

Model	<i>df</i>	<i>AIC</i>	<i>BIC</i>	<i>loglik</i>	<i>deviance</i>	$\Delta\chi^2$	Δdf	<i>p</i>
a3	12	4725.3	4777.5	-2350.7	4701.3			
a1	17	4730.1	4804.0	-2348.1	4696.1	5.1934	5	0.3927
a2	14	4702.3	4763.2	-2337.2	4674.3	26.994	2	1.375e-06 ***

afinal: Random slopes for type of interval as a function of participants were kept.

AIC = Akaike's Information Criterion; BIC = Bayesian Information Criterion.

Perceived control:

Model	<i>df</i>	<i>AIC</i>	<i>BIC</i>	<i>loglik</i>	<i>deviance</i>	$\Delta\chi^2$	Δdf	<i>p</i>
a3	12	5104.4	5156.5	-2540.2	5080.4			
a1	17	5102.4	5176.3	-2534.2	5068.4	11.971	5	0.03519 *
a2	14	5104.0	5164.8	-2538.0	5076.0	4.3891	2	0.1114

afinal: Random slopes for control schedule as a function of participants were kept.

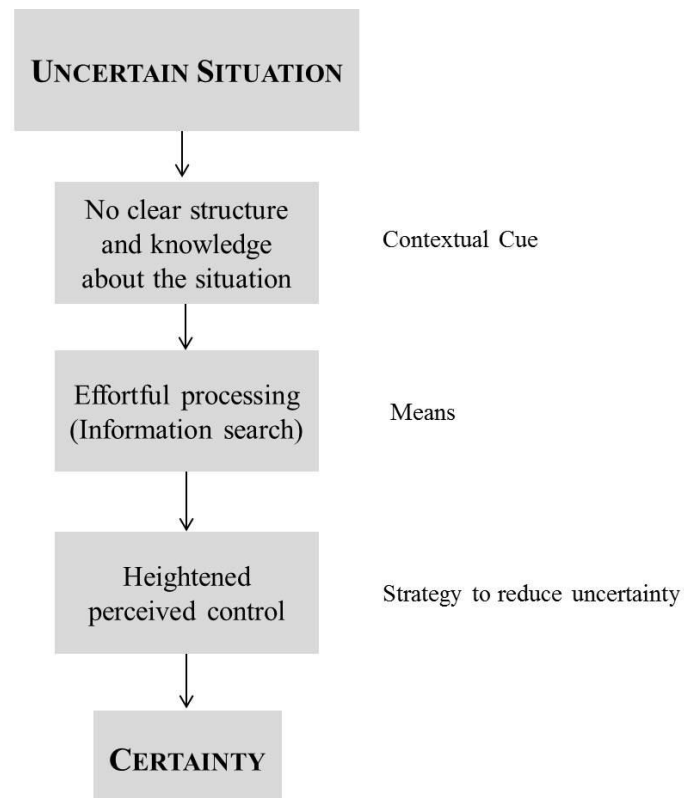


Figure 1. Conceptual model explaining how high NFC individuals may reduce uncertainty using effortful means leading to heightened perceived control in an uncertain situation with no proper structure

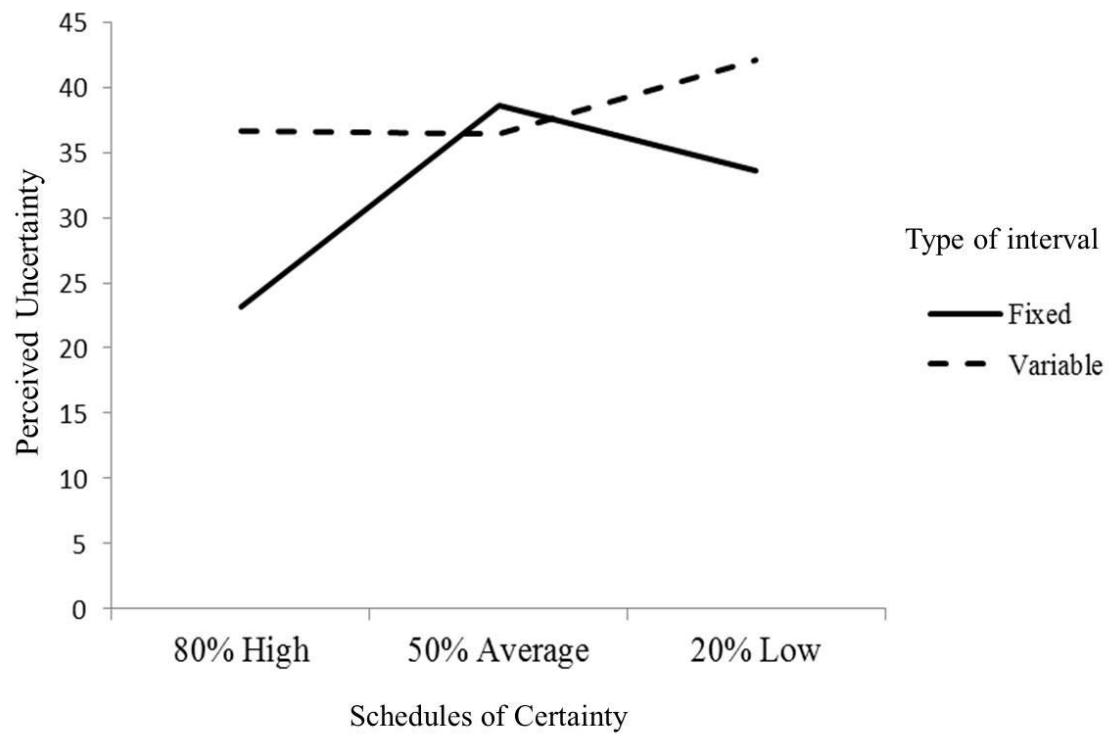


Figure 2: Interaction between schedules of certainty and type of interval on perceived uncertainty (Pilot Study)

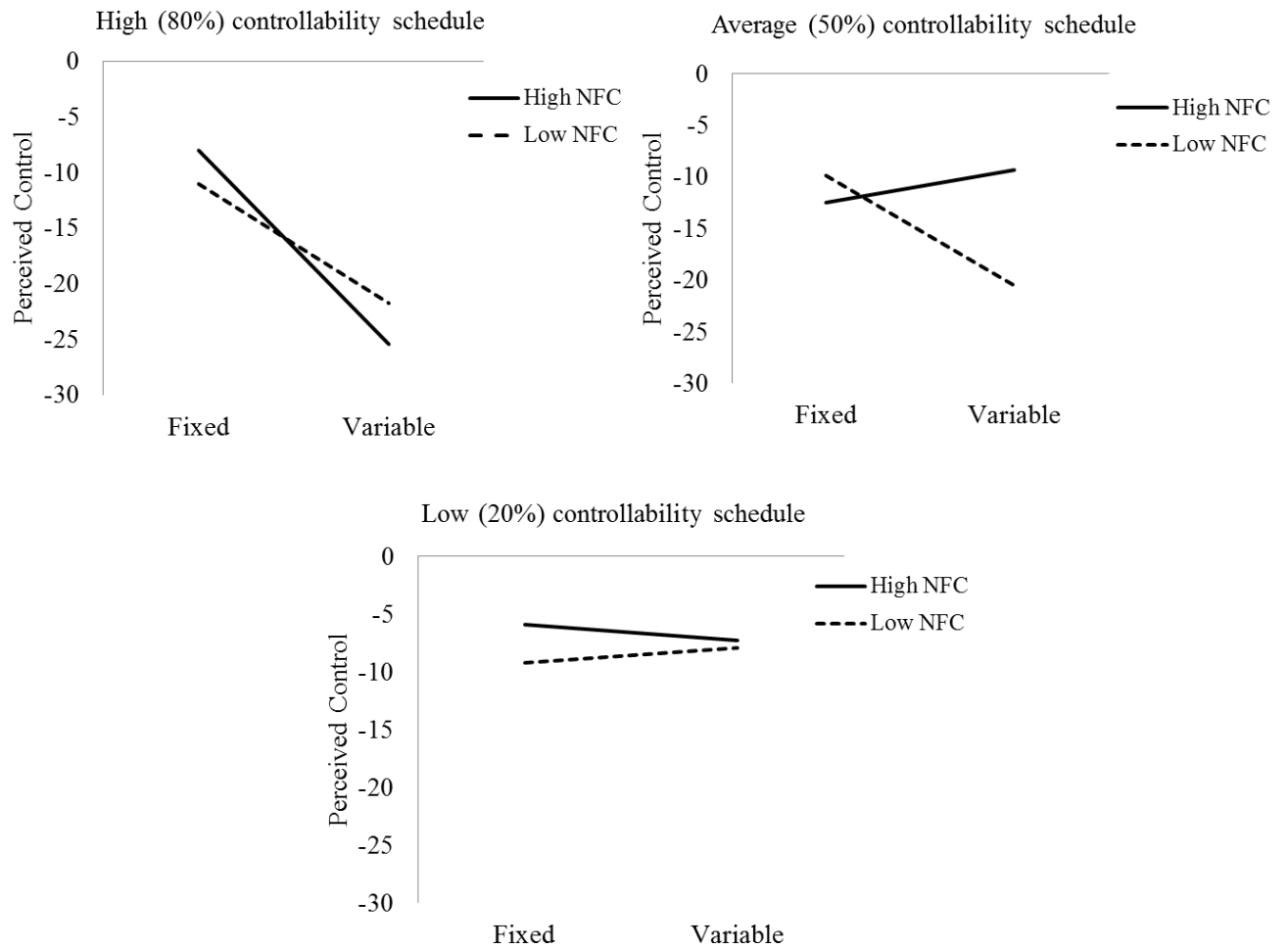


Figure 3: Three-way interaction of perceived control as a function of controllability schedules, ambiguity interval and NFC in Study 2.

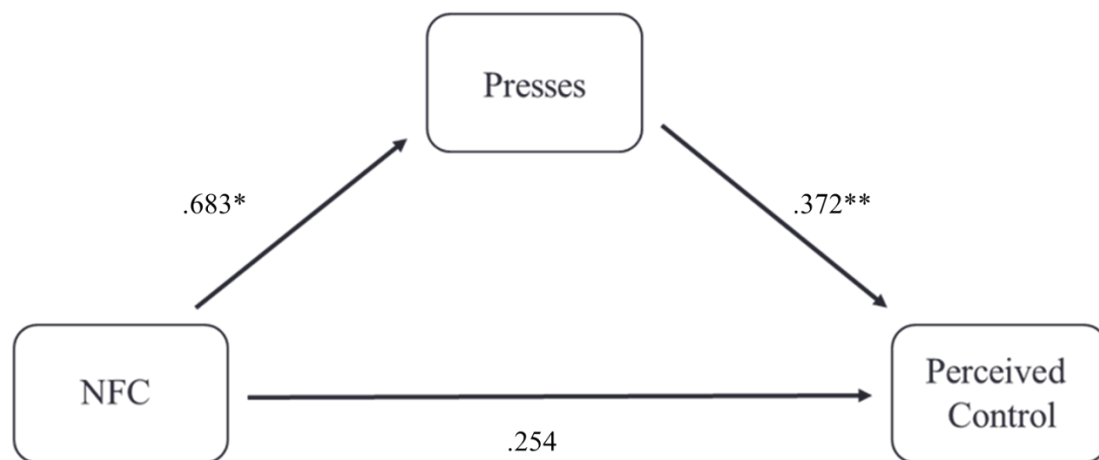


Figure 4: Mediation model of the relationship between NFC, presses, and perceived control in the 50% uncertainty conditions in Study 2

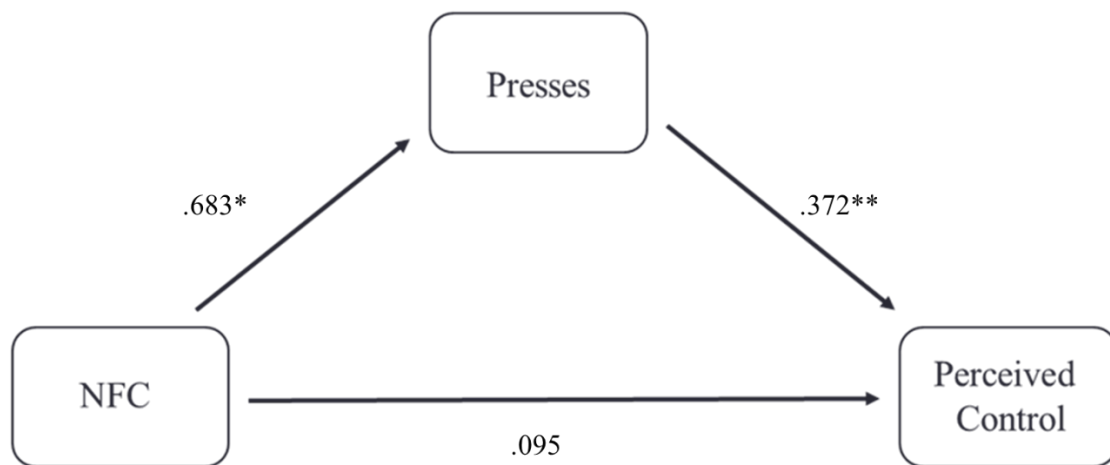


Figure 5: Mediation model of the relationship between NFC, presses, and perceived control in the 20% uncertainty conditions in Study 2