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Subjective competence breeds overconfidence in errors in psychosis. A hubris account of paranoia

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ABSTRACT

Background and objectives: Overconfidence in errors is a well-replicated cognitive bias in psychosis. However, prior studies have sometimes failed to find differences between patients and controls for more difficult tasks. We pursued the hypothesis that overconfidence in errors is exaggerated in participants with a liability to psychosis relative to controls only when they feel competent in the respective topic and/or deem the question easy. Whereas subjective competence likely enhances confidence in those with low psychosis liability as well, we still expected to find more 'residual' caution in the latter group.
Methods: We adopted a psychometric high-risk approach to circumvent the confounding influence of treatment. A total of 2321 individuals from the general population were administered a task modeled after the "Who wants to be a millionaire" quiz. Participants were requested to endorse one out of four response options, graded for confidence, and were asked to provide ratings regarding subjective competence for the knowledge domain as well as the subjective difficulty of each item.
Results: In line with our assumption, overconfidence in errors was increased overall in participants scoring high on the Paranoia Checklist core paranoia subscale (2 SD above the mean). This pattern of results was particularly prominent for items for which participants considered themselves competent and which they rated as easy.
Limitations: Results need to be replicated in a clinical sample.
Discussion: In support of our hypothesis, subjective competence and task difficulty moderate overconfidence in errors in psychosis. Trainings that teach patients the fallibility of human cognition may help reduce delusional ideation.

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Delusions are traditionally associated with schizophrenia but are in fact transdiagnostic symptoms, which are present in many psychiatric disorders. Benign subclinical paranoid beliefs are encountered in 15–20% of the population (Freeman, 2006; Stip & Letourneau, 2009; van Os & Kapur, 2009).

Delusions can be briefly defined as fixed false beliefs. While conviction of the correctness of one's beliefs is a core defining feature of delusions, a plethora of studies suggest that this type of misjudgment reflects a general cognitive bias. Overconfidence is not confined to delusion-relevant scenarios but extends to situations that have no overt connection to delusional themes. Studies typically find that patients with paranoid schizophrenia or high-paranoid (subclinical) participants are more certain about their incorrect judgments while their confidence for correct responses is attenuated relative to controls (Moritz, Göritz, et al., 2014; Moritz & Woodward, 2002, 2006; Moritz, Woodward, Jelinek, & Klinge, 2008; Moritz, Woodward, & Rodriguez-Raecke, 2006; Moritz, Woodward, & Ruff, 2003; Peters, Hauschildt, Moritz, & Jelinek, 2013). The former effect is usually stronger than the latter. The difference between overconfidence in errors and underconfidence in correct judgments has been termed "confidence gap" (Moritz & Woodward, 2006; Moritz et al., 2008; Moritz, Woodward, & Rodriguez-Raecke, 2006). In combination with an increased error

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rate, it results in a state referred to as "knowledge corruption" (Moritz, Göritz, et al., 2014; Moritz & Woodward, 2006), i.e., a large part of what a person believes to be factually true is contaminated or corrupted (knowledge corruption is defined as follows: high-confident errors/all high-confident judgments × 100%). Overconfidence in errors is considered a risk factor and fodder for new delusional beliefs (Moritz & Woodward, 2006) and may aggravate the behavioral and emotional consequences of false beliefs (Moritz & Van Quaquebeke, 2014). Overconfidence is thus considered one target mechanism in the treatment of psychosis; indeed, antipsychotics have been reported to attenuate overconfidence and induce doubt (Andreou, Moritz, Veith, Veckenstedt, & Naber, 2014; Moritz, Andreou, Klingberg, Thoering, & Peters, 2013; Moritz et al., 2008, 2003).

However, not all studies found the aforementioned pattern of results (i.e., enhanced confidence gap in psychosis). A recent study (Klass, 2013) was unable to detect overconfidence in errors for difficult knowledge questions. In contrast, the same study population (Moritz, Göritz, et al., 2014) was also administered a hidden figures test with low demands. Here, the expected pattern (i.e. overconfidence in errors in patients with psychosis) was replicated. Likewise, for a difficult social cognition test, patients with schizophrenia did not differ from healthy controls with respect to overconfidence in errors (Andreou et al., submitted), whereas more simple emotion recognition tasks yielded the expected pattern of overconfidence in errors (Kother et al., 2012; Moritz, Woznica, Andreou, & Kother, 2012). For source memory tasks, the degree of overconfidence in errors and underconfidence in correct responses seems to fluctuate depending on whether items are self-generated, externally generated, or novel (Gaweda, Moritz, & Kokoszka, 2012; Moritz, Woodward, Whitman, & Cuttler, 2005; Peters et al., 2007). For a simple recognition task, patients with schizophrenia even displayed overconfidence in both correct and incorrect judgments (Kircher, Koch, Stottmeister, & Durst, 2007). In an earlier study on memory, differences between schizophrenia patients and controls in false recognition confidence were increased as a function of distracter difficulty (Moritz et al., 2008).

The above stimulated the hypothesis that task difficulty and the subjective competence patients experience when performing these tasks may moderate the magnitude of their confidence. While it is reasonable to assume that subjective competence will augment confidence both in healthy controls and patients with psychotic disorders, the effect is predicted to be particularly prominent in patients, reflecting a lack of 'residual' caution. Multiple methodological differences across the various tasks used to calculate knowledge corruption in prior studies preclude firm conclusions. Therefore, for the present study we tested the above hypothesis within the framework of a single paradigm. We predicted that subjects scoring high on psychosis would display exaggerated overconfidence in errors for tasks in which they considered themselves competent and which they deemed easy. This would be in line with the clinical observation that delusional beliefs are not random ideas that 'come out of the blue' but often are rooted in patients' premorbid areas of subjective 'expertise' (e.g., interests and profession). Taking into account subjective competence in research regarding overconfidence may help to explain why some studies did not find a robust correlation between overconfidence with delusions.

To pursue this hypothesis, we adopted a psychometric high-risk approach (Chapman & Chapman, 1988, 1985; Lenzenweger & Korfine, 1994), particularly in order to circumvent the confound of antipsychotic medication and comorbid psychiatric disorders as well as treatment-related caveats (e.g., stigma). In such studies, nonclinical subjects scoring at least 2 SD above the mean on a psychosis liability scale are compared to those scoring no higher than .5 SD above the mean.

We posed participants knowledge questions of a low, moderate or high degree of objective difficulty (e.g., 'What are geysers?') from the "Who wants to be a millionaire" quiz (for a forerunner study on a similar paradigm see Moritz, Woodward, & Hausmann, 2006) using a single-choice response format (demons, hot springs (correct), jewelry, ibexes) along with confidence ratings. Further, we asked whether participants felt competent for the respective topic and whether they deemed the question to be difficult, moderately difficult, easy or very easy. We felt it was important to determine subjective difficulty, as it may well differ from objective difficulty — for example, if a participant either under-or overestimates his/her level of expertise or has particular knowledge gaps versus strengths. For the overall analyses, we expected to find a narrowed confidence gap (overconfidence in errors, underconfidence in correct responses) in high-paranoid participants, with the additional prediction that subjective competence as well as difficulty would enhance the difference between high- and low-paranoid participants, particularly for incorrect judgments. If true, this finding may not only contribute to refining theoretical models of paranoia, but may also have implications for existing cognitive treatment programs for delusions (Garety & Freeman, 2013; Moritz, Andreou, et al., 2014).

1. Method

1.1. Participants

Participants were recruited via WiSo-Panel, a German online service providing researchers with the opportunity to advertise scientific studies (for the reliability of data of this and related services see Göritz, 2007; Judge, Ilies, & Scott, 2006; Piccolo & Colquitt, 2006). The online survey was programmed using the software package "unipark" (Globalpark AG/Questback). A total of 12,183 individuals from the general population were invited to participate. Of these, 2352 (20%) completed the relevant questionnaires (Paranoia Checklist and "Who wants to be a millionaire" task). The survey contained two further parts on latent aggression and dysfunctional coping strategies, which, however, are irrelevant to the present topic.

We discarded data of 31 participants who had either entered the same value (i.e., each time either the score 2, 3, 4 or 5) throughout in the psychopathological scales ($n = 27$) or had made nonsensical entries in one of the comment fields ($n = 4$). The final sample consisted of 2321 participants. As an incentive, participants were offered the free download of a manual containing mindfulness and relaxation exercises at the end of the survey (a different version was used than in Moritz, Göritz, et al., 2014). The research was completed in accordance with the Helsinki Declaration and was approved by the local ethics committee.

1.2. Measures

1.2.1. Psychopathology

Before the quiz, we administered two scales assessing paranoia and depression. Responses were entered on a 5-point Likert scale ranging from "fully applies" to "does not apply at all". For paranoia, the frequency scale of the *Paranoia Checklist* (Freeman et al., 2005) was administered. It consists of 18 items that, according to a factor analysis (Moritz, Van Quaquebeke, & Lincoln, 2012), are best represented by two subscales termed suspiciousness ("Bad things are being said about me behind my back") and core paranoia ("I can detect coded messages about me in the press/TV/radio"). The latter scale seems to be particularly relevant for psychosis: A recent experiment showed that the core paranoia but not the suspiciousness subscale correlates with jumping to conclusions (Moritz, Van

Quaquebeke & Lincoln, 2012), a reasoning bias that often characterizes people with delusions (Fine, Gardner, Craigie, & Gold, 2007; Garety & Freeman, 2013). Previous studies have confirmed good psychometric properties for the Paranoia Checklist (Freeman et al., 2005; Lincoln, Peter, Schafer, & Moritz, 2010; Lincoln, Ziegler, Lullmann, Muller, & Rief, 2010). The short-term test retest reliability of the online version is $r = .92$ (Moritz, Göritz, et al., 2014). Items of the Paranoia Checklist were intermixed with items from the *Center for Epidemiologic Studies-Depression Scale* (*CES-D*; Hautzinger & Brähler, 1993; Radloff, 1977). The CES-D is a 20 item questionnaire covering depressive symptoms. The CES-D has both a good internal consistency and test retest reliability ($r = .81$). Its validity has been confirmed against the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). Participants were screened for absence of schizophrenia and psychotropic medication.

1.2.2. "Who wants to be a millionaire" quiz

The study was modeled after the well-known "Who wants to be a millionaire" quiz and posed 12 questions from a commercial board game. One third of questions were of predetermined low difficulty (level 3 or 4, equivalent to the 200 or 300€ questions of the game), one third of moderate difficulty (level 4 or 5, equivalent to 500 or 1000€ questions of the game), and one third were of higher difficulty (level 8 or 9, equivalent to 4000 or 8000€ questions of the game). Each question contained four response options. The order of presentation of response options was pseudo-random, such that correct responses were displayed in the 1st, 2nd, 3rd or 4th position with equal frequency. For each question, participants were required to provide responses regarding (1) their answer to the actual question, (2) their confidence in their response ("very certain", "rather certain", "rather uncertain", "very uncertain/guessed"), (3) the subjective competence in the particular domain of knowledge (e.g., geography; "highly competent", "average", "not competent"), and (4) an estimate about the level of difficulty of the question ["very easy question (almost all people can answer this question)", "easy question (most people can answer this question)", "moderately difficult question (many people cannot answer this question)", "difficult question (very few people can answer this question)"]. The complete set of questions is available upon request.

1.2.3. Strategy of data analysis

In keeping with the methodology of most psychometric high-risk studies, we divided the sample into high and low scorers on the Paranoia Checklist core paranoia subscale. The performance of participants scoring at least two standard deviations above the mean on this scale was contrasted to that of participants with scores not higher than .5 *SD* above the mean of the sample.

Accuracy and response confidence, respectively, served as dependent variables. We expected that high scorers would show an overall pattern of overconfidence in errors as well as underconfidence in correct responses (i.e., confidence gap), which would be moderated by subjective difficulty and competence (a stronger confidence gap for items considered easy and those for which subjects perceived themselves as competent, in high scorers versus low scorers).

In more recent papers we focussed on the number of high-confident responses (i.e., ratings made with highest confidence), as such ratings are considered particularly momentous in case they are errors. Clearly, the number of high-confident errors is not independent from the number of overall errors. However, the two parameters are not redundant and can be well distinguished: For example, a participant who is aware of his/her cognitive deficits may commit many errors, but few high-confident responses. In contrast, a patient who is very insecure about his/her abilities, as often seen in depression, may commit few errors but at the same time may not be very confident. An alternative approach would be to consider only mean error rates; however, these do not reflect the real magnitude of the effect (e.g., if very few errors are made, a mean score exaggerates the importance of high-confident errors).

As the large sample size inflates Type I error we will confine exposition of results to all main effects and interactions that achieved significance at $p < .01$.

We also analyzed the percentage of high-confident errors on all errors, the percentage of high-confident correct responses on all correct responses, and the knowledge corruption index.

2. Results

2.1. Background variables

Most participants were women (59%) and had a high school degree (62%). Mean age was 46.9 years ($SD = 14.4$). Employment status was as follows: employed (60%), student (15%), retired (14%), unemployed (5%), parental leave (1%) and other (5%). The total score on the Paranoia Checklist was 26.33 ($SD = 10.64$; high scorer: $M = 56.70$, low scorer: $M = 23.34$).

2.2. High versus low scorers

The mean on the Paranoia Checklist core paranoia subscale score was 6.01 ($SD = 2.35$). A total of 123 participants were high scorers ($M = 14.31$, $SD = 3.05$); 2022 participants were low scorers ($M = 5.27$, $SD = .58$). Groups did not differ on major background characteristics.

2.3. Accuracy

We computed a 3 × 2 ANOVA with Level of Objective Difficulty as the within-subject factor (easy, medium, difficult) and Group (high versus low paranoia) as the between-subject factor. The number of correct responses was the dependent variable. Speaking of the validity of item pre-categorization, the main effect of Level of Difficulty was significant at a large effect size reflecting a greater number of correct responses for easy ($M = 3.82$) than for medium ($M = 3.55$) and difficult ($M = 2.52$) questions, $F(2,4286) = 652.17$, $p < .001$, $\eta^2_{partial} = .233$. At a weak-to-moderate effect size, participants scoring high on paranoia made less correct responses than low scoring participants, $F(1,2143) = 111.562$, $p < .001$, $\eta^2_{partial} = .049$. This was not qualified by a substantial interaction as revealed by a small effect size, $F(1,2142) = 8.43$, $p < .001$, $\eta^2_{partial} = .00$: Participants scoring high on paranoia made more errors for all three levels of difficulty (all $ps \leq .001$), although differences were somewhat attenuated for the easy items, perhaps due to ceiling effects. Further speaking for the validity of item selection, subjective difficulty was significantly different across the three predetermined difficulty levels [easy ($M = 1.54$), medium ($M = 1.89$) and difficult items ($M = 2.69$), all paired t-tests were significant ($p < .001$).

2.4. Subjective competence and ease

Although participants scoring high on paranoia made more errors, they regarded themselves as equally competent ($M = 1.78$) relative to low paranoid controls ($M = 1.82$), $t(2143) = 1.06$, $p = .29$. One-sample t-tests confirmed that both groups considered themselves more competent (an instance of the "better than average" or Dunning-Kruger (Kruger & Dunning, 1999) bias) than the average person (rating = 2, both $p < .001$). Moreover, subjective difficulty of the 12 items was judged the same by both groups, $t(2143) = .97$, $p = .33$.

2.5. Response confidence

We carried out a mixed ANOVA with Accuracy (correct, incorrect) and Objective Difficulty (easy, medium, difficult) as within-subject factors and Group as between-subject factor. The number of high-confident responses served as the dependent variable. At a weak effect size, patients scoring lower on the Paranoia Checklist subscore made more high-confident responses overall, $F(1,2143) = 36.23$, $p < .001$, $\eta^2_{partial} = .017$, which, as expected, was qualified by a significant Accuracy × Group interaction at a weak-to-moderate effect size, $F(1,2143) = 93.03$, $p < .001$, $\eta^2_{partial} = .042$: Fig. 1 shows that low paranoid scorers displayed more high-confident correct responses than high scorers, while the opposite was true for incorrect responses. The three-way interaction was also significant, $F(2,4286) = 6.85$, $p = .003$, $\eta^2_{partial} = .003$: The confidence gap was significant for all three levels of difficulty at $p < .001$ but it was more marked for easy ($\eta^2_{partial} = .032$) and moderately difficult items ($\eta^2_{partial} = .030$) than for difficult items ($\eta^2_{partial} = .015$) when each level of difficulty was considered in isolation. When the mean confidence scores were entered as dependent variables, all significant results remained unchanged.

2.6. Knowledge corruption

The percentage of high-confident errors on all errors was elevated in the high-scoring ($M = 24.08\%$) relative to the low-scoring group ($M = 17.58\%$). In contrast, the percentage of high-confident correct responses on all correct responses was lower in the high-scoring (M = 68.03%) relative to the low-scoring group (M = 76.38%). When entered in a two-way ANOVA the interaction of Group × Accuracy was significant, $F(1,2143) = 21.78$, $p < .001$, $\eta^2_{partial} = .01$. This, along with a higher error rate in the high-scoring group (see above) was reflected in increased knowledge corruption (i.e., ratio of high-confident incorrect responses to all high-confident answers) in high ($M = 11.23\%$, $SD = 18.73$) versus low scorers ($M = 3.76\%$, $SD = 7.43$) at a moderate effect size, $t(2143) = 9.48$, $p < .001$, $d = .52$.

2.7. Association between subjective item difficulty and competence with confidence

We then looked if subjective item difficulty (very easy, easy, moderately difficult, very difficult) and competence (very competent, average, not competent) moderated the results. We calculated new confidence variables (correct versus incorrect) separately for each level of subjective difficulty and subjective competence. To avoid repetition, we only report results for the main effects of competence and subjective difficulty as well as the three-way interaction (subjective difficulty and competence were examined in separate analyses). As can be seen in Fig. 3, the factor competence achieved significance, $F(2,4286) = 193.28$, $p < .001$, $\eta^2_{partial} = .08$: items for which participants considered themselves less competent received the lowest confidence ratings. Likewise, the more difficult an item was judged, the lesser the degree of confidence, $F(3,6429) = 308.74$, $p < .001$, $\eta^2_{partial} = .126$. The effects of both Group × Accuracy × Subjective Difficulty, $F(3,6429) = 8.96$, $p < .001$, $\eta^2_{partial} = .004$, and Group × Accuracy × Competence, $F(2,4286) = 8.40$, $p < .001$, $\eta^2_{partial} = .004$, achieved significance. Figs. 2 and 3 show that the usual pattern of underconfidence in correct versus overconfidence in incorrect responses was more marked for responses in the middle of the difficulty/competence continuum (difficulty: easy, medium; competence: average). When high paranoid participants felt very competent and regarded the task as easy, overconfidence in errors was significantly enhanced ($p < .001$; see Figs. 2 and 3). Underconfidence in correct responses was particularly seen in middle categories ($p < .001$; see Figs. 2 and 3). For tasks that were deemed difficult, group differences were reduced, and participants displayed very low confidence overall.

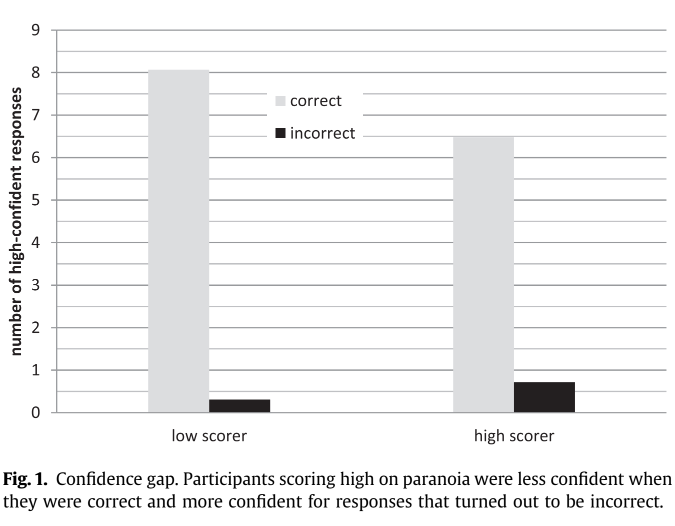

Fig. 1. Confidence gap. Participants scoring high on paranoia were less confident when they were correct and more confident for responses that turned out to be incorrect.

2.8. Correlations

Subjective competence and difficulty were modestly inter-correlated ($r = .32$, $p < .001$; 9% shared variance). Scores on the core paranoia subscale were significantly correlated with major experimental parameters: accuracy ($r = -.23$), knowledge corruption ($r = .18$) and confidence gap ($r = .22$; all $p < .001$).

3. Discussion

The present study aimed to clarify partial inconsistencies in the literature on overconfidence in errors in psychosis. While the majority of prior findings indicate that patients with paranoid schizophrenia as well as nonclinical participants scoring high on paranoia are marked by overconfidence in errors and underconfidence in correct responses, some important empirical exceptions exist (see Introduction).

Overall, the results are in line with the vast majority of studies showing that participants with a liability to psychosis show a decreased confidence gap (overconfidence in errors, less confidence in correct responses) and enhanced knowledge corruption (percentage of high-confident responses that are errors); the difference for the latter index achieved a moderate effect size. However, our study can also reconcile the counterintuitive pattern of results reported in some studies. In line with our hypothesis, overconfidence in errors in paranoia-prone people was exaggerated if the person felt competent or deemed the question easy. In contrast, when participants scoring high on paranoia felt incompetent or rated the question as very difficult, differences to low scorers diminished and were no longer significant. Our study thus replicates that overconfidence in errors is not bound to content (delusional versus nondelusional), but at the same time it suggests a role of subjective difficulty. Our findings may particularly explain the results of a recent study, which failed to replicate the basic overconfidence in errors effect for difficult knowledge questions (Klass, 2013), while confirming it for a simple hidden figure test (Moritz, Göritz, et al., 2014). It may also resolve the discrepant results of studies that have used self-report measures tapping (cognitive) confidence, which sometimes report overconfidence in scales such as the Beck Cognitive Insight Scale (Beck, Baruch, Balter, Steer, & Warman, 2004) but at other times underconfidence in other scales such as in the MCQ-30 (Moritz, Peters, Larøi, & Lincoln, 2010; Morrison & Wells, 2003). This is consistent with the clinical

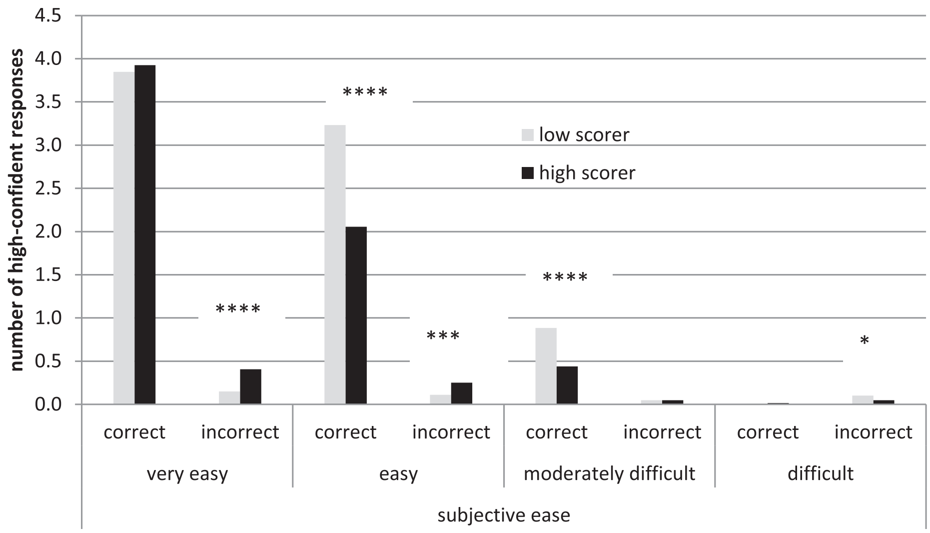

Fig. 2. For very difficult tasks, confidence judgments were extremely low. For very easy tasks participants scoring high on paranoia showed a pattern of enhanced confidence for both correct and incorrect judgments while the expected pattern (overconfidence in errors, underconfidence in correct responses) was shown for items of moderate difficulty. For the middle categories (easy, moderately difficult) the confidence gap achieved significance ($p < .001$). Independent t-tests: * = $p < .05$, ** = $p < .01$, *** = $p < .005$, **** = $p < .001$.

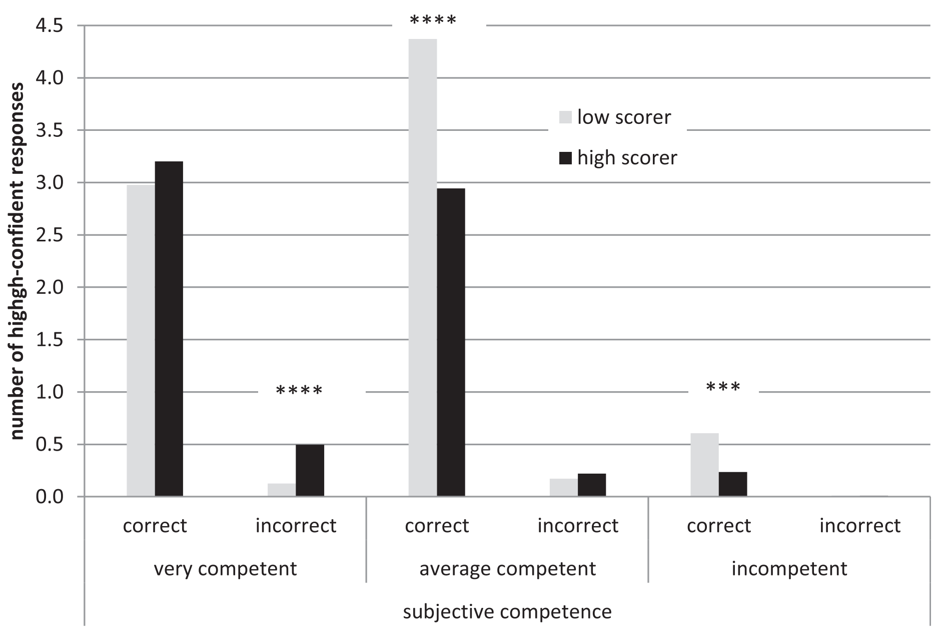

Fig. 3. For items, for which participants scoring high on paranoia considered themselves very competent, they displayed increased overconfidence for all judgments, while the confidence gap was strongest for items, for which they estimated their competence as average. Independent t-tests: *** = $p < .005$, **** = $p < .001$.

experience of patients being ambivalent or indecisive for some topics, but concurrently highly confident and inflexible in their opinions regarding other topics.

The study also elucidated metacognitive deficits in the high-paranoid subgroup: Whereas participants made more errors than controls, they regarded themselves as equally competent as the low-scoring group. Their judgments were even shifted in the direction of being more competent than the average person ($M = 1.78$; average competence = 2; $p < .001$). This agrees with prior studies showing lack of cognitive insight and lack of awareness about cognitive dysfunction in this group (Beck et al., 2004; Cella, Swan, Medin, Reeder, & Wykes, 2014; Moritz, Ferahli, & Naber, 2004). Importantly, the strongest between-group effect size emerged for the metacognitive parameter of knowledge corruption, suggesting that the assessment of metacognitive aspects adds information to the mere examination of error rates.

The present study was set up as an analog study, a design which has several advantages over studies with clinical patients. First, participants were unmedicated, removing a significant confound (in light of the fact that antipsychotics have been reported to affect subjective confidence, see Introduction). Second, high-risk participants had not received any psychiatric treatment, and thus stigma and other consequences of diagnosis and treatment that may have influenced the dependent variable (for example, low self-esteem may reduce overconfidence) do not apply. The approach is considered valid, as (subclinical) paranoid symptoms are not confined to patients with psychotic disorders but can also be found in the general population (Freeman, 2006; Moritz & Van

Quaquebeke, 2014; Stip & Letourneau, 2009; van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009) ranging from psychotic experiences (8%) to psychotic symptoms (4%) to a manifest psychotic disorder (3%). Still, results should be confirmed in a patient sample.

Limitations of the study should also be mentioned. First, we used a psychometric high-risk approach; the cut-off of 2 SD versus .5 SD has to be considered arbitrary. Second, prior research has indicated that the magnitude of overconfidence in errors depends on the specific task, so that the present conclusions should be verified by testing other domains such as perception.

Although speculative at this point, our results have several implications for treatment. First, as already attempted by means of metacognitive interventions (Moritz, Andreou, et al., 2014; Ross, Freeman, Dunn, & Garety, 2011; Waller, Freeman, Jolley, Dunn, & Garety, 2011), it may prove beneficial to demonstrate to patients the fallibility of human cognition per se, even for seemingly easy tasks, and patients should be advised to be less confident if evidence is unpersuasive. Even if one feels competent, residual doubt should remain and additional checks should be sought. The message of metacognitive interventions is that utter conviction should be confined to real *facts* that are beyond any doubt and are shared with the vast majority of the population (e.g., Paris is the capital of France), whereas judgments ("Picasso was the greatest artist of all times") and opinions ("Russia and the European Union are opponents") that are subject to controversy and may change over time should never be endorsed with full confidence. Second, as results show that overconfidence in errors is more pronounced for easy topics and for those for which the person feels competent, a challenge of the person's competence might also be a target for metacognitive intervention. Clearly, this has to be done in a subtle way to avoid undermining the therapeutic relationship and insulting patients. It should be emphasized that metacognitive training is not about "outsmarting" the patient, fully negating the belief and being more knowledgeable, but aims at asking questions that "plant the seeds of doubt". As noted, at present these suggestions should be contemplated with caution to avoid harming the patient's self-esteem.

To conclude, the present study confirms that a propensity for delusions is associated with overconfidence in errors. However, this effect is moderated by important parameters: subjective competence and subjective item difficulty. Overconfidence in errors in paranoid people is more pronounced when they feel competent in the topic in question. This finding has implications for both theoretical models of delusions and their treatment.

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