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ORIGINAL PAPER

Generalized Pliance in Relation to Contingency Insensitivity and Mindfulness

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Abstract

Conceptual accounts of pliance, a particular class of rule-governed behavior, propose that its generalization precipitates insensitivity to direct contingencies. Accordingly, a context of mindfulness has been theorized to influence the way in which rules function and facilitate effective contact with such contingencies. Despite the profound implications of these conceptualizations, there is a dearth of empirical support for their claims. This study aimed to investigate self-reported generalized pliance as a predictor of sensitivity to changing schedules of reinforcement and mindfulness. Forty young adults completed the Generalized Pliance Questionnaire (GPQ), Contingency-shifting variant Iowa Gambling Task (csIGT), Wisconsin Card Sorting Test (WCST), and Freiburg Mindfulness Inventory—Short Form. Analyses revealed that higher scores on the GPQ were predictive of lower mindfulness and sensitivity to changing contingencies on the csIGT and WCST with medium to large statistically significant effect sizes. The findings support the aforementioned conceptual accounts and have implications for novel research in mindfulness.

Keywords Mindfulness · Contingency insensitivity · Pliance · Rule-governed behavior

The ability to generate and follow rules allows human beings to respond effectively in contexts where learning through direct experience may be dangerous, override immediate consequences, and respond to delayed contingencies, but this evolutionary asset can undermine sensitivity to changes in the environment and produce aversive consequences that could have been avoided (McAuliffe et al. 2014; Törneke et al. 2008). Behavior under the control of rules or instructions, known as rule-governed behavior (Barnes-Holmes et al. 2001; Hayes et al. 1989b; Kissi et al. 2017; O'Hora and Barnes-Holmes 2004), can be distinguished from behavior under the control of direct contingencies in the environment (e.g., burning one's hand when touching a naked flame). Zettle and Hayes (-1982) proposed three types of rule-governed behavior: pliance, tracking, and augmenting. Pliance involves following a verbal rule based on a history of socially or speaker-mediated reinforcement for correspondence between the rule and relevant behavior (Hayes et al. 1989b). For example, if a mother tells her son, "wear a coat when you leave the house today," and he wears the coat under the control of apparent consequences from his mother for following or not following the rule—this is pliance (Hayes et al. 1989b). Conversely, tracking is rule-following under the control of a history of correspondence between the rule and the way in which the environment is arranged—independent of the delivery of the rule (Barnes-Holmes et al. 2001). Tracking is established in the behavioral repertoire by increasing sensitivity to the environmental contingencies of rule-following (Luciano et al. 2012). An example of tracking is the behavior of a person driving in a particular direction upon hearing, "drive straight for 500 yards, turn left and then you will see the gas station," assuming that this behavior is under the control of the correspondence between the rule and the actual location of the gas station (Törneke et al. 2008). Augmenting interacts with pliance and tracking to influence the degree to which events function as reinforcers or punishers (Hayes et al. 2001). For instance, if a friend says, "wouldn't a warm cup of coffee be nice right now?" and this statement increases or decreases the probability of drinking a cup of coffee, it is said to function as an augmental (Kissi et al. 2017). Research by Ju and Hayes (2008) assessed this type of rule-governed behavior and

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provided an experimental demonstration of augmental rule-following, as contact with the functions of a consequence (e.g., the warmth of the coffee) strengthened the behavior that gave rise to that consequence.

In contrast to pliance, tracking is sensitive to environmental contingencies, such that a change in these contingencies will lead to a corresponding change in behavior. In the experimental laboratory, for example, tracking the rule, "try to earn as many points on the task as you can," is exemplified by abandoning specific task instructions (e.g., "push the button rapidly to earn points") when they directly undermine participants' ability to earn as many points as possible on the task (McAuliffe et al. 2014). A learning history devoid of interactions for establishing tracking and contextualizing pliance predisposes an individual to generalized pliance (Luciano et al. 2012). Problems arise when pliance is over-generalized, as socially mediated consequences are less predictable and controllable than other types of consequences (Törneke et al. 2008). Moreover, this dominance of socially mediated reinforcement precipitates insensitivity to direct contingencies. Although the insensitivity to environmental contingencies precipitated by pliance is adaptive in some contexts (e.g., instructions given to children are often intended to reduce sensitivity to environmental contingencies), when generalized across situations, it increases the likelihood of the person losing contact with sources of positive reinforcement and entering loops of negative reinforcement (Ruiz et al. 2018).

Early studies investigating the effects of rule-governed behavior on insensitivity to changing contingencies of reinforcement demonstrated that verbal instructions impaired adaptation to changes in experimental contingencies (Hayes et al. 1986; Matthews et al. 1977; Rosenfarb et al. 1992; Shimoff et al. 1981). More recently, Monestès et al. (2017) found that this insensitivity effect transferred to stimuli that were never directly associated with the rule. Empirical work has also shown that instructions led to greater contingency insensitivity in participants with a history of delusional ideas (Monestès et al. 2014) and those self-reporting psychological rigidity as a pervasive response style (Wulfert et al. 1994) relative to control participants. Similarly, studies have investigated whether sensitivity to changing environmental contingencies differed as a function of pliance versus tracking instructions and depressive symptomology (high vs. low levels). McAuliffe et al. (2014) showed that participants with high levels of depressive symptoms who were provided with pliance instructions were significantly less likely to adapt their responding in accordance with new reward and punishment contingencies than those in tracking or low depressive symptoms (pliance or tracking) conditions. On the contrary, a study by Baruch et al. (2007) revealed no statistically significant difference in schedule sensitivity between participants provided with pliance or tracking instructions.

Previous studies have highlighted the difficulties inherent in experimentally manipulating pliance (Baruch et al. 2007; Donadeli and Strapasson 2015; Reese 1989), as participants' learning histories can easily interfere with their instruction-following performance. In accordance, a review by Kissi et al. (2017) concluded that the experimental research investigating pliance is extremely limited. This review called for future research to implement alternative procedures to enhance the ecological validity of the empirical literature on pliance. Accordingly, Ruiz et al. (2018) recently developed a self-report measure of generalized pliance: the Generalized Pliance Questionnaire (GPQ). Although the validity of this measure relies on respondents' awareness and willingness to report on the degree to which they emit this type of rule-governed behavior, findings from psychometric evaluations of the GPQ support conceptual accounts of generalized pliance (Luciano et al. 2012; McAuliffe et al. 2014; Plumb et al. 2009), as the measure has demonstrated medium to strong positive correlations with cognitive fusion, experiential avoidance, and depressive symptomology as well as a negative correlation with values-congruent living (Ruiz et al. 2018). In contrast to the assumption that responses on a psychometric questionnaire reveal something about the true nature of personality or character (Ciarrochi et al. 2016), responses on the GPQ are not assumed to reflect a latent, unchanging trait. Rather, pliance is viewed as rule-governed behavior and, like all behavior, understood and influenced by the context in which it occurs.

Theoretical models in this behavioral tradition propose manipulating contextual factors as a means of diminishing problematic rule-following (Ciarrochi et al. 2016). That is, changing whatever comes before the behavior (i.e., antecedents) and whatever follows it (i.e., consequences). Contextual cognitive behavioral therapies (Hayes et al. 2011), for example, use consequence-focused strategies to influence behavior (Hofmann and Asmundson 2008; Needleman and Cushman 2010). Accordingly, the psychological flexibility model emphases creating a context of mindful engagement to diminish destructive rule-following (Hayes et al. 2012a). Although there is no consensus on a definition of mindfulness (Van Dam et al. 2017), numerous conceptualizations emphasize moment-to-moment awareness (e.g., Kabat-Zinn 2005). Accordingly, Langer (2000) defines mindfulness as a flexible state of mind which is characterized by active engagement in the present, noticing new things and sensitivity to context. Conversely, mindlessness is characterized by rigidity—behaving like an automaton programmed to act based on the sense behavior made in the past, rather than the present (Langer 2000). Indeed, Gardner and Moore (2007) proposed that mindfulness may act as a foil for the aforementioned insensitivity effect as it, "enhances the individual's sensitivity to cues and contingencies in the environment and thus promotes greater behavioral flexibility" (p. 37). Accordingly, a context

of mindfulness has been theorized to influence the way in which rules function and facilitate effective contact with direct contingencies in the environment (Hayes et al. 1989a; Hayes et al. 2012b). In this context, individuals are less likely to rigidly follow maladaptive rules that are out of contact with direct consequences (i.e., pliance) and more likely to derive adaptive rules from their own contact with environmental contingencies (i.e., tracking; Hayes et al. 2012b; Poppen 1989; Törneke et al. 2008). Indeed, a research by McHugh et al. (2012) manipulated this context with a mindfulness induction procedure and observed individuals demonstrating greater sensitivity to changing environmental contingencies relative to those who received an active control procedure.

The current study aimed to investigate self-reported generalized pliance as a predictor of sensitivity to changing schedules of reinforcement and mindfulness in generalized contexts. It was hypothesized that increased scores on the GPQ would significantly predict increased perseverative errors on the Wisconsin Card Sorting Test as well as decreased scores on the Contingency-shifting variant Iowa Gambling Task and Freiburg Mindfulness Inventory—Short Form.

Method

Participants

An a priori power analysis was conducted in G*Power (Faul et al. 2009) to determine the required sample size for the study. In accordance with earlier relevant research (Steingroever et al. 2013), the analysis revealed that 40 participants were required to provide 80% statistical power to detect a medium effect size ($r = 0.38$) at $\alpha = 0.05$. This non-probability sample of 40 university students was recruited through the University College Dublin, School of Psychology Research Participation System and posters in local businesses. Of the university students who participated in the study, 52.50% ($N = 21$) identified as male and 47.50% ($N = 19$) identified as female, with ages ranging from 18 to 36 (M age = 22.17, SD age = 4.16). Participants had completed a mean of 16.60 (SD = 2.02) years of education.

Procedure

The University College Dublin Research Ethics Committee approved the study procedures which were performed in accordance with the Declaration of Helsinki (World Medical Association 2013). In accordance with Simmons et al. (2012), we report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. All persons provided informed consent prior to their inclusion in the study. Participants completed the study measures in a sound-attenuated booth: socio-demographic questionnaire, the GPQ, the Freiburg Mindfulness Inventory—Short Form (FMI-SF), and the WCST followed by the csIGT. Participation took approximately 35 min and participants received research participation credit for taking part in the study.

Measures

The Wisconsin Card Sorting Test A computer-administered version of the WCST (Berg 1948; Grant and Berg 1948) assessed participants' ability to modify their responding to changing environmental contingencies. Throughout the test, participants were presented with four stimulus cards: the first featured a red triangle, the second featured two green stars, the third featured three yellow crosses, and the fourth featured four blue circles. On each of the 128 test trials, participants were provided with a response card featuring a design similar to the stimulus cards but varying in color, shape, and number. The participants were instructed to match each response card to a stimulus card and corrective feedback was provided after each trial. This sorting rule changed repeatedly and without warning throughout the task. The number of perseverative errors the participant makes before discovering the new sorting rule provides an index of rigidity (Schultz and Searleman 2002). The WCST has demonstrated excellent interrater reliability (Axelrod et al. 1992; Greve 1993) as well as criterion validity in predicting clinically significant behaviors characterized by perseverative rigidity (Lacerda et al. 2003; Tchanturia et al. 2012).

The Contingency-Shifting Variant Iowa Gambling Task A computerized version of the csIGT (Dymond et al. 2010; Turnbull et al. 2006) measured the rapidity with which participants could adapt their behavior to new reward and punishment contingencies. The task consisted of 11 blocks of 20 trials each. On each trial, participants selected a card from the four available decks with the goal of maximizing profits. The first five blocks of the task familiarized participants with the basic reward and punishment contingencies: decks A and B were disadvantageous, whereas decks C and D were advantageous. The contingency-shifting phases occurred during the final six blocks of the task. In these phases, the reward and punishment contingencies of the decks were systematically modified: decks A and D, A and B, and B and C became advantageous at the beginning of blocks 6, 8, and 10, respectively. The csIGT demonstrates external validity in reflecting the fluctuating and complex nature of real-world experience (Dymond et al. 2010) and can differentiate between individuals who present with mental disorders which exemplify psychological rigidity and those who do not (Cella et al. 2010; Turnbull et al. 2006).

The Generalized Pliance Questionnaire The GPQ (Ruiz et al. 2018) is an 18-item self-report measure of generalized pliance. Items are rated on a seven-point Likert-type scale, ranging from 1 (*never true*) to 7 (*almost always*), with higher scores (range 18–126) reflecting increased dominance of pliance over the respondent's behavioral repertoire. A sample item is "hard work is only worth it if people recognize it." A psychometric evaluation of the GPQ found the measure to demonstrate criterion validity, with evidence of concurrent validity (Ruiz et al. 2018). The English version of the GPQ was developed for the current study in accordance with the Guidelines for the Translation and Adaptation of Tests (Hambleton 2001). The original GPQ was translated from Spanish to English by the authors. The back translation was independently performed by a professional translator with no knowledge of the research area. Discrepancies were resolved through consensus. The English version of the GPQ exhibited a high level of internal consistency in this study ($\alpha = 0.93$).

The Freiburg Mindfulness Inventory—Short Form The FMI-SF (Walach et al. 2006) is a 14-item self-report measure of mindfulness in generalized contexts. Items are rated on a 4-point scale, ranging from 1 (*rarely*) to 4 (*almost always*), with higher scores (range 14–56) indicative of greater mindful awareness. A sample item is "when I notice an absence of mind, I gently return to the experience of the here and now." Research by Kohls et al. (2009) supported the criterion validity of the FMI-SF. The inventory has also demonstrated construct validity through correlations with measures of similar constructs (Walach et al. 2006). The FMI-SF displayed an acceptable level of internal consistency in the present study ($\alpha = 0.85$).

Data Analyses

Three simple regression analyses were planned to test the hypotheses. Total scores on the GPQ served as the predictor variable in each regression model. Criterion variables included scores on the FMI-SF, csIGT, and WCST. In order to reduce risk of bias, task scoring was determined a priori. Participants' perseverative errors are the most commonly used measure on the WCST (Hsieh et al. 2010; Strauss et al. 2006) and were calculated by summing the number of responses that involved perseveration of a previously successful strategy despite negative feedback signaling that the rules of the test had changed. In accordance with previous studies that administered the csIGT (Cella et al. 2010; Dymond et al. 2010), mean net scores on the contingency-shifting phases were calculated by subtracting participants' frequency of disadvantageous choices from their advantageous choices. Mean net scores above zero reflect advantageous choices, while scores below zero reflect disadvantageous choices.

Data Availability Data and materials (i.e., task instructions and original questionnaire measures) used in this research are publicly available on the Open Science Framework: https://osf.io/46qj9/

Results

Descriptive statistics for participants' scores on the csIGT, WCST, GPQ, and FMI-SF are presented in Table 1. Bivariate correlations between the aforementioned measures are shown in Table 2.

Generalized Pliance and Perseverative Errors A simple linear regression was calculated to predict failure to modify responding after negative feedback, as measured by perseverative errors on the WCST, based on self-reported generalized pliance, as measured by the GPQ. The GPQ was a statistically significant predictor of perseverative errors on the WCST, $R^2 = 0.31$, 95% CI [0.09, 0.54], $F(1, 38) = 17.45$, $p < .001$, indicating that self-reported generalized pliance accounted for 31% of the variance in failure to modify responding after negative feedback.

Generalized Pliance and Contingency-Shift Learning Linear regression analysis was conducted to assess self-reported generalized pliance as a predictor of rapidity in adapting behavior to new reward and punishment contingencies, as measured by mean net scores on the contingency-shifting phases of the csIGT. The analysis revealed that the GPQ made a statistically significant contribution to predicting scores on the csIGT, $R^2 = 0.21$, 95% CI [0.00, 0.43], $F(1, 38) = 10.29$, $p = .003$, suggesting that 21% of the variance in task performance was accounted for by self-reported generalized pliance.

Generalized Pliance and Mindfulness A simple linear regression was calculated to predict mindfulness in generalized contexts, as measured by the FMI-SF, based on self-reported generalized pliance. The GPQ was a statistically significant

Table 1 Summary of ranges of number of cases, means, and standard deviations for scores on the GPQ, WCST, csIGT, and FMI-SF

Measure	Scale	Range	*N*	*M*	SD
GPQ	Total score	29–105	40	66.85	18.83
WCST	Perseverative errors	6–26	40	15.33	4.76
csIGT	Mean net score	− 36–102	40	14.25	37.65
FMI-SF	Total score	21–50	40	36.10	7.52

csIGT the Contingency-shifting variant Iowa Gambling Task, *FMI-SF* the Freiburg Mindfulness Inventory—Short Form, *GPQ* the Generalized Pliance Questionnaire, *WCST* the Wisconsin Card Sorting Test

Table 2 Summary of intercorrelations for scores on the GPQ, WCST, csIGT, and FMI-SF

Measure	1	2	3	4
1. GPQ	–	0.561** [0.30, 0.74]	− 0.462** [− 0.68, − 0.18]	− 0.469** [− 0.68, − 0.18]
2. WCST		–	− 0.199 [− 0.48, 0.12]	− 0.106 [− 0.40, 0.21]
3. csIGT			–	0.384* [0.08, 0.62]
4. FMI-SF				–

csIGT the Contingency-shifting variant Iowa Gambling Task, *FMI-SF* the Freiburg Mindfulness Inventory—Short Form, *GPQ* the Generalized Pliance Questionnaire, *WCST* the Wisconsin Card Sorting Test. * $p < .05$. ** $p < .01$. 95% confidence intervals are in brackets

predictor of scores on the FMI-SF, $R^2 = 0.22$, 95% CI [0.01, 0.43], $F(1, 38) = 10.69$, $p = .002$, indicating that self-reported generalized pliance accounted for 22% of the variance in participants' levels of mindfulness.

Discussion

This study aimed to investigate self-reported generalized pliance as a predictor of sensitivity to changing environmental contingencies and mindfulness. In accordance, a large statistically significant positive relationship was found between self-reported generalized pliance and response perseveration despite changing schedules of reinforcement on the WCST. Similarly, participants' self-reported level of generalized pliance significantly predicted their rapidity in adapting behavior to new reward and punishment contingencies on the csIGT with a medium effect size. Further, in line with hypotheses, a medium statistically significant negative relationship was found between self-reported generalized pliance and mindfulness in generalized contexts.

These findings support existing conceptual accounts of the sequelae of generalized pliance. According to Törneke et al. (2008), enormous advantages accrue from pliance as it can reduce sensitivity to other environmental contingencies in situational contexts in which learning through direct experience may be disadvantageous. However, when pliance is over-generalized, it is theorized to impede successful tracking and to promote hypersensitivity to socially mediated reinforcement—rendering the individual vulnerable to social whim. Consequently, sensitivity to direct contingencies is diminished. Consistent with this assertion, participants in the current study who reported elevated levels of pliant rule-following demonstrated diminished sensitivity when contingencies were intermittently changed without notice on the WCST and csIGT. Moreover, a context of mindfulness has been proposed to influence the way in which rules function and facilitate effective contact with direct environmental contingencies (Hayes et al. 1989a; Hayes et al. 2012b). This proposition concurs with the negative relationship found between mindfulness and self-reported generalized pliance in the current study. These theoretically consistent findings provide preliminary support for participants' self-awareness of generalized pliance and willingness to report on the degree to which they emit this type of rule-governed behavior.

The insensitivity to changing environmental contingencies exhibited by participants who reported elevated levels of pliant rule-following in the current study is broadly consistent with the insensitivity effect demonstrated by participants with high levels of depressive symptoms who were provided with pliance instructions in a study by McAuliffe et al. (2014). However, differences in study design (i.e., experimental; cross-sectional) and population (i.e., adolescents with high levels of depressive symptoms; university students) limit comparisons with the current study. Conversely, the non-significant effect of manipulations in pliance instructions on schedule sensitivity in a study by Baruch et al. (2007) is somewhat discordant with the current findings. This disparity may be attributable to differences in the studies' procedural approach to pliance: Baruch et al. reported difficulties in experimentally evoking pliance in university students, whereas the current study investigated self-reported pliant rule-following in a cross-section of university students. A further noteworthy departure from the aforementioned studies is that participants in the current study familiarized themselves with the tasks' basic reward and punishment contingencies through trial-and-error learning, while those in the previous research had their behavior instructed. Moreover, no statistically significant correlation was found between performances on the WCST and csIGT in the current study. Heterogeneity in the tasks' cognitive demands and emotional outcomes may account for this disparity, as the WCST places greater cognitive demands on participants while the csIGT may provide more emotionally powerful feedback (Turnbull et al. 2006). The methodological heterogeneity between the previous research and the current study helps to answer the call of a recent systematic review by Kissi et al. (2017) for future research to implement alternative procedures to advance this research agenda.

Limitations and Future Research

The limitations of the current study should be taken into consideration when making inferences from its results. Firstly, the study revealed that increased self-reported generalized pliance

is predictive of decreased sensitivity to changing schedules of reinforcement but did not provide evidence of causation. Therefore, inferences from the current findings are limited by the bidirectionality problem and the third-variable problem. Secondly, the interpretation of this study's findings used pliance as a key explanatory concept, but this premise may, at present, have insufficient support from experimental studies (Kissi et al. 2017). Thirdly, the sample in this study consisted exclusively of university students, thus limiting the generalizability of the findings to other populations. Replicating this study's results in more diverse samples would enhance the generalizability of the findings. Fourthly, the study relied on self-report measures of generalized pliance and mindfulness. Consequently, response biases such as socially desirable responding—impression management and self-deceptive enhancement—may have affected the current findings.

With these limitations in mind, the current findings have implications for future research. Given that increased self-reported generalized pliance has been shown to be predictive of decreased sensitivity to changing environmental contingencies in this study and previous studies have highlighted the difficulties inherent in experimentally manipulating pliance (Baruch et al. 2007; Donadeli and Strapasson 2015; Reese 1989), future studies could advance this research agenda by testing the hypothesis that individuals who present with psychological problems which exemplify this pattern of perseveration despite directly experienced adverse consequences (e.g., delusions; Monestès et al. 2014) exhibit significantly higher scores on the GPQ than those who do not. Another avenue for future research is to investigate the current study's assumption that the csIGT and WCST are measures of the latent variable of insensitivity to changing environmental contingencies and its relationship to mindfulness. This hypothesis could be tested with confirmatory factor analysis in a larger sample size (Harrington 2009). Furthermore, the negative relationship between mindfulness and self-reported generalized pliance suggests that the latter could be investigated as a mediator of change in future research studies of mindfulness-based interventions. These studies will help facilitate a greater understanding of rule-governed behavior and calculate the price we pay for this evolutionary asset.

Author Contributions MOC: Study design, statistical analysis, and manuscript preparation.
PB: Study design, data collection, and statistical analysis.
FJR: Study design and manuscript preparation.
LMH: Study design, statistical analysis, and manuscript preparation.
Martin O'Connor and Philip Byrne are joint first authors.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval Ethical approval for the study was provided by the University College Dublin Research Ethics Committee. All procedures performed were in accordance with the ethical standards of the institutional and/or national research committee and with the Declaration of Helsinki or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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