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Original article

Impaired self-agency inferences in schizophrenia: The role of cognitive capacity and causal reasoning style

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ABSTRACT

Background: The sense of self-agency, i.e., experiencing oneself as the cause of one's own actions, is impaired in patients with schizophrenia. Normally, inferences of self-agency are enhanced when actual outcomes match with pre-activated outcome information, where this pre-activation can result from explicitly set goals (i.e., goal-based route) or implicitly primed outcome information (i.e., prime-based route). Previous research suggests that patients show specific impairments in the prime-based route, implicating that they do not rely on matches between implicitly available outcome information and actual action-outcomes when inferring self-agency. The question remains: Why? Here, we examine whether neurocognitive functioning and self-serving bias (SSB) may explain abnormalities in patients' agency inferences.

Methods: Thirty-six patients and 36 healthy controls performed a commonly used agency inference task to measure goal- and prime-based self-agency inferences. Neurocognitive functioning was assessed with the Brief Assessment of Cognition in Schizophrenia (BACS) and the SSB was assessed with the Internal Personal and Situational Attributions Questionnaire.

Results: Results showed a substantial smaller effect of primed outcome information on agency experiences in patients compared with healthy controls. Whereas patients and controls differed on BACS and marginally on SSB scores, these differences were not related to patients' impairments in prime-based agency inferences.

Conclusions: Patients showed impairments in prime-based agency inferences, thereby replicating previous studies. This finding could not be explained by cognitive dysfunction or SSB. Results are discussed in the context of the recent surge to understand and examine deficits in agency experiences in schizophrenia.

1. Introduction

The complex syndrome of schizophrenia has often been described as a disturbance of the minimal self, in which patients have a decreased sense of self-presence [1–3]. The concepts that are key to this fundamental sense of self are body ownership and self-agency [4]. Disturbances in self-agency experiences, in which patients have problems identifying the cause of their own bodily movements or thoughts, are reflected in Schneiderian first rank symptoms such as delusions of control and auditory verbal hallucinations [5]. In experimental settings, these aberrant experiences have been consistently found [6–10], but the underlying mechanisms responsible for these impairments are still under investigation.

Understanding ourselves is a prerequisite for understanding the thoughts and intentions of others, which implicates that self-disturbances underlie social cognitive, and thus social functioning deficits in patients with schizophrenia [11,12]. To better understand human interaction and patients' impairments herein, we distinguish between two routes that explain inferences of self-agency [13,14]. First, in goal-directed behavior, self-agency is generally inferred when an action-outcome matches an explicitly set goal. For example, when someone intentionally raises her voice to get attention from someone else, and that person turns around, a

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feeling of self-agency arises. However, human interaction does not always occur in such an explicit and deliberate way. A substantial part of our social behavior advances implicitly, without an explicit goal or prior intention. In these situations agency inferences can result from implicitly associated cues or situations that can unconsciously pre-activate or prime an outcome representation in the agent's mind. For example, an implicitly pre-activated emotional expression can influence a feeling of self-agency over emotional expressions in others [15]. That is, although to a lesser extent than is the case in goal-directed behavior, a match between this primed outcome representation and the actual action-outcome also enhances agency experiences [16]. Whereas the process of action selection, action execution, and processing of the actual outcome of one's action *may* require cognitive control, the prime-based agency inference itself seems to materialize without much attention. Together, this illustrates that feelings of authorship in social situations can be affected unconsciously.

Interestingly, patients with schizophrenia show specific impairments in agency inferences of behavior that is not explicitly instigated by goal-directed thought [17–19]. Specifically, by employing a reliable and widely used agency task allowing to examine goal-based and prime-based agency inferences, patients (in contrast to healthy controls) showed less (or even no) enhanced experiences of self-agency over action-outcomes that match primed outcome information. The impaired prime-based agency inferences in patients could not be explained by motivational problems to conduct the task [17], problems in visual processing of primed information [18], or symptom severity [19]. Consequently, the question remains: what then causes these impaired inferences of self-agency that are thought to be involved in social interaction? This question might be answered by considering whether patients and healthy controls differ in the way they process agency cues on a cognitive, affective, and sensorimotor level [20]. In the current study, we focus on the cognitive level and examine two potential candidates that have been suggested to play a role in schizophrenia patients' decreased functioning, i.e., neurocognitive functioning and causal reasoning style.

First, overall cognitive decline is one of the core deficits of schizophrenia [21–24], which might be a potential cause for impairments in prime-based agency inferences. That is, cognitive resources are required to mobilize the selection, execution, and perception of the actions over which we infer agency. The neurocognitive deficits in schizophrenia include a broad range of domains, including executive functioning and attentional problems [22]. Although our previous research showed that individual differences in self-reported attention during task performance could not explain patients' impairments in prime-based agency inferences [17], decreased insight into their own neurocognitive functioning asks for a more objective measure [25]. Therefore, here we use a short version of a cognitive test battery to explore whether patients' impairments in prime-based agency processing are attributable to decreased neurocognitive functioning or whether they are independent constructs.

A second (social) cognitive feature that is related to self-agency pertains to the way that people attribute the cause of events to internal (e.g., ability or personality) or external factors (e.g., other people or circumstances) [26]. A well-known causal reasoning bias is the self-serving bias (or externalizing bias), which is the tendency to attribute positive events to the self and negative events to external sources [27,28]. Importantly, in patients with schizophrenia an aberrant self-serving bias has been observed compared with healthy controls. Although most studies showed a stronger self-serving bias in psychotic patients [29–32], some studies found the opposite [33,34], and others found no evidence for group differences at all [35–37]. These inconsistent findings might be explained by different methodologies or psychopathology. Therefore, in the current study, we will assess group differences in self-serving bias by employing a widely used measure of self-attributions.

Furthermore, although prime-based agency inferences are found to be relevant in social interaction [15], uncertainty exists about its relation with (impaired) social cognitive functioning. Interestingly, the social cognitive principle of the self-serving bias overlaps with the process underlying agency inferences. Specifically, when inferring self-agency over an action-outcome, matching goals or primes may give rise to a feeling of success and are more likely to be attributed to the self (i.e., a positive event leads to self-attribution) [16,38]. Conversely, a mismatch between a goal or prime and action-outcome may give rise to a feeling of failure and is more often attributed to external sources (i.e., a negative event leads to external attribution). Building on this theoretical relation between the self-serving bias and the principles underlying agency experiences, we explore whether an aberrant self-serving bias are related to patients' impairments in prime-based agency processing.

2. Methods

2.1. Subjects

Thirty-six patients with a DSM-IV diagnosis of schizophrenia and 36 healthy controls (gender and age matched) participated in this study. Diagnoses were checked with the Comprehensive Assessment of Symptoms and History [39]. Patients were recruited from the psychiatry department of the University Medical Center Utrecht (UMCU), from previous studies performed at this department, and from other psychiatric institutions in the Utrecht area. Healthy controls were recruited through advertisements on notice boards and an online recruiting company for scientific research (www.proefpersonen.nl).

Participants were aged between 18 and 50, Dutch speaking, able to give informed consent, and had a (premorbid) IQ of at least 80 [40]. Also, they had no history of closed-head injury, neurological or endocrinological disorders, and did not meet DSM-IV criteria for drug or alcohol abuse in the past six months. Participants did not chronically use medication (for patients: other than psychiatric medication). Patients were not experiencing a psychotic episode at the time of testing. Healthy controls did not have a history of psychiatric illness and did not have a first or second-degree family member with a psychotic disorder. All participants were financially compensated and the study was approved by the UMCU Human Ethics Committee.

2.2. Procedures and measures

2.2.1. Agency inference task

An agency inference task was used to measure goal-based and prime-based agency inferences [13,17]. In this task, participants believed they were in control of a rotating square that traversed along a path, see Fig. 1 (see [13,17,19], for task details). When the s-key was pressed during the start cue, two squares (one of the participant and one of the computer) started moving in opposite directions. Participants were told that when 'stop' appeared in the middle of the screen, both squares continue to move *invisibly* at the same speed. When they pressed the enter-key to stop this invisible rotation, one of the tiles turned black. They were told that the location of this tile randomly represented the final position of their own or the computer's square. After each trial, participants indicated on a 9-point scale (not at all (1) – strongly (9)) to what extent they felt they were the one that caused the

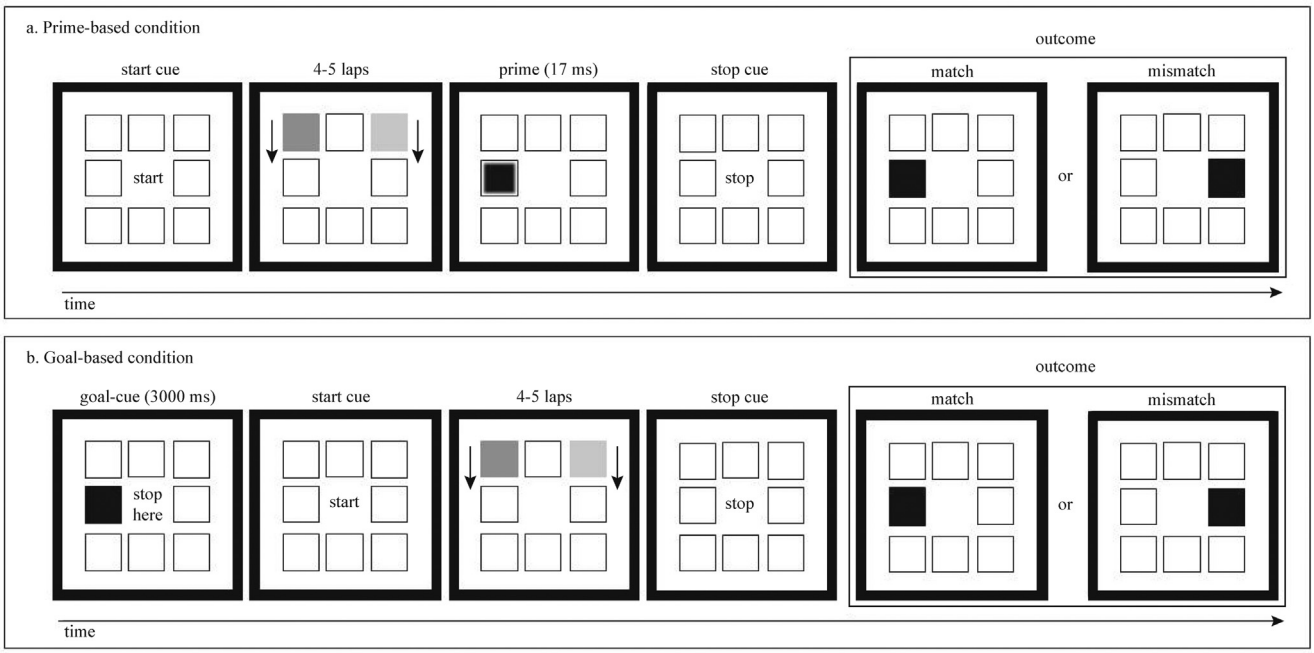

Fig. 1. Agency inference task. Both conditions comprised 32 trials. Each tile was used as a goal or prime twice in each block: once as a match and once as a mismatch. The prime-based condition was administered before the goal-based condition.

square to stop at that specific location (i.e., experienced self-agency).

In the prime-based condition, an outcome location was subtly primed just before the stop-cue (see Fig. 1a; for checks regarding unawareness of the prime, see [13,16,41–43]). Conversely, in the goal-based condition participants explicitly received the goal to stop their square at a certain location (Fig. 1b). Importantly, in reality the presented outcome location was always predetermined by the program and thus occurred independent of the participant's key press. This predetermined outcome could either match or mismatch the goals and primes. The difference between agency ratings on matching and mismatching trials (i.e., matching effect) reflects the strength of inferring agency on the basis of goal-based or prime-based agency cues.

2.2.2. Neurocognitive functioning

Neurocognitive functioning was assessed by the Brief Assessment of Cognition in Schizophrenia (BACS), which covers those cognitive domains that are most disturbed in schizophrenia [44]. The BACS consists of six tasks covering verbal memory, working memory, motor speed, verbal fluency, attention, speed of information processing, and executive functioning, which are intercorrelated and have good internal consistency (Cronbach's $\alpha = 0.74$ in our dataset) [40]. Therefore, the mean of all standardized subscale scores was used as a measure of cognitive capacity.

2.2.3. Attributional style

The Internal, Personal, and Situational Attributions Questionnaire (IPSAQ) was used to measure attributional style [27]. This 32-item questionnaire was verbally administered by a trained experimenter. Participants had to come up with a most likely cause of a situation (e.g., 'a friend betrayed the trust you had in her'). Then, they had to indicate whether this cause was most likely due to self (internal attribution), another person (external personal attribution), or circumstances (external situational attribution). The questionnaire consists of 16 positive and 16 negative situations.

Self-serving bias (SSB), representing the tendency to attribute more positive than negative events to the self, was calculated by subtracting the number of internal attributions for negative events from the number of internal attributions for positive events [27].

Additionally, by adding all items that are attributed to the self, the IPSAQ allows us to estimate a general tendency to make internal attributions, irrespective of the valence of the event. To correct for missing items, we measured a general attribution to the self by taking the proportion of completed items in which the proposed situation was attributed to the self. In order to calculate the reliability of this measure, IPSAQ scores were dichotomized ('internally attributed' and 'externally attributed') and only the participants that fully completed the IPSAQ were included ($n = 63$). Cronbach's α of 0.78 indicated good internal consistency for this measure of a general tendency to attribute events to the self.

2.3. Statistical analyses

First, group differences in age, gender, own and parental years of education, BACS, and IPSAQ scores were analyzed using independent sample *t*-tests and a chi-square test.

Second, to test potential differences between healthy controls and patients with respect to goal-based and prime-based inferences, two separate repeated measures (ANOVA's) were performed according to the experimental design: Matching (matching vs. mismatching trials) $\times$ Group with the first factor as within-subjects variable and the latter one as between-subjects variable. Also, matching effects per group were evaluated by performing the same repeated measures ANOVA in both groups separately. Additionally, a potential relation between internal predictions based on the reaction time to press 'stop' and the strength of agency experiences was examined. For detailed methods of this analysis, see Supplementary material 1.

Third, the relationship between goal- and prime-based agency inferences and neurocognitive functioning on the one hand, and self-serving bias on the other, we conducted two separate ANOVA's including the BACS or the SSB measure as covariate to test the specific main effects of BACS or SSB and their interaction effects with Group and Matching, respectively. SSB scores were centered.

Last, we explored the relationship between a generally biased attribution to the self and overall agency ratings to assess whether agency experiences in our task are in concordance with feelings of personal causation in daily situations. Therefore, linear regression analyses were performed with Group, the proportion of self-attributions in the IPSAQ, and its interaction as independent variables. Mean agency rating (ratings irrespective of the manipulation of matching) was used as dependent variable. This was done for prime-based and goal-based agency ratings separately.

3. Results

Demographics and clinical characteristics are displayed in Table 1. Age, gender distribution, and parental level of education did not differ between patients and healthy controls. As expected, healthy controls had significantly more years of education, a higher (premorbid) IQ, and a higher BACS total score. Patients had a significantly greater general tendency to attribute situations to the self, while the self-serving bias was marginally larger in healthy controls.

Table 1
Demographics, clinical characteristics, and BACS and IPSAQ descriptives.

	Schizophrenia patients ($n = 36$)	Healthy controls ($n = 36$)	Group differences
Age	32.33 (6.97)	31.01 (6.32)	$t(70) = -0.84$, $P = 0.40$, Cohen's $d = 0.20$
Gender (m/f)	31/5	32/4	$X^2(1) = 0.13$, $P = 0.72$, $r = 0.04$
Years of education	13.11 (2.01)	14.06 (1.88)[a]	$t(69) = 2.05$, $P = 0.04$, Cohen's $d = 0.49$
Parental years of education	14.67 (3.30)[b]	14.34 (2.40)[c]	$t(63) = -0.45$, $P = 0.66$, Cohen's $d = 0.12$
(Premorbid) IQ[e]	100.28 (6.21)[c]	105.58 (6.45)[b]	$t(63) = 3.36$, $P = 0.001$, Cohen's $d = 0.84$
Years of illness duration	13.01 (7.34)[c]	N/A	
Antipsychotic medication			
Typical/atypical/both/none	4/30/1/1	N/A	
PANSS			
Positive	12.39 (3.50)	N/A	
Negative	12.81 (5.29)	N/A	
General	24.58 (4.33)	N/A	
Total	49.78 (8.56)	N/A	
BACS total score[f]			
Raw score	237.06 (34.04)	278.38 (36.76)[d]	$t(68) = 4.88$, $P < 0.001$, Cohen's $d = 1.18$
IPSAQ[g]			
Self-serving bias	0.79 (2.91)[d]	2.03 (2.98)	$t(68) = 1.75$, $P = 0.09$, Cohen's $d = 0.42$
General attribution to self	0.45 (0.15)[d]	0.36 (0.15)	$t(68) = -2.59$, $P = 0.01$, Cohen's $d = 0.60$

[a] $n = 35$.
[b] $n = 33$.
[c] $n = 32$.
[d] $n = 34$.
[e] Measured with the Dutch Adult Reading Test [39]: participants with a non-Dutch native language or dyslexia were removed from IQ analysis.
[f] Due to missing data BACS total score could not be calculated for 2 participants.
[g] Two patients with > 3 missing items were removed from IPSAQ analysis.

Table 2
Repeated measures of ANOVA results regarding self-agency experiences[a].

Mean self-agency ratings (sd)	Schizophrenia patients ($n = 36$)	Healthy controls ($n = 36$)	Group differences
Prime-based: match trials	5.20 (1.43)	5.84 (1.17)	$t(70) = 2.08$, $P = 0.04$, Cohen's $d = 0.49$
Prime-based: mismatch trials	4.24 (1.23)	3.75 (1.36)	$t(70) = -1.60$, $P = 0.11$, Cohen's $d = 0.38$
Goal-based: match trials	6.78 (1.58)[b]	7.07 (1.22)	$t(69) = 0.88$, $P = 0.38$, Cohen's $d = 0.20$
Goal-based: mismatch trials	3.61 (1.38)[b]	3.00 (1.25)	$t(69) = -1.94$, $P = 0.06$, Cohen's $d = 0.46$

Repeated measures ANOVA	Prime-based agency experiences				Goal-based agency experiences			
	df	*F*	Sig.	η_p^2	*df*	*F*	Sig.	η_p^2
Group	1.70	0.15	0.7	0.002	1.69	0.68	0.41	0.01
Matching	1.70	41.61	< 0.001	0.37	1.69	191.18	< 0.001	0.74
Matching $\times$ Group	1.70	5.66	0.02	0.08	1.69	2.95	0.09	0.04

Simple main effects	Matching effect: prime-based				Matching effect: goal-based			
	df	*F*	Sig.	η_p^2	*df*	*F*	Sig.	η_p^2
Schizophrenia patients	1.35	10.53	0.003	0.23	1.34	59.3	< 0.001	0.64
Healthy controls	1.35	32.13	< 0.001	0.48	1.35	155.65	< 0.001	0.82

[a] As seven patients also participated in our previous study with the same task [17], which might have influenced their responses to the present task, we repeated these analyses without these participants. These results yielded the same conclusions.
[b] $n = 35$: one patient refused to continue with the task and only completed the prime-based condition.

Table 3
Repeated measures ANCOVA results regarding the effect of cognitive capacity and causal reasoning style on self-agency experiences.

	Prime-based agency experiences (df = 1,67)			Goal-based agency experiences (df = 1,66)		
	F	Sig.	η_p^2	F	Sig.	η_p^2
Neurocognitive functioning						
BACS	0.29	0.59	0.96	0.01	0.93	< 0.001
Group × BACS	0.8	0.38	0.01	3.16	0.08	0.05
Matching × BACS	3.38	0.07	0.05	9.73	0.003	0.13
Matching × Group × BACS	0.05	0.83	0.001	1.75	0.19	0.03
Causal reasoning style						
SSB	2.36	0.13	0.03	0.06	0.81	0.001
Group × SSB	< 0.001	1	< 0.001	0.04	0.83	0.001
Matching × SSB	0.23	0.64	0	< 0.001	0.99	< 0.001
Matching × Group × SSB	1	0.32	0.02	0.03	0.87	< 0.001

BACS: Behavioral Assessment of Cognition in Schizophrenia; SSB: self-serving bias.

3.1. Self-agency experiences in schizophrenia patients and healthy controls

Table 2 shows results regarding self-agency experiences. In both the goal-based and prime-based condition, a main effect of matching was found in both groups, indicating higher agency ratings on matching compared with mismatching trials. In the prime-based condition, the matching effect (i.e., the strength of the effect of primes on agency experiences) was significantly larger in healthy controls than in patients (Matching × Group). In the goal-based condition, this difference was only marginally significant. Additional analyses showed that agency experiences were independent of potential internal predictions (see Supplementary material 1).

3.2. The role of neurocognitive functioning in goal-based and prime-based agency inferences

ANCOVA results (Table 3) revealed a significant Matching × BACS interaction in the goal-based, but not in the prime-based agency inference task. This implies a positive relation between neurocognitive functioning and the matching effect in the goal-based condition, i.e., the extent to which goals inform agency inferences (Fig. 2). Non-significant Matching × Group × BACS interactions indicate that the relation between neurocognitive functioning and agency inferences did not differ between patients and healthy controls. For correlation coefficients between BACS subtests and agency inferences, see Supplementary material 2.

3.3. The role of causal reasoning style in goal-based and prime-based agency inferences

Although the self-serving bias was marginally larger in healthy controls (Table 1), ANCOVA results showed that it was not related to the matching effect in the goal-based and prime-based condition (no Matching × SSB and Matching × Group × SSB interactions: Table 3).

Additionally, regression analyses to assess the relation between the tendency to attribute to the self in our task and in the IPSAQ revealed no significant predictors. That is, the general tendency to attribute to the self, group, and the interaction between the two were no significant predictors of mean agency ratings in our task.

4. Discussion

Building on previous findings revealing that patients with schizophrenia show abnormalities in prime-based agency processing, this study examined two possible cognitive correlates of this impairment, namely neurocognitive functioning and self-serving bias. First, in the current sample, a significant effect of goals and primes on agency inferences was found in both healthy controls and patients. Importantly, compared with healthy controls, patients were less informed by primes when inferring

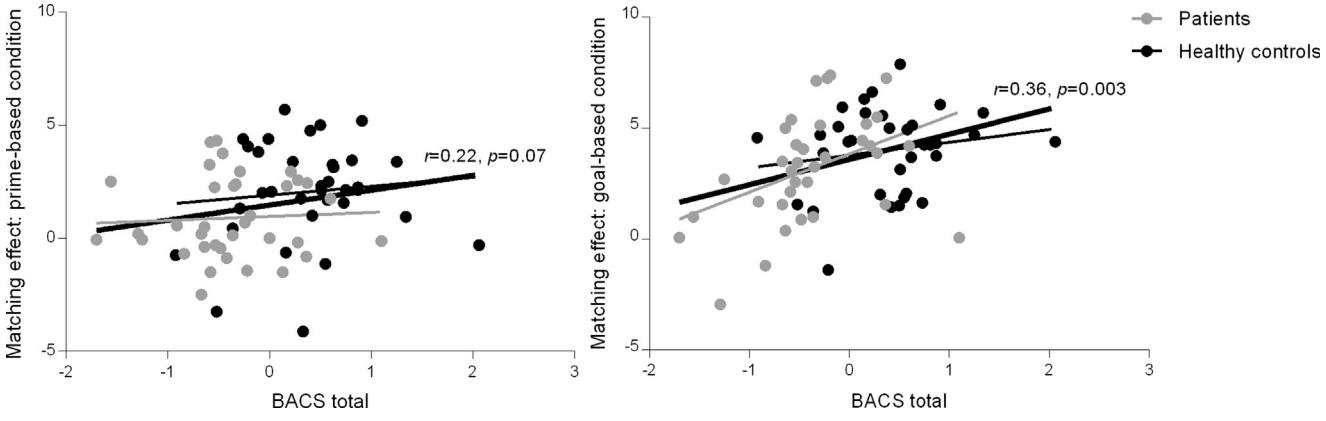

Fig. 2. The relationship between cognitive capacity and matching effect in the prime-based and goal-based condition. Thin lines represent the regression line in healthy controls (n = 34) and patients (n = 36 in the prime-based condition and n = 35 in the goal-based condition). Bold line represents the regression line in the total sample.

self-agency, which is in line with findings from two previous studies that used the exact same task [17,18]. To increase statistical power, we combined data of these previous studies with the present study (see Supplementary material 3). These analyses confirmed that the effect of primes on agency inferences was significantly smaller in patients compared with healthy controls in a combined sample of 180 participants (90 in each group). Importantly, combined data from the study of Renes et al. [17] and the current study showed that group differences in matching effect in the prime-based condition were marginally larger than group differences in matching effect in the goal-based condition (see Supplementary material 3). It should be noted that the strength of the group effects was different between the studies. A possible explanation for these findings might be differences in study protocols or it may be simply due to sampling differences, but the exact reason remains unclear. To summarize, all studies individually suggest specific impairments in prime-based agency inferences in patients and most importantly, findings of the three studies combined confirm these specific impairments.

In the present study, we tested and excluded the possibility that decreased neurocognitive functioning drives patients' deficits in prime-based agency inferences. Although at trend level a relation between BACS and prime-based inferences is found, the effect size is small and the trend can be explained by the finding that patients score significantly lower on both variables (Fig. 2). Interestingly, goal-based agency inferences were significantly related to individual differences in neurocognitive functioning in the total sample ($n = 69$). Although this relation appears stronger in patients than in healthy controls, it did not differ statistically between the groups. This suggests that the relation between goal-based agency inferences and cognitive processing is also present in patients with schizophrenia, i.e., a sample with reduced neurocognitive functioning. The current sample might be too small to detect such an interaction with group, and hence, the absence of the interaction should be treated with caution. Of importance, the findings of the current study relate to agency inference research in healthy individuals [45,46]. Specifically, increasing cognitive load (e.g., by a working memory task) seemed to negatively affect *goal*-based, but not *prime*-based agency inferences.

These findings suggest two important implications. First, the goal-based route to self-agency experiences relies on attentional processes that aid goal attainment (e.g., monitoring and feedback processing). Hence, taxing these attentional processes impairs goal-based agency inferences, and, as the present findings suggest, this might be similar for healthy individuals and patients suffering from schizophrenia. Second, *prime*-based agency inferences can occur rather automatically and seem to materialize without much attention. As these implicit inferences are essential to social cognitive behavior [47], our findings support the hypothesis that patients' difficulties with relying on subtle agency cues might be related to their problems in social functioning [6,48–50]. However, empirical evidence for this hypothesis is lacking.

Furthermore, we explored the relationship between the self-serving bias and agency inferences. First, patients showed weaker self-serving biases compared to control subjects, but this difference did not reach the conventional level of significance. Accordingly, the present study adds another piece of data to earlier research suggesting that schizophrenia is not related to the self-serving bias [35–37]. Furthermore, the effect of primes on agency inferences was unrelated to differences in self-serving bias, indicating that, at least in the current study, patients' impairments in prime-based agency processing cannot be explained by an aberrant self-serving bias. Finally, a generally biased attribution to the self, as estimated from the IPSAQ, was not related to the level of overall agency experiences in our task. These results are in line with previous research that showed no significant relation between locus of control (i.e., related to our measure of a generally biased attribution of the self) and indirect measures of self-agency (i.e., temporal binding and sensory attenuation) [51]. We extend this finding to a more explicit measure of self-agency, confirming that ratings of self-agency in a specific task setting (as we examined here) might tap into different processes underlying the sense of agency than a measure of general experiences of control (as represented in general measures of self-attributions or locus of control). More specifically, our results suggest that attributions in social situations are influenced by additional factors, which might overrule cognitive inferences. We wish to stress here that we do not know yet whether the underlying mechanisms of agency experiences, as we studied in the goal-based vs. primed-based agency inference task, directly pertain to actual agency experiences that people have in everyday situations, or whether there are important moderators that may shed light on the link between basic mechanisms and more complex real life social situations. This discrepancy is also apparent in the absence of clinical correlates of patients' impaired prime-based agency processing [19] and Supplementary material 4. Nevertheless, our results indicate that the agency inference task clearly taps into disturbed processes that are relevant to schizophrenia. To better understand the possible clinical implications of these problems, future studies should focus on designing an agency inference task with more ecological validity in order to better assess the behavioral and clinical consequences of impaired prime-based agency processing.

5. Conclusions

In the present study, we observed aberrant prime-based agency inferences in patients with schizophrenia. This replicates previous studies and suggests robustness of the finding. Also, the current study showed that decreased neurocognitive functioning negatively influences goal-based agency inferences. However, patients' impairments in prime-based agency inferences could neither be explained by decreased neurocognitive functioning nor by an aberrant self-serving bias. The confirmation that prime-based inferences can occur rather automatically underscores its potential relevance for behavior in social situations. The integration and distinction between self and other as a cause of behavior are essential to social functioning, but it remains a challenge to take the complexity of social processes into account in experimental settings [50]. In order to study the behavioral relevance of patients' deficits in prime-based inferences, future studies should focus on developing an agency inference task that taps into everyday situations.

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Disclosure of interest

The authors declare that they have no competing interest.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.eurpsy.2017.08.007.

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