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Exploring the relationships between rule-governed behavior and adherence to guidelines aiming to reduce the spread of COVID-19☆

Alison Stapleton [1], Conor McCloskey [1,*], Louise McHugh

School of Psychology, University College Dublin, Belfield, Dublin 4, Ireland

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ABSTRACT

Research demonstrates that socially mediated consequences impact adherence to health mandates during pandemics. However, no published research has examined whether adherence varies based on the extent to which an individual relies on arbitrary social approval (i.e., displays generalized pliance). The present study explored the relationships between adherence to COVID-19 public health measures, two types of rule-following (pliance and tracking), and perceived peer behavior in a sample of adults (n = 288). Findings revealed that adherence was negatively correlated with generalized pliance and tracking was unrelated to adherence. Pliance did not moderate the relationship between peer adherence and individual adherence. Findings are discussed with reference to the need to develop easily adaptable and context sensitive measures of types of rule-following, in addition to a measure of social tracking.

1. Introduction

In response to the COVID-19 pandemic, authorities implemented a series of public health measures to promote and enforce transmission-reducing behaviors (West et al., 2020). Researchers have sought to examine how individuals respond to these new rules and to identify factors that impact adherence (Stapleton, 2020). A sizable body of literature demonstrates that socially mediated consequences (i.e., social pressure, perceived social norms, and the extent to which the social community endorses or condemns behavior) can impact adherence to public health guidelines during pandemics (Braunack-Mayer et al., 2013; Cava et al., 2005; Desclaux et al., 2017; Webster et al., 2020; Young & Goldstein, 2021). However, no published research has examined whether adherence varies based on the extent to which an individual relies on, or is motivated by, arbitrary social approval.

In accordance with relational frame theory, pliance refers to rule-following under the control of a history of socially mediated reinforcement for a correspondence between behavior and rules (Barnes-Holmes et al., 2001; Hayes et al., 1998). Simply put, pliance is motivated by arbitrary socially mediated consequences that arise from the speaker/social community detecting that a rule has been followed. If a social community fails to appropriately contextualize pliance for an individual, then pliance will become generalized and dominate an individual's behavioral repertoire (Ruiz et al., 2019); individuals displaying generalized pliance are particularly dependent on arbitrary social approval (Törneke et al., 2008).

Distinct from pliance within this account, tracking refers to rule-following under the control of an apparent correspondence between a rule and the way the environment is arranged, independent of the delivery of the rule (Barnes-Holmes et al., 2001; Hayes et al., 1998). With tracking, consequences are natural and non-arbitrary (Hayes et al., 1998; Ruiz et al., 2019). It is the precise form of the listener's behavior in a given context (i.e., not a social detection that rule-following has occurred) that allows the listener to contact the consequences of following the rule (Barnes-Holmes et al., 2001).

While the consequences of tracking may be social (i.e., when a rule is followed to contact natural non-arbitrary social consequences) (Waldeck et al., 2019), social approval serves as the main source of reinforcement for individuals displaying generalized pliance. Therefore, for individuals displaying generalized pliance, adherence or non-adherence to public health measures would likely depend on both the presence of arbitrary socially mediated consequences and perceived peer behavior surrounding the restrictions. To illustrate this, consider an individual who removes their face covering when they are alone at the office. They

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* Corresponding author.
E-mail address: conor.mccloskey@ucdconnect.ie (C. McCloskey).
[1] Alison Stapleton and Conor McCloskey are joint first authors.

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may do so due to the natural consequences of being at a low risk of acquiring or transmitting COVID-19 given that there are no other people present (i.e., tracking). Alternatively, this individual may remove their mask because they know that they will not get in trouble since their boss is not around to catch them (i.e., pliant adherence relies on consequences being added [usually by 'others'] and thus may not persist in the absence of such speaker-mediated consequences). A paucity of published research has examined the impact of perceived peer behavior on adherence to COVID-19 restrictions; the available research suggests that self adherence is positively correlated with perceived peer adherence and apparent approval from peers for adhering (Martínez et al., 2021; Nivette et al., 2021). However, to date, no published research has examined this with regard to the extent to which participants rely on social approval (i.e., display/report generalized pliance).

The present study examines the relationships between adherence to COVID-19 restrictions, classes of rule-governed behavior (i.e., pliance and tracking), and perceived peer behavior. It is hypothesized that perceived peer behavior will be positively correlated with adherence to COVID-19 restrictions, and that peer behavior will be a statistically significant predictor of adherence to COVID-19 restrictions among individuals reporting greater generalized pliance. Given the dearth of research on this topic, no further formal predictions were made (i.e., remaining analyses around the relationships between types of rule-following and adherence in the overall sample were exploratory in nature).

2. Materials and methods

2.1. Participants

Participants were recruited through the University College Dublin Research Participation System and advertisements on social media. Participants were 288 adults identifying as female ($n = 190$), male ($n = 89$), and non-binary ($n = 1$) aged 18–75 years ($M = 29.73$, $SD = 14.456$, $Skew = 1.496$). The sample identified primarily as Caucasian (85.1%, Asian: 6.9%, Black: 2.4%, Multiracial: 2.1%, Arab: 1.7%, Other: 1.4%, Latino: 0.3%). The highest level of educational qualification that most participants had acquired was school-level (45.5%, undergraduate degree: 37.8%, Master's Degree: 13.5%, Doctorate: 2.8%, Post-Doctorate: 0.3%). Most participants were currently employed ($n = 152$) and/or were currently students ($n = 197$).

2.2. Procedure

Ethical approval for the present study was granted by the University College Dublin Research Ethics Committee and procedures were performed in accordance with the Declaration of Helsinki (World Medical Association, 2013). All participants provided informed consent prior to their inclusion in the study. Participants completed questionnaire measures of adherence to guidelines aiming to reduce the spread of COVID-19 (variable named 'overall adherence'), types of rule-following (pliance and tracking), and perceived peer behavior. Participants completed this study online. No compensation was provided to participants for participation.

2.3. Measures

2.3.1. Adherence to guidelines aiming to reduce the spread of COVID-19

In line with similar research (Graupensperger et al., 2021), participants rated on a scale of 1 (*never*) to 5 (*very often*) how often they engaged in five behaviors related to the current guidelines and restrictions (i.e., reusing face coverings, changing face coverings as required, storing face coverings incorrectly, traveling outside permitted distances, and attending non-permitted social gatherings). These five ratings were summed for each participant to compute an overall adherence total score. Overall adherence total scores were calculated by summing participants' responses to each of the five items and reverse scoring items indicating non-adherence, such that higher scores indicated greater adherence to guidelines. This scale displayed an adequate level of internal consistency in the present study ($\alpha = 0.654$).

2.3.2. Generalized pliance

The Generalized Pliance Questionnaire (GPQ; Ruiz et al., 2019) is a 9-item measure of generalized pliance. Items such as "Hard work is only worth it if people recognize it" are rated on a 7-point scale ranging from 1 (*never true*) to 7 (*always true*), with higher scores indicative of greater generalized pliance. Research has supported the factor structure, convergent validity, and reliability of the GPQ (Ruiz et al., 2019). Generalized pliance scores were calculated in accordance with scoring procedures outlined by Ruiz et al. (2019) with scores being summed and higher scores being indicative of greater pliance. The GPQ displayed a good level of internal consistency in the present study ($\alpha = 0.892$).

Based on existing clinical prompts designed to tap into generalized pliance (Villatte et al., 2016), participants also rated their agreement with the following 'stand alone' item on a scale of 1 (*strongly disagree*) to 5 (*strongly agree*): "If I knew that no one would ever find out, I would break the restrictions". Individuals who strongly agree with this item are more likely to be pliantly adhering to guidelines (i.e., not adhering based on the natural consequences of adherence that would occur regardless of the verbal community's awareness of their adherence).

2.3.3. Generalized tracking

The Generalized Tracking Questionnaire (GTQ; Ruiz et al., 2020) is an 11-item measure of tracking. Items such as "I make decisions based on my experience and not on what others say" are rated on a 7-point scale ranging from 1 (*never true*) to 7 (*always true*), with higher scores indicative of greater tracking. Research has supported the factor structure, convergent validity, and reliability of the GTQ (Ruiz et al., 2020). Generalized tracking scores were calculated in accordance with scoring procedures outlined by Ruiz et al. (2020) with scores being summed and higher scores being indicative of greater tracking. The GTQ displayed a good level of internal consistency in the present study ($\alpha = 0.869$).

2.3.4. Perceived self and peer adherence behavior

Similar to existing research (Graupensperger et al., 2021), on a scale of 1 (*not at all adhering*) to 5 (*fully adhering*), participants rated the extent to which (a) they (i.e., self-rated adherence; perceived self adherence), (b) their friends, (c) their family, and (d) someone they were close with whose opinion mattered to them were adhering to the current restrictions.

2.4. Data analysis and management

An *a priori* power analysis conducted in G*Power (Faul et al., 2007) revealed that 84 participants were required for 80% statistical power to detect a medium effect size ($r = 0.3$) at $\alpha = 0.05$. Participants with incomplete responses to any of the measures ($n = 8$) were excluded from analyses. Given that the present mean generalized pliance total score was higher than those observed in previous similar research (Ruiz et al., 2019), participants who scored greater than or equal to one standard deviation above (40.665) and participants who scored less than or equal to one standard deviation below (22.015) the present mean generalized pliance total score were categorized as displaying high ($n = 47$) and low ($n = 48$) generalized pliance respectively. Kolmogorov-Smirnov tests indicated that only generalized pliance total scores were normally distributed within the sample, $D(280) = 0.041$, $p = .2$. Thus, data were predominantly analyzed using a series of Spearman's rank-order correlations. Bias-corrected and accelerated (BCa) 95% confidence intervals were computed for the correlation coefficients based on 1000 bootstrap samples.

Table 1
Descriptive statistics for measures of generalized pliance, tracking, overall adherence, and perceived self and peer adherence behavior across the three samples.

Sample	Measure	*M*	*SD*	*Min*	*Max*	*Skew*
Total sample (n = 288)	GPQ	31.34	3.921	9	54	.082
	GTQ	55.33	7.760	34	77	.124
	Overall adherence	16.37	4.162	5	25	-.056
	Adherence-specific pliance	2.17	1.108	1	5	.859
	PaSelf	5.12	.919	2	6	−1.274
	PaFriends	4.33	1.029	2	6	-.307
	PaFamily	5.02	.978	1	6	−1.054
High GP sample (n = 47)	GPQ	45.62	3.921	41	54	.596
	GTQ	53.66	8.613	34	72	.099
	Overall adherence	16	4.379	7	24	-.112
	Adherence-specific pliance	2.17	1.176	3	5	.683
	PaSelf	5.19	.741	3	6	-.661
	PaFriends	4.23	.890	2	6	-.296
	PaFamily	5.11	.866	2	6	−1.262
Low GP sample (n = 48)	GPQ	17.71	3.626	9	22	-.869
	GTQ	58	7.965	43	77	.336
	Overall adherence	17.19	5.085	6	25	-.328
	Adherence-specific pliance	2	1.22	1	5	1.099
	PaSelf	5.15	1.111	2	6	−1.369
	PaFriends	4.38	1.231	2	6	-.341
	PaFamily	5.21	1.051	1	6	−1.814
	PaClose	4.54	1.352	1	6	-.658

Notes. GPQ = Generalized Pliance Questionnaire-9, GTQ = Generalized Tracking Questionnaire, Overall Adherence = Total Scores on the Adherence to Guidelines Aiming to Reduce the Spread of COVID-19 measure, PaSelf = Perceived Self Adherence, PaFriends = Perceived Adherence of Friends, PaFamily = Perceived Adherence of Family, PaClose = Perceived Adherence of a Close Person whose Opinion Matters.

3. Results

3.1. Descriptive statistics

Complete descriptive statistics of the study variables are presented below in Table 1.

3.2. Testing the relationships between types of rule-following and overall adherence

A series of exploratory two-tailed Spearman's correlations were used to examine the relationships between pliance, tracking, and overall adherence. Overall adherence total scores were statistically significantly negatively correlated with generalized pliance total scores. The magnitude of this relationship was small. Overall adherence was moderately statistically significantly negatively correlated with responses to the adherence-specific single-item measure of pliance ("If I knew that no one would ever find out, I would break the restrictions"). Overall adherence did not correlate significantly with tracking. Complete correlation coefficients from these analyses (in addition to a summary of intercorrelations) are presented in Table 2.

3.3. Testing the relationships between perceived peer behavior and overall adherence

A series of one-tailed Spearman's correlations were used to examine the relationships between perceived peer behavior and overall adherence. As hypothesized, positive statistically significant relationships were observed between overall adherence and perceived adherence of friends (PaFriends), family (PaFamily) and adherence of somebody close whose opinion matters (PaClose). The magnitude of these relationships was small. A strong positive statistically significant relationship was observed between overall adherence and perceived self adherence. Complete correlation coefficients from these analyses are presented in Table 2.

3.4. Exploring differences among individuals reporting high versus low generalized pliance

To test the main hypotheses of this study, namely that peer behavior will be a statistically significant predictor of adherence to COVID-19 restrictions among individuals reporting greater generalized pliance, simple linear regression was used. Assumptions of normality, homoscedasticity, linearity and independence of observation were all met in the high and low generalized pliance samples prior to the regression analyses being performed. Simple linear regression revealed peer adherence was a significant predictor of adherence for individuals in the high, $t(46) = 2.897$, $p = .006$, and low generalized pliance groups, $t(47) = 3.356$, $p = .002$, with variance estimates indicating that 15.76% and 20.07% respectively of the variance in adherence among these groups was predicted by perceived peer behavior. A further *post hoc* moderation analysis with peer adherence as an independent variable, self adherence as the dependent variable, and generalized pliance as a moderating variable was conducted for the overall sample. This analysis revealed a significant main effect for adherence based on perceived peer behavior, t

Table 2
Summary of intercorrelation of measures of generalized pliance, tracking, overall adherence, and perceived self and peer adherence behavior.

Measure	2.	3.	4.	5.	6.	7.	8.
1. GPQ	-.185** [-.305, −.059]	-.121* [-.273, −.009]	.102* [-.026, .229]	-.037 [-.152, .074]	-.052 [-.175, .065]	-.101* [-.214, .012]	.128* [.007, .249]
2. GTQ	–	.035 [-.092, .144]	-.102* [-.230, .010]	.158** [.050, .264]	.085 [-.027, .195]	.104* [-.015, .217]	-.001 [-.122, .121]
3. Overall adherence		–	-.388** [-.489, −.272]	.499** [.396, .590]	.201** [.071, .322]	.236** [.133, .332]	.168** [.046, .281]
4. Adherence-specific pliance			–	-.416** [-.515, −.298]	-.235** [-.346, −.125]	-.170** [-.274, −.053]	-.228** [-.351, −.110]
5. PaSelf				–	.411** [.304, 501]	.408** [.303, 501]	.451** [.344, .550]
6. PaFriends					–	.179** [.053, .297]	.311** [.200, .427]
7. PaFamily						–	.342** [.226, .447]
8. PaClose							–

Notes. GPQ = Generalized Pliance Questionnaire-9, GTQ = Generalized Tracking Questionnaire, Overall Adherence = Total Scores on the Adherence to Guidelines Aiming to Reduce the Spread of COVID-19 measure, PaSelf = Perceived Self Adherence, PaFriends = Perceived Adherence of Friends, PaFamily = Perceived Adherence of Family, PaClose = Perceived Adherence of a Close Person whose Opinion Matters. **$p \leq .001$, *$p < .05$, Bias-corrected and accelerated (BCa) 95% confidence intervals are presented in brackets.

(287) = 7.515, $p < .000$ but no significant interaction effect, $t(287) = -0.197$, $p = .844$.

A further series of one-tailed Spearman's correlations were used to examine the relationships between overall adherence (total scores on the Adherence to Guidelines Aiming to Reduce the Spread of COVID-19 measure), perceived self adherence (PaSelf), and perceived peer adherence among individuals displaying high and low generalized pliance separately. Diverging from findings observed among the full sample, Perceived adherence of friends (PaFriends) was not associated with overall adherence among individuals with high or low generalized pliance. Perceived adherence of family (PaFamily) was statistically significantly positively correlated with overall adherence among individuals with high and low generalized pliance. Finally, overall adherence was statistically significantly positively correlated with perceived adherence of a close person whose opinion matters (PaClose) among individuals reporting high generalized pliance but not low generalized pliance. Complete correlation coefficients from these analyses (in addition to a summary of intercorrelations) are presented in Tables 3 and 4.

4. Discussion

The present study examined the relationships between adherence to COVID-19 restrictions, classes of rule-governed behavior (i.e., pliance and tracking), and perceived peer behavior. As hypothesized, and in line with previous research (Martínez et al., 2021; Nivette et al., 2021), the present findings revealed that perceived peer adherence was positively associated with overall adherence. Interestingly, overall adherence was negatively correlated with generalized pliance, suggesting that individuals who rely on arbitrary social approval as their main source of reinforcement were adhering less. One possible explanation for this relates to the nature of the restrictions. For example, in many cases, adherence requires isolation and minimizing social interaction, meaning socially mediated consequences are less readily accessible (Bu et al., 2020). Given that individuals displaying generalized pliance rely on these consequences, non-adherence may result from seeking out these reinforcers rather than appealing to other sources of reinforcement available in the environment. Alternatively, individuals' social communities may reinforce rule-breaking. For example, there may be apparent social pressure to not adhere or even resist health mandates (Braunack-Mayer et al., 2013; Forsyth, 2020).

The present findings also revealed that adherence was not related to tracking. However, it is important to note that tracking requires an individual to derive relationships between the rule and its corresponding natural consequences (Ruiz et al., 2020). The present study did not assess participants' understanding or knowledge of the rules, nor the apparent consequences of adherence for the individual. Furthermore, the present study did not employ an adherence-specific single-item measure of tracking, which may have increased measurement specificity. These are viable avenues for future research (for example, it may be the case that, relative to individuals who do not understand the rules and associated consequences, individuals that do are more likely to engage in tracking and adhere. This aligns with research by Al-Hasan et al. (2020), who observed that knowledge of COVID-19 was associated with greater adherence to measures).

Table 3
Summary of intercorrelation of measures of overall adherence, perceived self adherence, and peer adherence behavior in the high generalized pliance sample.

Measure	2.	3.	4.	5.
1. Overall adherence	.536** [.291, .722]	.091 [-.240, .365]	.270* [-.006, .513]	.379** [.074, .631]
2. PaSelf	–	.350** [.055, .578]	.481** [.194, .726]	.577** [.314, .782]
3. PaFriends		–	.433** [.170, .654]	.213 [-.117, .493]
4. PaFamily			–	.497** [.267, .681]
5. PaClose				–

Notes. Overall Adherence = Total Scores on the Adherence to Guidelines Aiming to Reduce the Spread of COVID-19 measure, PaSelf = Perceived Self Adherence, PaFriends = Perceived Adherence of Friends, PaFamily = Perceived Adherence of Family, PaClose = Perceived Adherence of a Close Person whose Opinion Matters. $^{**}p \leq .001$, $^{*}p < .05$, Bias-corrected and accelerated (BCa) 95% confidence intervals are presented in brackets.

Table 4
Summary of intercorrelation of measures of overall adherence, perceived self adherence, and peer adherence behavior in the low generalized pliance sample.

Measure	2.	3.	4.	5.
1. Overall adherence	.490** [.221, .703]	.205 [-.118, .491]	.381** [.099, .595]	.168 [-.190, .475]
2. PaSelf	–	.438** [.173, .658]	.556** [.317, .760]	.539** [.265, .761]
3. PaFriends		–	.264* [-.008, .503]	.390** [.030, .669]
4. PaFamily			–	.470 [.187, .681]
5. PaClose				–

Notes. Overall Adherence = Total Scores on the Adherence to Guidelines Aiming to Reduce the Spread of COVID-19 measure, PaSelf = Perceived Self Adherence, PaFriends = Perceived Adherence of Friends, PaFamily = Perceived Adherence of Family, PaClose = Perceived Adherence of a Close Person whose Opinion Matters. $^{**}p \leq .001$, $^{*}p < .05$, Bias-corrected and accelerated (BCa) 95% confidence intervals are presented in brackets.

The present study also explored differences among individuals displaying high versus low generalized pliance, hypothesizing that peer behavior would be a statistically significant predictor of adherence to COVID-19 restrictions among individuals reporting greater generalized pliance. Despite a statistically significant regression analysis supporting this hypothesis, a similar relationship was observed for participants reporting low generalized pliance and a subsequent moderation analysis revealed that peer behavior predicted adherence to COVID-19 restrictions irrespective of pliance. As such, this hypothesis was not supported. However, the present study did not manipulate social consequences for compliance/non-compliance, nor did the present study explore which plys were likely to be in play for the present participants. Although perceived peer behavior can serve as a proxy measure for plys, future research should endeavor to directly capture which plys participants are adhering to, if any.

Diverging from findings observed among the full sample, perceived adherence of friends was not associated with overall adherence among individuals with high or low generalized pliance. This finding somewhat aligns with existing research demonstrating that potentially pliant adults are more likely to follow older adult advice than peer advice (Lourenco et al., 2015). Perceived adherence of family members was positively correlated with overall adherence among individuals with high and low generalized pliance. This overlap may be the result of individuals adhering to protect family members, who are themselves adhering as they are at risk from COVID-19. The present study also assessed adherence of somebody close whose opinion mattered (i.e., someone participants were likely to be pliant to). Responses to this item were positively correlated with adherence among individuals displaying high generalized pliance and not individuals displaying low generalized pliance (i.e., pliant individuals' adherence aligned with adherence of someone they were likely to be pliant to).

Although the present study extends the existing literature around adherence and rule-following, there are limitations to address. First, research suggests that young adults underestimate how well their peers adhere to COVID-19 guidelines (Graupensperger et al., 2021). Therefore, using self-report to determine perceived peer behavior may be problematic. However, a strength of the present study is its use of self-report with regard to generalized pliance, for which self-report is particularly relevant (Stapleton et al., 2020). Second, the present study

was somewhat limited in its approach to plys. Specifically, the present study could not account for instances where perceived peer behavior did not align with what participants believed their peers expected from them (i.e., when arbitrary social approval is contingent upon behaving differently from peers) nor whether the social community promoted rule-breaking. This is particularly relevant to pliance and future research should explore whether generalized pliance moderates the relationships between perceived peer *expectations* and individual behavior. This could be explored across various domains including health behaviors and education. Third, the present study did not include an adherence-specific single-item of tracking nor a means of assessing social tracking, another viable avenue for future research, once such measures have been developed.

In conclusion, the relationships between rule-following, adherence, and peer behavior are complex. Future research should strive to develop easily adaptable and context sensitive measures of proposed types of rule-following, in addition to a measure of social tracking. It is important to emphasize that pliance and tracking are listener-oriented concepts (Hayes et al., 1986; Peláez & Moreno, 1999), meaning researchers should avoid assuming that a rule functions as a ply or track based solely on their perception of the controlling consequences (i.e., consider the perspective of the listener). Noticing the function for the individual will allow researchers to acquire an in-depth understanding of their rule-following, informing the development of effective interventions.

Declaration of competing interest

Given her role as an Associate Editor, Professor Louise McHugh and their role as an Editorial Board member, Stapleton A. had no involvement in the peer-review of this article and had no access to information regarding its peer-review. The other author has declared no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jcbs.2022.06.005.

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