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**Schizophrenia and Increased Distrust-Based Competitiveness in Interpersonal
Interactions:
A Serial Process Model**

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Abstract

Background and Hypothesis

Game theory paradigms, such as the Prisoner's Dilemma Game (PDG), have been used to study nonclinical paranoia, though research using clinical populations has been scarce. We test our novel theoretical model that schizophrenia leads to competitiveness in interpersonal interactions, and that this link is serially mediated by trait paranoia, state paranoia, and distrust.

Study Design

In this quasi-experimental study, individuals with schizophrenia spectrum diagnoses with current persecutory delusions ($n = 46$) and a nonclinical control group ($n = 43$) played the PDG, and completed measures of trait paranoia, state paranoia, and distrust.

Study Results

Individuals with schizophrenia competed more in the PDG than the control group. Supporting our theoretical model, all direct effects were significant: schizophrenia was associated with higher trait paranoia (H1); trait paranoia predicted state paranoia in the PDG (H2); state paranoia in the PDG predicted distrust of the opponent in the PDG (H3); and distrust predicted competition in the PDG (H4). The hypothesized indirect effect of schizophrenia on competition in the PDG via trait paranoia, state paranoia, and distrust was supported in a serial mediation model (H5).

Conclusions

The findings make clear theoretical and methodological contributions. We provide the first evidence for a theoretical process model by which schizophrenia leads to competitiveness in interpersonal interactions via trait paranoia, state paranoia, and distrust. Game theory

paradigms, and the PDG in particular, are important for advancing theory and research on paranoia as it occurs in both clinical and nonclinical populations.

Keywords: paranoia; schizophrenia; prisoner's dilemma game; competition; persecutory delusions; distrust

Schizophrenia and Increased Competitiveness in Interpersonal Interactions:

A Serial Process Model

Persecutory delusions are beliefs that other people are intentionally trying to cause one harm¹ and are part of the symptom profile of schizophrenia. Milder forms of persecutory thinking, often referred to as 'paranoid beliefs' or 'nonclinical paranoia,' have been shown to be common in the general population²⁻⁵. The data on nonclinical paranoia are consistent with prevailing supporting both existing theoretical models proposing continuity between nonclinical and clinical experiences⁶⁻⁷ and with in line with a own evolutionary perspective model of paranoia, which proposes that the capacity to perceive others as malevolent may have been selected because it held survival value in ancestral environments². Experimental research has sought to elucidate the key mechanisms involved in the aetiology and maintenance of persecutory thinking, as it occurs in both clinical and nonclinical populations. Whereas a range of paradigms have been developed and tested with nonclinical groups⁸, experimental research with clinical populations remains scarce.

Game theory paradigms are increasingly being used to study (nonclinical) paranoia, with research to date utilizing the Prisoner's Dilemma Game (PDG)⁸⁻⁹, the Dictator Game (DG)¹⁰⁻¹², and the Trust Game (TG)¹³. In the PDG, the participant simply chooses whether to cooperate with, or compete against, the other player, with payoffs dependent on the choice made by both players. In both the DG and the TG, one player first decides how to split an endowment between themselves and the other player. In, and whereas in the DG, the recipient then decides whether to accept or reject the offer (rejection results in both players receiving a payoff of 0). In the TG, the initial proposed endowment is increased before it is received (usually doubled or trebled) and the recipient must choose then decides whether to keep the full amount without repercussion, or whether to send some of it back to the other player. To date, these paradigms have been used to understand how individual differences in

~~(nonclinical)~~ paranoia relate to behavioural outcomes through associations with trait and state paranoia⁸⁻⁹, including measuring harmful attributions towards the other player in the game¹³.

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~~Game theory paradigms thus provide a unique context to examine paranoia-relevant behaviours.~~

~~These paradigms are useful for studying paranoia because they are interpersonal (paranoia by definition is an interpersonal phenomenon as it involves detection of threat to self from others) and involve genuine social interactions with others¹⁴. Game theory paradigms also have the advantage of modelling some of the necessary environmental conditions that give rise to persecutory thinking, such as ambiguity¹⁵. For example, motives underlying decision-making in both the DG (i.e., can be due to self-interest or attributions of harmful intent¹¹) and the PDG (competition can be due to greed or distrust) are necessarily ambiguous, and, additionally in the PDG, a player is not aware of their opponent's choice at the time of making their own choice⁹.~~

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In the PDG, individuals make a forced choice to either cooperate or compete with their opponent. ~~In the PDG, the participant simply chooses whether to cooperate with, or compete against, the other player, with payoffs dependent on the choice made by both players.~~ — On each trial, if only one player competes, that person receives the maximum possible reward and the other gets nothing; if both cooperate, they both receive a smaller and equal reward; and if both compete, neither player gains any reward. In the PDG, decision-making is thus strongly influenced by perception of the other's likely behaviour towards the self, making it an ideal paradigm for studying paranoia. ~~The PDG can thus be used for understanding much of our social life—in everyday social situations, we have to choose between helping another person at a cost to ourselves (cooperating in the PDG), or advancing our own self-interest (competing in the PDG).~~ Trust is crucial for establishing mutual

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cooperation in the PDG, and distrust (the expectation that the other player will choose to compete in the game) promotes competition. The PDG thus offers an elegant experimental proxy for real-world decision-making in everyday interpersonal interactions, and is therefore ideally suited for studying paranoia in interpersonal contexts.

Research has shown that competition in the PDG is indeed associated with state paranoia⁹. However, in the PDG, competition might reflect either it is important to assess the motive for competition—a player might choose to compete either because of greed (i.e., predicting that an opponent will cooperate, and responding exploitatively to this possibility) or distrust (i.e., predicting that an opponent will compete, and responding defensively to this possibility¹⁶). Theoretical models of paranoia would predict an association between it is important to differentiate between these two possibilities because paranoia and should be reflected in distrust-based (but not greed-based) competition, because only distrust-based competition arises from the perception that the other player possesses malevolent intentions. In support of this, PDG research has shown that nonclinical state paranoia is specifically associated specifically with distrust-based competition, and not with greed-based competition⁹. Distrust-based competition in the PDG has therefore been proposed as a behavioural marker or signature of nonclinical paranoia⁹.

Game theory paradigms are thus providing a unique window into paranoia-relevant thinking and behaviours. A strength of these paradigms is that they are interpersonal (paranoia by definition is an interpersonal phenomenon as it involves perceived threat to self from others) and involve genuine social interactions with others¹⁴. Game theory paradigms have the further advantage of modelling some of the necessary environmental conditions that give rise to persecutory thinking, such as ambiguity¹⁵ - for example, in the PDG, a player is unaware of their opponent's choice at the time of making their own choice⁹. This latter point is a crucial strength of the PDG paradigm when studying paranoia and may shed light on why

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paradigms such as the Dictator Game (DG) have not also found an association between paranoia and distrust-based competition¹⁷. Inconsistent findings concerning how paranoia relates to distrust and competition may also reflect

There has been some debate in the literature about the role of distrust in paranoia when using game theory paradigms. Whereas distrust in the PDG has been shown to be associated with paranoia⁹, studies using other game theory paradigms have suggested that the association between paranoia and competitiveness may not be due to distrust. For example, one study found that paranoia predicted reduced generosity in the Dictator Game, and was associated with lower offers in the Ultimatum Game (whereas, in the UG, it is argued that distrust should predict higher offers¹⁷). One explanation is that differences in the game paradigms themselves could account for these divergent findings. For example, whereas in the PDG, the payoff received depends on both players' choices, in the DG, the outcome is determined by a single decision. Alternatively, important key methodological differences in the measurement of paranoia across studies between studies might explain this divergence in findings. In studies that have used the DG and UG have measured trait paranoia at baseline (sometimes several months prior to Game-Theory exposure) but not is first measured and participants then complete the DG or UG (typically several months later), but there is no measure of in-the-moment or state paranoia specifically about the opponent either during or after the game¹⁷. However, in studies that have used the PDG have measured both baseline trait paranoia and, as well as measuring trait paranoia, a measure of state paranoia about the opponent has been used⁸⁻⁹. Including both measures might arguably provide a more fine-grained assessment of paranoia in game contexts. Additionally, research to date has exclusively used game theory paradigms, including the PDG, to examine paranoia as it manifests in the general population, and their utility to study clinical paranoia remains unknown. Game theory paradigms are particularly well suited to study the behavioural

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consequences of clinical paranoia as the opponent in the game is outside of, and therefore independent from, the individual's persecutory delusion system.

The current study

To date, no study has applied a game theory paradigm to study paranoia in a clinical population. In the current study, we use the PDG for the first time in individuals with current persecutory delusions with a schizophrenia spectrum diagnosis are compared with controls on the PDG. We are particularly interested in understanding how persecutory delusions within the context of schizophrenia spectrum disorders may affect people in their social daily lives and interactions, focusing specifically on how they might influence decision-making (behavioural choice in the PDG). We therefore expect individuals with persecutory delusions to choose to compete more in the PDG (rather than cooperate) than nonclinical controls, because competition can arise from the perception that the other player possesses malevolent intentions, which is a key defining feature of persecutory delusions. Figure 1 summarises our proposed theoretical model. Based on the theory and evidence reviewed above, we predict that: schizophrenia will be associated with higher trait paranoia (H1); trait paranoia will predict state paranoia in the specific context of the PDG (H2); state paranoia in the PDG will predict distrust of the opponent in the PDG (H3); and distrust in the PDG will predict the behavioural choice of competition (H4). Finally, H1-H4 imply an indirect effect of schizophrenia on competition in the PDG via trait paranoia, state paranoia, and distrust (H5). H5 is the key prediction of our serial process model.

Method

Participants

We recruited two groups of participants—people with current persecutory delusions and a schizophrenia spectrum diagnosis ($n = 46$) and nonclinical controls ($n = 43$). Inclusion

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criteria for the clinical group were: (1) a diagnosis of a Schizophrenia-spectrum disorder and experiencing current persecutory delusions (confirmed by a consultant psychiatrist); (2) aged over 18 years of age. Exclusion criteria were: (1) organic cause for symptoms; (2) diagnosis of a learning disability; (3) absence of distressing persecutory delusion. Diagnoses were Paranoid Schizophrenia ($n = 9$), Schizoaffective Disorder ($n = 7$), and Schizophrenia ($n = 30$).

Clinical pParticipants were recruited from National Health Service secondary care mental-health NHS-services in England. In the nonclinical control group, inclusion criteria were: (1) aged 18 or over; (2) no current or previous mental health diagnosis; (3) no history of contact with mental health services. We excluded one female participant in the nonclinical control group who did not complete the measure of trait paranoia.

We aimed to recruit as many clinical participants in the time available as possible. A sensitivity power analysis using G*Power 3.1¹⁸ revealed that our final sample size ($N = 88$; 46 men, 42 women) afforded 80% power to detect direct effects (H1-H4) with an effect size equal to or greater than $f^2 = .09$ (equivalent to $r = .29$; a medium effect size). Tests of indirect effects (H5) tend to have more power than tests of direct effects¹⁹ and this power advantage of indirect effects increases for serial mediation models; “including multiple mediators may be more beneficial to power than including a single mediator or testing only the total effect for significance”²⁰.

Measures

*Paranoia Scale*²¹

This is a 20 item scale measuring trait paranoia. Participants rated the PS items (e.g., “someone has it in for me”) on a 5-point scale (1 = *not at all applicable to me*, 5 = *extremely applicable to me*), with higher scores indicating greater levels of trait paranoia (possible range 20-100). The measure is reliable ($\alpha = .84$) and has been validated and used in both

clinical and nonclinical samples²¹⁻²². We summed the PS items to create a trait paranoia index.

State Paranoia Scale (SPS)⁹

This is a 4-item scale assessing state paranoia, which was developed specifically for use with the PDG. Participants rate how they perceive the other player by marking responses on a 7-point scale anchored with two opposing statements. The four paranoia items are: (1) “Is friendly towards me” vs. “Is hostile towards me”; (2) “Wants to please me” vs. “Wants to upset me”; (3) “Wants to help me” vs. “Wants to harm me”; and (4) “Respects me” vs. “Has it in for me.” All SPS items contain both elements of threat and intention, such that clear persecutory thinking was assessed. We summed the items to create an index, with high ratings indicating higher levels of state paranoia (possible range 4-28). The SPS has good internal consistency ($\alpha = .92$).

Prisoner's Dilemma Game (PDG)

The PDG involves two players who make a simple forced choice either to cooperate with, or compete against, each other in the game. To play the game, participants are presented with a matrix which summarises the possible choices within the game (cooperate [labelled X in the matrix] or compete [labelled Y in the matrix]) and the payoffs they will receive. The payoffs received depend on whether each player chooses to cooperate or compete in the game. The dilemma is that each player can maximise their outcome by competing, yet paradoxically, when both players choose to compete, their outcomes are lower than the outcomes they can achieve by mutual co-operation. A key outcome derived from the game is therefore the number of participants who choose to cooperate and the number who choose to compete (reported simply as n for each choice).

PDG Reasons Assessment²³

This self-report measure comprises 10 items assessing various reasons for choice on the PDG. Each item is rated on a 7-point scale (1 = *not at all*, 7 = *very much*). For the purposes of this study, we were interested in the two items that measure distrust (“I wanted to defend myself against the actions of the other person” and “I did not trust the other person”) and the two items that measure greed (“I wanted to earn more than the other person” and “I wanted to maximise the difference between both persons in my favour”). We created composite measures of distrust and greed by summing the two relevant items (possible range 2-14; $\alpha = .70$ and $.71$, respectively, for distrust and greed).

Procedure

Participants first provided socio-demographic information, completed the Paranoia Scale, and then played the PDG. We modelled PDG procedures on prior research^{9,24}. We did not give participants specific information about their opponent or guidance on game strategy (e.g., to try and maximise ones’ earnings). In all information provided to participants, we labelled the two PDG choices simply as “X” and “Y” (it is only in writing about the research that we have adopted the terminology of “cooperate vs. compete”). We gave participants detailed instructions on the PDG matrix, including a review of the possible combinations of choices and their associated outcomes. Participants then had to pass a test of their understanding of the outcomes of various combinations of choices. We informed participants that they would be playing between 1 and 6 rounds of the PDG. We did so to ensure that they did not know that, in fact, there was to be only a single trial. When participants know that only a single trial is involved, this can increase competition (i.e., ‘end-gaming’), thereby producing restriction of range²⁵. After participants selected their PDG choice on the first (and only) trial, we administered the SPS and the reasons assessment. Finally, we debriefed participants and thanked them for their time.

Results

Sample Characteristics

We present descriptive statistics and zero-order correlations among study variables in Table 1. Average age was significantly higher in the clinical group ($M = 25.28$, $SD = 4.99$) than in the control group ($M = 21.11$, $SD = 3.39$), $t(86) = 4.53$, $p < .001$, $d = 0.97$. Further, there were significantly more men in the clinical ($n = 34$) than control ($n = 12$) group, $\chi^2(1, N = 88) = 18.09$, $p < .001$, $\phi = 0.45$. Therefore, we included age and gender as covariates in the mediation models.

PDG Choice

Individuals in the clinical group competed significantly more in the PDG than those in the control group, $\chi^2(1, N = 88) = 4.90$, $p = .027$, $\phi = 0.24$. In the clinical group, 21 participants cooperated and 25 competed on the PDG (54% competition); in the control group, 29 participants cooperated and 13 competed (31% competition).

Mediational Analyses

Given the continuity between clinical and nonclinical experience, all mediational analyses were conducted using the full sample of participants. First, we examined the individual direct effects specified in our theoretical model (H1-H4; Table 2). As hypothesised, schizophrenia (vs. control) was associated with higher trait paranoia (H1); trait paranoia predicted higher state paranoia in the specific context of the PDG (H2); state paranoia predicted greater distrust of the opponent in the PDG (H3); and distrust predicted more competition (H4). Therefore, each of the four individual hypothesised model paths was supported. Next, we used Hayes' (2022) PROCESS macro (Model 6; 5,000 bootstrap samples)²⁶ to test the serial indirect effect of schizophrenia on competition in the PDG via trait paranoia, state paranoia, and distrust (Figure 2, Model 1). As hypothesised, the indirect effect was statistically significant, as the 95% CI did not include zero. Results supported the hypothesized serial mediation model (H5; Figure 1).

Testing Alternative Models

We tested alternative serial mediation models to examine the specificity of our theoretical model. First, we substituted distrust with greed in the model (Figure 2, Model 2) to examine the pathway from schizophrenia to competition in the PDG via trait paranoia, state paranoia, and greed. We did not expect this model to be supported because, although greed was positively associated with competition in the PDG, schizophrenia (vs. control), trait paranoia, and state paranoia were not significantly correlated with greed (Table 1). The 95% CI included zero and therefore the alternative serial indirect effect via greed was not supported. Second, we reversed the position of distrust and state paranoia, testing the pathway from schizophrenia to competition via trait paranoia, distrust, and state paranoia (Figure 2, Model 3). We did not expect this model to receive support because state paranoia did not predict competition above and beyond distrust (see Table 2, under H4). Indeed, the 95% CI for this serial indirect effect included zero.

Discussion

Our study examined paranoia and competitiveness in individuals with schizophrenia experiencing current persecutory delusions and nonclinical controls. A significantly greater proportion of individuals with schizophrenia chose to compete in the PDG compared with nonclinical controls. We expected competition to be higher in the clinical group as it flows from the expectation that others hold malevolent intentions towards the self, a key defining characteristic of persecutory delusions. This demonstrates the importance of competition in the PDG for understanding paranoia in clinical (as well as nonclinical) populations. Our findings also add to the growing body of evidence demonstrating the utility of game theory paradigms for investigating paranoia⁸⁻¹³ and theoretical models that propose continuity between clinical and nonclinical experiences⁶⁻⁷.

Results supported our theoretical model. Direct effects for the individual paths in the model were significant, such that schizophrenia was associated with higher trait paranoia (H1), trait paranoia predicted state paranoia in the PDG (H2), state paranoia predicted distrust of the opponent in the PDG (H3), and distrust predicted competition (H4). Crucially, we found evidence for serial mediation, with an indirect effect of schizophrenia on competition in the PDG via trait paranoia, state paranoia, and distrust (H5). The two alternative models tested (substituting distrust with greed and reversing the position of distrust and state paranoia) were not supported. Collectively, this provides the first evidence for both a process model linking schizophrenia with competitiveness in interpersonal interactions (via trait paranoia, state paranoia, and distrust), and for the role of distrust in clinical paranoia. Future research could further scrutinise the role of distrust in paranoia across the continuum of experience by adopting other experimental paradigms that have been used to study paranoia or by using alternative methodology, such as naturally-occurring interpersonal transgressions⁸.

There are a number of limitations that warrant consideration. First, evidence for the serial mediation model was correlational and, hence, does not provide a strong basis for causal inferences. The limitations of the measurement-of-mediation design (i.e., designs in which the mediating variables are measured rather than manipulated) are well documented²⁷. Nonetheless, the design is informative because it puts the mediational hypothesis at risk. In the present case, the hypothesized serial indirect effect (H5) comprised four direct effects (corresponding to H1-H4). Failure to detect any one of these links would have resulted in rejection of the serial mediation model, yet each link held. Second, sample size was relatively modest, though this is typical in hard-to-recruit clinical populations, such as those with schizophrenia. A sensitivity power analysis indicated that the study was adequately powered to detect medium-sized effects. **Third, the groups differed significantly in age and gender,**

though we controlled for these demographic variables in all hypothesis tests. Fourth, we did not collect information about psychiatric medications in the clinical sample and the study is therefore silent about whether medication was related to any of the outcomes measured.

Finally, the sample consisted predominantly of individuals of white ethnicity and the findings may therefore have limited generalisability to individuals from other cultural backgrounds. Future research would do well to address this by recruiting larger and more representative samples.

Our findings have important real-world relevance and significance. The PDG paradigm shows how people with persecutory delusions experience state paranoia and distrust in interpersonal interactions even with strangers who have no connection with their persecutory belief system. Whilst the process model serves to render the resulting endpoint behaviour understandable, there are likely to be real-world negative consequences of this type of distrust and lack of cooperation for people with schizophrenia. ~~Our findings have important real-world relevance and significance.~~ Persecutory ideation appears to be particularly linked with loneliness (REF) and i~~The PDG offers a unique opportunity to examine the behavioural consequences of persecutory delusions, as the paradigm models a forced-choice involving everyday decision-making where the opponent in the game is a stranger and therefore outside of the context of the individual's persecutory delusion system. And yet, what we see in action is that, in interpersonal interactions, persecutory delusions result in increases in state paranoia, leading to increased levels of distrust, which ultimately results in competitive behaviour. Our findings also show that the behavioural choice of competition is not based on personal gain or greed, but rather is driven by distrust. In this way, individuals' decision-making is self-protective and adaptive, consistent with our evolutionary model of paranoia².~~ Additionally, there are likely to be real world negative consequences of increased distrust and competition for people with schizophrenia ~~has been argued that 'paranoid symptoms imply a~~

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Volume 54, March 2017, Pages 51-57



The impact of loneliness on paranoia: An experimental approach
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panel Fabian Lamster^a Clara Nittel^b Winfried Rief^b Stephanie Mehl^{bd1} Tania Lincoln^{c1}

disruption of the processes involved in belonging and social trust' (REF). The theoretical process modelled in the present study demonstrates *in action* how persecutory thinking can directly lead to people experiencing heightened state paranoia, distrust and a reaching a decision to compete rather than cooperate in social interactions with a stranger. Future research might explore in real world settings not only the impact this behaviour has on the person with persecutory ideation (e.g. social isolation and loneliness), but also on the other person in the dyad - for example, might it lead them to withdraw and avoid the person with persecutory ideation, creating a vicious cycle that further exacerbates feelings of loneliness and lack of belonging? which could include increased isolation and loneliness, poorer relationship functioning and a more limited capacity to generate new relationships and friendships, though this would need to be established in future research. Our findings thus make a clear contribution to our understanding of the behavioural impact of persecutory delusions in schizophrenia.

In terms of clinical implications, the findings raise the important/interesting issue of how we might go about reducing persecutory ideation and habitual distrust and its potential negative consequences such as (e.g. isolation and, loneliness, poorer relationship functioning). One option is traditional cognitive behaviour therapy for psychosis, though psychological reactance is easily triggered when working directly with persecutory ideation/paranoia²⁸, but this can be very challenging. A promising/second alternative/option is mindfulness for psychosis, which has been shown to benefit/helpful for people with schizophrenia²⁹, including persecutory delusions³⁰, and does not require direct discussion of the content of persecutory beliefs, has the added benefit of reducing distress in the absence of focusing directly on belief content. A novel third possibility is to seek to strengthen a personality trait that moderates paranoid ideation. For example, option is to look to increase forgiveness, as there is emerging evidence that trait forgiveness it ameliorates paranoia in the

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Schizophrenia Bulletin, Volume 44, Issue 3, May 2018, Pages 681–690, <https://doi.org/10.1093/schbul/sbx110>

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nonclinical population⁸. Future research might explore if interventions aimed at ~~This raises the intriguing possibility that~~ increasing interpersonal forgiveness might ~~disrupt the pathway from persecutory ideation to interpersonal competition observed in the present study, be~~ important in reducing clinical paranoia, though this would need to be tested in future research.

To conclude, our study makes clear theoretical and methodological contributions. We provide the first evidence for a theoretical model by which schizophrenia leads serially to competitiveness in interpersonal interactions via trait paranoia, state paranoia, and distrust. Game theory paradigms, and the PDG in particular, are important for advancing theory and research in paranoia as it occurs across the continuum of experience.

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Table 1

Descriptive Statistics and Correlations Among Study Variables

	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7
1. Schizophrenia	0.52	0.50	-						
2. Age	23.29	4.76	.44***	-					
3. Gender	0.52	0.50	.45***	.24*	-				
4. Trait paranoia	45.55	17.42	.50***	.21*	.23*	-			
5. State paranoia	15.10	3.59	.13	-.14	.00	.28**	-		
6. Distrust	7.32	3.63	.31**	-.08	.10	.50***	.43***	-	
7. Greed	8.66	3.91	.04	.04	.06	.07	.07	.30**	-
8. Competition	0.43	0.50	.24*	-.02	.01	.17	.17	.48***	.35**

Note. Schizophrenia was coded: 0 = control group, 1 = schizophrenia group. Gender was coded: 0 = women, 1 = men. Competition was coded: 0 = cooperate, 1 = compete. $N = 88$. Means for schizophrenia and gender reflect the proportion of participants in the schizophrenia group and proportion of male participants, respectively.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2

Regression Analyses Testing Direct Effects Corresponding to H1-H4

Predictor	H1: Predicting trait paranoia			H2: Predicting state paranoia			H3: Predicting distrust			H4: Predicting competition		
	<i>b</i> (<i>SE</i>)	<i>t</i>	<i>b</i> *	<i>b</i> (<i>SE</i>)	<i>t</i>	<i>b</i> *	<i>b</i> (<i>SE</i>)	<i>t</i>	<i>b</i> *	<i>b</i> (<i>SE</i>)	χ^2	<i>b</i> *
Schizophrenia	17.26 (3.98)	4.33***	.50	0.83 (0.98)	0.84	.12	1.34 (0.85)	1.58	.19	1.20 (0.71)	2.87	.33
Trait paranoia				0.06 (0.02)	2.49*	.29	0.08 (0.02)	3.58***	.37	-0.03 (0.02)	1.76	-.25
State paranoia							0.28 (0.09)	2.92**	.27	-0.02 (0.08)	0.07	-.04
Distrust										0.37 (0.10)	12.76***	.74

Note. Schizophrenia was coded: 0 = control group, 1 = schizophrenia group. *b* = unstandardized beta; *SE* = standard error; *b** = standardized beta. The analysis testing H4 is a logistic regression analysis in which competitive choice was the dichotomous dependent variable (under H4: Predicting competition). We included gender and age as covariates in all analyses. *N* = 88.

* $p < .05$, ** $p < .01$, *** $p < .001$

Figure 1

The Process Model Linking Schizophrenia to Competition in the PDG: Hypothesized Direct Effects (H1-H4) and Serial Indirect Effect (H5)

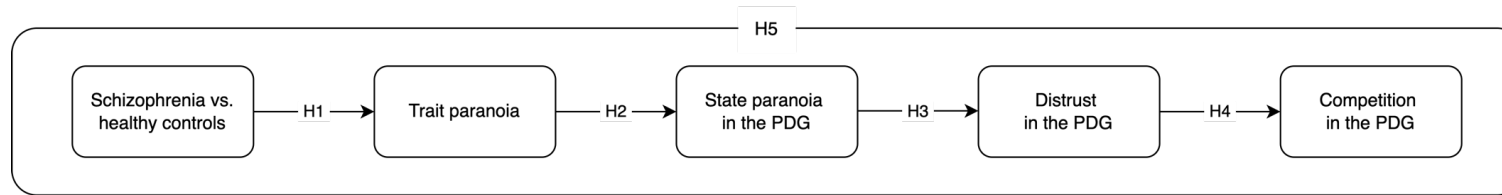
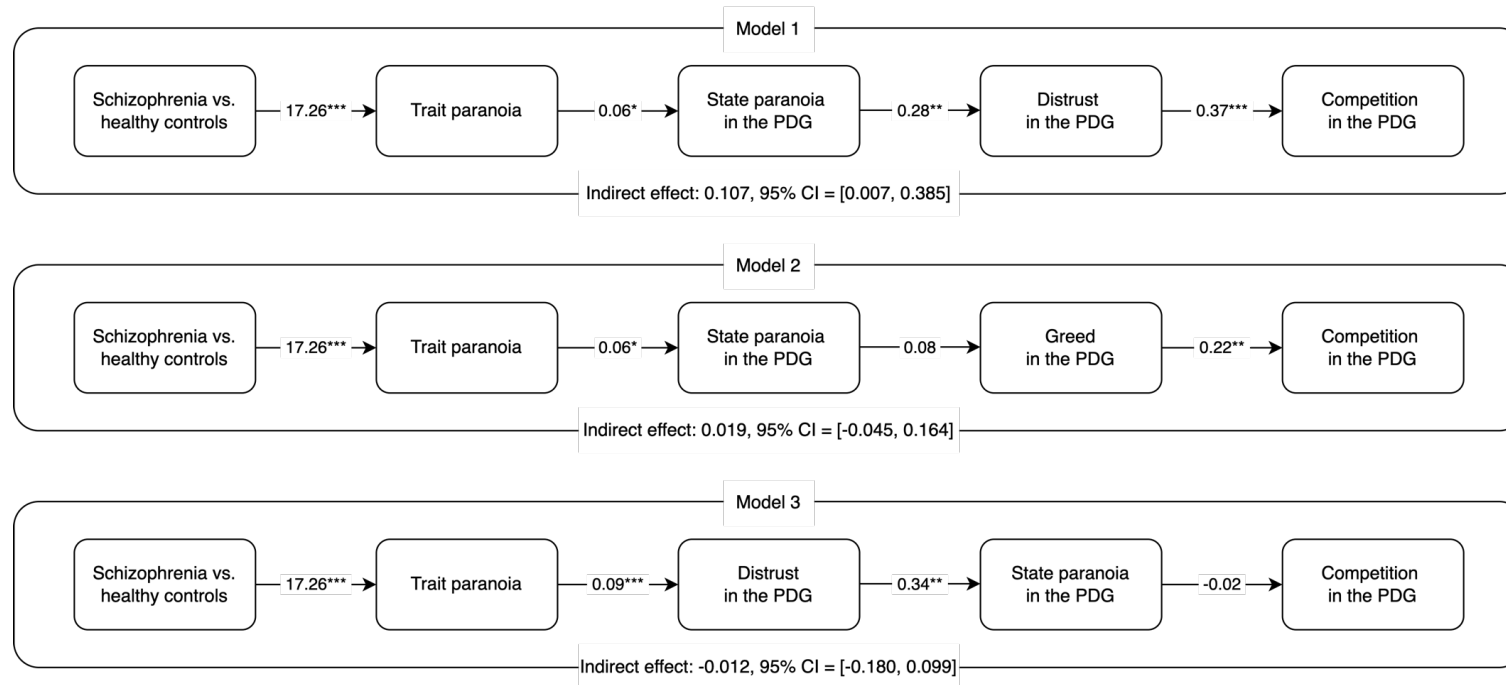


Figure 2

The Hypothesized Serial Mediation Model (Model 1) and Two Alternative Serial Mediation Models (Models 2-3)



Note. Schizophrenia was coded: 0 = control group, 1 = schizophrenia group. Compared to Model 1, Model 2 substituted greed for distrust and Model 3 reversed the order of state paranoia and distrust. Gender and age were included as covariates in all analyses. $N = 88$.

* $p < .05$, ** $p < .01$, *** $p < .001$