Title:

Paranoia and Conspiracy:

Group Cohesion Increases Harmful Intent Attribution in the Trust Game

Anna Greenburgh^a, Vaughan Bell^{b,c} & Nichola Raihani^a

- a. Department of Experimental Psychology, University College London, 26 Bedford Way,
London WC1H 0AP, England
- b. Division of Psychiatry, University College London, Maple House, 149 Tottenham Court
Road, London W1T 7BN.
- c. South London and Maudsley NHS Foundation Trust

Corresponding author:

nicholaraihani@gmail.com

Abstract

Current theories argue that hyper-sensitisation of social threat perception is central to paranoia. Affected people often also report misperceptions of group cohesion (conspiracy) but little is known about how paranoid ideation affects conspiracy thinking in live interactions. In a pre-registered experimental study, we used a large-scale game theory approach ($n=1,165$) to test whether the social cohesion of an opposing group affects paranoid attributions in a mixed online and lab-based sample. Participants spanning the full population distribution of paranoia played as proposers in a modified Trust Game against a lab-based panel. Participants were allocated a bonus and chose how much money to send to a pair of responders which was quadrupled before reaching the responders. Responders decided how much to return to the proposers through the same process. Participants played in one of two conditions: against a cohesive group who communicated and arrived at a joint decision, or a non-cohesive group who made independent decisions. After the exchange, proposers rated the extent to which the responders' decisions were driven by (i) self-interest and (ii) intent to harm. Although the true motives are ambiguous, cohesive responders were reliably rated by participants as being more strongly motivated by intent to harm, indicating that group cohesion affects social threat perception. Highly paranoid participants attributed harmful intent more strongly overall but were equally reactive to social cohesion as other participants, suggesting paranoia involves a generally lowered threshold for social threat detection but an intact sensitivity for cohesion-related group characteristics.

Key words: paranoia, group cohesion, conspiracy, trust game

1. Introduction

Although paranoia is the most common positive symptom of psychosis (Freeman et al., 2007), it is also present to varying degrees in the general population. Paranoia can range from mildly out-of-proportion concerns about how others see us, to frank and disabling paranoid delusions of conspiratorial harm (Freeman & Garety, 2014; Taylor et al, 2016; Elahi et al 2017).

One well-established component of paranoia is an alteration to social threat perception. Patients with persecutory delusions have better memory for threat-related words (Bentall et al., 1995) and actively paranoid patients diagnosed with schizophrenia over-perceive anger in neutral faces (Pinkham et al., 2011). Highly paranoid members of the general population over-estimate chances of future victimisation (Jack and Egan, 2016) and are more likely to perceive harmful intent in ambiguous social exchanges (Raihani and Bell, 2017a).

Notably, paranoia does not solely focus on misperceiving the harmful intent of individuals but also frequently involves problems with accurately judging the intentions of groups. In clinical studies, concerns about conspiracy are a well-established component of paranoia that have been documented from early in the history of psychiatry (Harper, 1990) and form part of current definitions (Andreasen, 1984; Oyeboode, 2008). Conspiracy perception as a component of paranoia involves concerns about being persecuted by others who are perceived to be coordinated in attempts to harm the individual but who fail to correspond to any collection of people with these aims – something Cameron (1943; 1959) conceptualised as the ‘paranoid pseudocommunity’. This is distinct from belief in public conspiracy theories more broadly, which concern conspiratorial explanations of important historical events that are not centred on the believer (Douglas et al, 2017).

However, perception of threat from groups is not solely associated with paranoia. Studies that have examined social threat processing as a broader psychological mechanism suggest it is likely to be supported by a specialised, evolved mechanism that is attuned to threats from both individuals and groups. The Coalitional Index Model (Boyer et al. 2015) proposes that individuals can judge cues of social threat and support, and can integrate them to encode how vulnerable an individual feels in any given environment. Under this hypothesis, activation of what Boyer and colleagues call the ‘coalitional safety index’ is expected to trigger a set of physiological, cognitive and behavioural responses attuned to the perceived degree of social threat. The automaticity of this mechanism is supported by evidence that we spontaneously attend to alliance-relevant information in our social environment (e.g. Pietraszewski, Cosmides, & Tooby, 2014). Threat inputs to this mechanism are thought to include coalitional identity, as supported by evidence that out-group cues increase anxiety and fear responses (e.g. Stephan & Stephan, 1985; Navarrete et al., 2009; Hart et al., 2000).

A psychological mechanism to detect social threat should be sensitive to the cohesiveness of rival groups. More cohesive groups are more able to act towards a common goal and, when opponents are part of cohesive groups, they should therefore be perceived as more threatening than similar-sized but non-cohesive groups (Boyer et al, 2015). Indeed, group entitativity (its perceived unity: cohesiveness *and* likelihood to act on a group goal) increases negative cognitive and behavioural responses towards the group (Campbell 1958; Hamilton & Sherman, 1996). High-entitativity groups are also perceived as more morally suspicious (Newheiser et al., 2012), more capable of negative retaliation (Dasgupta, Banaji & Abelson, 1999) and evoke increased negative stereotyping (Spencer-Rodgers, Hamilton & Sherman, 2007).

One clear implication of these studies is that individuals will exhibit increased threat responses when in the presence of cohesive compared to non-cohesive groups. However, despite the clear overlap with paranoia both conceptually and clinically, the effects of group cohesiveness on threat perception have never been tested in this domain.

Various hypotheses regarding paranoia and group cohesion emerge. The first is that paranoia may involve an exaggerated reaction to group cohesion (a social over-sensitivity bias) so that highly paranoid people will show an enhanced tendency to over-attribute harmful intent when interacting with cohesive compared to non-cohesive groups, over and above the general tendency to over-attribute harmful intent when compared to low-paranoia individuals. However, an alternative hypothesis is that in addition to a general tendency to over-attribute harmful intent, paranoia may involve a misperception of group cohesiveness, in that all groups are perceived to be cohesive, suggesting that highly paranoid people will equally attribute harmful intent to cohesive and non-cohesive groups, unlike low-paranoia individuals who will attribute greater levels of harmful intent to cohesive compared to non-cohesive groups. Finally, it could be that paranoia simply involves a higher baseline of harmful intent attribution – a general tendency to over-attribute harmful intent in social situations when compared to low-paranoia individuals – but show the same pattern of reactivity to group cohesiveness as low-paranoia individuals.

Here, we report a pre-registered study testing these predictions. We recruited a dual online and offline sample, including a large online sample covering the population distribution of paranoid ideation, and a lab-based panels of participants who formed cohesive and non-cohesive pairs to respond to decisions by the online participants. Previous studies have demonstrated that large-scale game theory approaches are effective in capturing live paranoid attributions and

testing how paranoid attributions are modified by experimentally-induced social threat (Raihani and Bell, 2017a,b; Saalfeld et al., 2018).

Participants played as proposers in an adapted Trust Game in one of two conditions, where they interacted (i) against a pair of cohesive responders or (ii) against a pair of non-cohesive responders. Participants were given an initial sum of money (\$0.50) and were asked to indicate what proportion they would like to send (\$0.25 or \$0.05) to the responders. Participants kept any of the money they did not send to the responders. Participants were told that any amount they sent would be quadrupled by the experimenter, and that the responders would decide whether to send half or none of that increased amount back to the participant.

The cohesiveness of the responder pair was characterised by whether responders could communicate with one another or not. In the cohesive condition, responders had to agree on their decision, whereas in the non-cohesive condition responders came to their decision independently. Participants chose how much to send to the responders and were then presented with the responders' decision about how much would be returned. After finding out how much the responders returned to them, participants rated the extent to which they believed the responders' decisions to be driven by (i) self-interest and (ii) harmful intent, using two separate slider scales. The true motives underpinning responder decisions in this game are ambiguous and could plausibly reflect either self-interest (desire to keep more money) or harmful intent (desire to exploit the participant). Previous work indicates that paranoia positively predicts harmful intent attributions but not self-interest attributions in similarly ambiguous settings (Raihani and Bell., 2017a).

2. Method

This study was approved by the UCL Ethics board, under project 3720/001. Participation was voluntary and informed consent was obtained from all participants prior to their participation.

2.1 Participants

The behavioural data were collected in August, 2017; the GPTS data were collected in June 2017. We recruited 1172 participants to the study (682 female). 1164 of these participants were recruited via Amazon Mechanical Turk (MTurk; <http://www.mturk.com>), whose decisions were the focus of the analysis. In addition, 8 participants took part in the study in the laboratory at UCL and acted as paired responders to the online participants and were configured as cohesive (communicating) or non-cohesive (non-communicating) pairs in deciding the response. All MTurk participants were based in the US. The mean age of the participants was 38.2 ($SD=12.3$).

2.2 Design

We used a between-subject design, where the independent variables were the cohesiveness of the responder group in the Trust Game (non-cohesive / cohesive) and fairness of responder decision (fair / unfair). Dependent variables were attributions of i) harmful intent and ii) self-interest made by proposers to the responder group. Predictions were pre-registered at https://aspredicted.org/see_one.php?a_id=4809.

2.3 Materials and Procedure

The Green et al Paranoid Thought Scales (GPTS, Green et al., 2008) was used to measure pre-existing paranoid ideation. The GPTS is a reliable and valid scale for measuring paranoid ideation across the full clinical and non-clinical spectrum. It is a 32-item scale, consisting of two 16-item subscales that measure feelings of social reference and persecution, respectively.

Participants were asked to endorse each item on a five-point Likert scale from ‘Not at all’ to ‘Totally’. Responses are summed to provide final scores, which can range from 32-160, where higher scores indicate a greater degree of paranoia. This variable will be referred to as ‘pre-existing paranoia’.

An adapted Trust Game (Berg et al. 1995) was used as the main behavioural paradigm. On the online platform, proposers were allocated an initial sum of money (\$0.50) and were asked to indicate what proportion this they would like to send (\$0.25 or \$0.05) to a pair of responders, where the remainder would be theirs to keep. Proposers were told that any amount they sent to responders would be quadrupled, who decide how much of that amount to return to the proposer. Responder decisions were pre-collected at UCL (proposers were aware of this), and ex-post matching was used to assign proposers to responder pairs (Raihani et al., 2013). Responders were shown all possible decisions of proposers and were asked to decide how much money they would return given each proposer decision. Cohesiveness of the responder pair was characterised by whether they had to communicate and make their decision as a pair. In the cohesive condition, responders communicated through an online chat function and were required to come to a joint decision regarding much money to return to the proposer. In the non-cohesive condition, responders did not communicate: they came to their decision independently and they were subsequently matched with other responders who made the same decision. The cohesiveness of responders was clearly communicated to the proposers.

After making their decisions, proposers were informed of the responders’ decision (fair/unfair). They were asked to complete two ratings (using slider bars initialised at 50) on a scale of 1 to 100 to what extent they believed the responders’ decision was motivated by (i) a desire to earn

more, and (ii) a desire to reduce the proposer's bonus. These were the measures of self-interest and harmful intent attributions, respectively.

After completing these ratings, proposers were asked to answer a manipulation check, with three possible answers, to measure how cohesive they perceived the responders to be: 1) responders made their decisions as a team, 2) responders made their decisions separately or 3) unsure.

2.4 Predictions

We pre-registered 6 main predictions of the study on aspredicted.org before collecting behavioural data.

- P1) Proposers will attribute increased harmful intent to unfair compared to fair responders.
- P2) Proposers will attribute increased self-interest to unfair compared to fair responders.
- P3) Proposers will attribute increased harmful intent to responders in cohesive compared to non-cohesive groups.
- P4) Paranoia in proposers will be associated with higher harmful intent attribution overall.
- P5) Paranoia will interact with cohesion on harmful intent attribution, such that proposers with higher paranoia will attribute higher levels of harmful intent to cohesive compared to non-cohesive group, but this effect will be less pronounced in proposers with lower paranoia.
- P6) Paranoia in proposers will have no effect on self-interest attribution.

2.5 Statistical Approach

We employed an information-theoretic (IT) approach with multimodal averaging (Burnham & Anderson 2002; Grueber et al., 2011) to compare the explanatory power of different input variables. The importance of predictors is calculated in the IT methodology by estimating the relative support of a set of pre-determined, ecologically-valid models, and establishing a ‘top model set’ of models that best fit the data. Rather than defining arbitrary p values as indicators of significance, relative support for each model is indicated by comparing their corresponding Akaike Information Criterion corrected for small sample size (AICc; Hurvich & Tsai, 1989). Model-averaging is used if several models have similar levels of support, which takes into account uncertainty over which is the “best” model when calculating effect sizes, therefore providing more conservative estimates. A key benefit of the IT approach is that it avoids issues related to multiple hypothesis testing that occur in stepwise-backwards regression (Whittingham et al., 2006). We present full (unconditional) model averaged estimates and confidence intervals here.

We conducted two broad analyses with attribution of 1) harmful intent and 2) self-interest as the response terms, respectively. Explanatory terms for these models were paranoia (total score from GPTS), trusting decision (large/small investment), condition (cohesive/non-cohesive), fairness (fair/ unfair), gender and age. We also included the following two-way interactions: paranoia x cohesive, cohesive x fairness and paranoia x trusting decision; and the three-way interaction: paranoia x cohesive x fairness. Binary input variables were recoded as dummy (1/0) variables.

All continuous input variables were standardized (Gelman, 2008) and binary input variables were centred, so estimates can be considered on the same scale. We included incomprehension

(whether subjects answered 1+ comprehension questions incorrectly) in the analyses as a binary dummy variable to control for the effect of failed comprehension on responses. Where comprehension was found to have a meaningful effect, we re-ran analyses excluding non-comprehenders to determine whether the models qualitatively changed (no qualitative differences in the results presented below were found).

We conducted a pre-registered manipulation check as a secondary analysis. We performed a binomial test to confirm that proposers perceive the responders in the cohesive condition as more cohesive than in the non-cohesive condition.

We also report an un-registered post-hoc exploratory analysis: using binary logistic regressions we investigated whether pre-existing paranoia in proposers affected their perception of responder cohesiveness, in cohesive and non-cohesive responder conditions, respectively. For this analysis, we excluded a total of 120 subjects who said they were ‘unsure’ as to whether the opponents were part of a cohesive team, resulting in 515 observations for the cohesive condition and 528 responses for the non-cohesive condition. A preprint of this study, as well as data and code to reproduce analyses is available at OSF (<https://osf.io/w7yqx/>).

3. Results

The mean ($\pm$ SEM) paranoia score was 50.7 ± 0.67 , reflecting the combined scores of social reference (27.1 ± 0.35) and persecution (23.6 ± 0.36) subscales, respectively. Paranoia scores ranged from 32 to 158, with 53 participants (4.60 %) being over the clinical mean of 101.9 reported in Green et al. (2008).

3.1 Harmful intent attribution

As predicted, participants who played against unfair responders attributed higher harmful intent than those who played against fair responders (estimate: -1.19, CI: -1.44, -0.95), and higher levels of harmful intent were attributed to responders in cohesive compared to non-cohesive groups (estimate: 0.39, CI: 0.15, 0.63; Figure 1).

Figure 1. Harmful intent attribution made by the proposers concerning the pairs of responders, according to the cohesiveness of responders, and whether responders' decisions were fair (a) or unfair (b).

As can be seen from Figure 2a and Table 1, paranoia independently and positively predicted harmful intent attribution (estimate: 0.77, CI: 0.55, 1.00) but did not interact with cohesiveness to exaggerate this effect (estimate: -0.06, CI: -0.35, 0.24). We also found that, regardless of the amount returned by responders, participants who entrusted the higher amount to the responders made lower harmful intent attributions (estimate: -0.34; CI: -0.62, -0.05).

Figure 2. Mean harmful intent and self-interest attributions made by participants, as a function of paranoia in (a) the cohesive responder condition and (b) the non-cohesive responder condition. Means and standard errors are generated from raw data. Paranoia was converted to a five-level categorical variable for ease of visualisation, although it was included as a continuous term in the models.

Parameter	Estimate	Unconditional SE	Confidence Interval	Relative Importance
<i>Intercept 1 2</i>	<i>0.42</i>	<i>0.07</i>	<i>(0.29, 0.54)</i>	
<i>Intercept 2 3</i>	<i>1.31</i>	<i>0.08</i>	<i>(1.17, 1.46)</i>	
<i>Intercept 3 4</i>	<i>2.04</i>	<i>0.09</i>	<i>(1.86, 2.22)</i>	
<i>Intercept 4 5</i>	<i>2.76</i>	<i>0.12</i>	<i>(2.53, 2.99)</i>	
Cohesion (1=cohesive)	0.39	0.12	(0.15, 0.63)	1.00
Fairness (1=fair)	-1.19	0.12	(-1.44, -0.95)	1.00
Gender (1=male)	-0.36	0.13	(-0.60, -0.11)	1.00
Comprehension (1= > 1 comprehension failure)	0.86	0.22	(0.43, 1.29)	1.00
Trust decision (1=sent larger amount)	-0.34	0.14	(-0.62, -0.05)	1.00
Paranoia	0.77	0.11	(0.55, 1.00)	1.00
Cohesion:Paranoia	-0.06	0.15	(-0.35, 0.24)	0.32

Table 1. Model averaged estimates, unconditional standard errors, confidence intervals and relative importance for the terms included in the top model ordered set for the ordered logistic regression investigating the attribution of harmful intent to two responders in the trust game (see supplementary material for top model set). Reference levels are shown in parentheses.

Parameter	Estimate	Unconditional SE	Confidence Interval	Relative Importance
<i>Intercept 1 2</i>	-2.84	0.11	(-3.06, -2.63)	
<i>Intercept 2 3</i>	-1.97	0.09	(-2.15, -1.78)	
<i>Intercept 3 4</i>	-1.26	0.09	(-1.43, -1.09)	
<i>Intercept 4 5</i>	0.05	0.08	(-0.10, 0.21)	
Fairness (1=fair)	-3.37	0.15	(-3.67, -3.06)	1.00
Gender (1=male)	-0.07	0.12	(-0.31, 0.16)	0.54
Comprehension (1= > 1 comprehension failure)	-0.09	0.19	(-0.46, 0.29)	0.39
Trust Decision (1=sent higher amount)	0.06	0.12	(-0.18, 0.29)	0.25
Cohesion	0.00	0.03	(-0.06, 0.06)	0.26
Paranoia	0.00	0.03	(-0.07, 0.06)	0.09

Table 2. Model averaged estimates, unconditional standard errors, confidence intervals and relative importance for the terms included in the top model for the ordered logistic regression investigating the attribution of self-interest to two responders in the trust game. (See supplementary material for top model set). Reference levels are shown in parentheses.

3.2 Self-interest attribution

As described in Figure 2b and Table 2, participants attributed more self-interested motives to unfair than to fair responders, as predicted (estimate: -3.37, CI: -3.67, -3.06). Also in line with our predictions, we found no effects of paranoia, cohesiveness, gender, age or trusting decision on attributions of self-interest (Table 2).

3.3 Manipulation check

For the cohesive condition, 486 participants correctly perceived the responder pair as cohesive, whereas 101 did not. For the non-cohesive condition, 504 participants correctly perceived the responder pair as non-cohesive, whereas 60 did not. Binomial tests confirmed that the manipulation effect cannot be explained by chance ($p < 0.001$).

3.4 Post-hoc analysis: the effect of paranoia on cohesiveness perception

We conducted two binary logistic regression models with paranoia as the explanatory variable and perceived cohesion (1 = cohesive) as the outcome variable. In the cohesive responder condition, paranoia negatively predicted perceived cohesion, (estimate: -0.02, CI: -0.03, -0.01) such that increasing paranoia was associated with decreased perception of cohesion of responders. In the non-cohesive responder condition, paranoia significantly positively predicted perceived cohesion, (estimate: 0.03, CI: 0.01, 0.05), such that increased paranoia was associated with increased perception of cohesion of responders.

4. Discussion

We investigated the effects of pre-existing paranoia on harmful intent attribution when interacting with cohesive and non-cohesive groups. Participants played as proposers in an adapted Trust Game against a pair of responders who were either cohesive and made their decision together; or were non-cohesive and made independent decisions. Although the intentions of responders are ambiguous in this task, cohesive responder groups were perceived as more malevolent than non-cohesive responder groups, as measured by harmful intent attributions made by participants. Paranoia was associated with a general tendency to over-attribute harmful intent in all situations but highly paranoid individuals showed the same increase in harmful intent attribution when interacting with cohesive groups as individuals with lower paranoia. This suggests that pre-existing paranoia reflects a generally heightened tendency for threat perception but an intact sensitivity to social context. Therefore, there was no evidence of a qualitatively different response to the social context that may reflect a dysregulation in perceiving group interactions.

This finding converges with studies that found no interaction between paranoia or psychosis and social threat on behavioural (Saalfeld et al. 2018) and physiological responses (Veling et al., 2016; Counotte et al., 2016). Together, these studies suggest that paranoia is associated with a lower threshold for detecting social threat; but the scaling of response to changes in social threat is similar in all individuals, irrespective of where they lie on the paranoia spectrum. This goes against theories that suggest paranoia involves an increased reactivity to social threat (Yiend et al., 2017; Savulich et al., 2015; Pot-Kolder et al., 2017); and against a generalised insensitivity to social information (Fett et al., 2012, 2016; Gromann et al., 2013).

Our results support the hypothesis that group cohesiveness acts as a social threat cue, since paranoid attributions increased in response to greater group cohesiveness. In light of the Coalitional Index Model (Boyer et al., 2015), this would imply that group cohesiveness is an input into the Coalitional Safety Index. Changes in cohesiveness of the responder group affected proposer's attributions of harmful intent but not self-interest: the responder group was perceived as no more self-interested in conditions of high compared to low cohesiveness; whereas cohesive responders were perceived as more malevolent than non-cohesive responders. This can be viewed as a conceptual replication that group affiliation - another social threat cue - also affects attributions of harmful intent attribution, but not self-interest (Saalfeld et al., 2018).

Highly paranoid participants showed a clear difference in harmful intent attribution for cohesive and non-cohesive pairs, indicating that paranoia did not lead to a 'conspiracy bias' of perceiving social cohesion where none was present that might have led to them to respond similarly to the two conditions.

The lack of a clear 'conspiracy bias' is contrary to the fact that perception of conspiracy is a well-established component in the phenomenology of paranoid delusion (Andreasson, 1984; Oyebode, 2008). There are various possibilities as to why this may not have been apparent in the measured outcomes in our study. The first is that, although a commonly reported experience in paranoia, it is not a core cognitive component of paranoid ideation and the emphasis of conspiracy has been over-stated. Nevertheless, it is also possible that a conspiracy bias genuinely increases with paranoid ideation across the whole spectrum of paranoia but our paradigm was not sufficient to detect it. Notably, the interaction we used in this study was limited in comparison to more common social situations in that the groups in the paradigm

were pairs rather than more extensive groups, and that information exchange was constrained to a relatively brief, on-screen format. However, we did confirm the predicted effect of cohesive groups being perceived as having higher levels of harmful intent overall. This suggests that the paradigm was sufficient to pick up these group effects, and the game theory paradigm we used in this study relies on decision-making in a social exchange for genuine resources. The post-hoc analysis did show evidence for an association between paranoia and a general misperception of group cohesiveness in both directions, rather than just an over-perception of social cohesion, and it may be that the experience of conspiracy in paranoia is the most obvious manifestation of this general inaccuracy in perceiving social groups.

However, we suggest that the strongest hypothesis is that the misperception of social cohesion relating to people intending personal harm is particularly associated with paranoid delusions – as phenomenological studies suggest – and so may only be reliably detected in clinical samples. In the original Green et al. (2008) study 3% of non-clinical patients scored above the clinical mean. In our sample, 4.63% of participants reported GPTS scores above the mean of the patients with paranoid delusions in the Green et al. study. We did not record whether any participant had a clinical diagnosis and assessing the presence of delusions is best completed with a structured clinical interview, rather than self-report measures. As we have argued previously (Saalfeld et al, 2018) it would be surprising if in such a large sample no participants with delusions were present, but the extent to which this allows us to detect a delusion-specific effect is not clear.

The online nature of the study permitted a large sample size, as well as a more representative sample than typical samples from typical university undergraduate and community participant pools (Berinsky et al., 2012). However, MTurk participants still shows important demographic

differences to the general population (Huff et al., 2015) and in terms of mental health show higher levels of social anxiety although they are not more likely to report clinically relevant emotional dysregulation than the wider population (Shapiro et al., 2013). Furthermore, given all our participants were based in the US it is not clear how well these effects might generalise more widely.

Our results replicate and extend existing research into how social threat is processed. Firstly, they suggest that group cohesion is an input to a social threat detection mechanism, where more cohesive groups evoke greater perception of threat. Secondly, they support evidence for a lowered detection threshold for social threat in paranoia, rather than an increased reactivity to it. The game theoretic paradigm employed allowed us to examine real, incentivised social interactions, adding to the ecological validity of these conclusions.

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