Introduction

Metacognition refers to ‘thinking about thinking’ and involves active control over the cognitive processes engaged in thinking and acquiring knowledge or learning. Metacognition involves the notion of self, ranging from self as own body, to self as own identity or ‘agency’. A sense of body ownership occurs regardless of whether an action is generated by the self or others, whereas a sense of agency refers to the sense of being the one who initiates an action. Sense of agency is linked to the ability to maintain the distinction between the individual and the environment.

Intrusive thoughts are generally defined as thoughts that are unwanted or unintended, and may be perceived as uncontrollable. It is argued that when intrusive thoughts are experienced, any inconsistency between metacognitive beliefs about one’s ability to control thoughts and the experience of uncontrollable intrusive thoughts may lead to cognitive dissonance, a state of negative arousal. From this perspective, hallucination-prone individuals are motivated to attribute their intrusive thoughts to an external source in the attempt to prevent cognitive dissonance from occurring.

Method

We have included only systematic reviews (systematic literature search, detailed methodology with inclusion/exclusion criteria) published in full text, in English, from the year 2000 that report results separately for people with a diagnosis of schizophrenia, schizoaffective disorder, schizophreniform disorder or first episode schizophrenia. Due to the high volume of systematic reviews we have now limited inclusion to systematic meta-analyses. Where no systematic meta-analysis exists for a topic, systematic reviews without meta-analysis are included for that topic. Reviews were identified by searching the databases MEDLINE, EMBASE, CINAHL, Current Contents, PsycINFO and the Cochrane library. Hand searching reference lists of identified reviews was also conducted. When multiple copies of reviews were found, only the most recent version was included.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist that describes a preferred way to present a meta-analysis. Reviews were assigned a low, medium or high possibility of reporting bias depending on how many items were checked. For instance, a low possibility of bias would be assigned to reviews checking over 66% of items, a medium possibility between 33 and 66% and a high possibility would be given to reviews checking less than 33%. Due to the increased number of reviews published since 2014, reviews reporting less than 50% of items have been excluded from the library, prior to this date we excluded reviews reporting less than 33% of items. The PRISMA flow diagram is a suggested way of providing information about studies included and excluded with reasons for exclusion. Where no flow diagram has been presented by individual reviews, but identified studies have been described in the text, reviews have been checked for this item. Note that early reviews may have been guided by less stringent reporting checklists than the PRISMA, and that some reviews may have been limited by journal guidelines.

Evidence was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach where high quality evidence such as that gained from randomised controlled trials (RCT) may be downgraded to moderate or low if review and study quality is limited, if there is inconsistency in results, indirect comparisons, imprecise or sparse data and high probability of reporting bias. It may also be downgraded if
risks associated with the intervention or other matter under review are high. Conversely, low quality evidence such as that gained from observational studies may be upgraded if effect sizes are large or if there is a dose dependent response. We have also taken into account sample size and whether results are consistent, precise and direct with low associated risks (see end of table for an explanation of these terms)\(^4\). The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of the Schizophrenia Research Institute.

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**Results**

We found three reviews that met our inclusion criteria\(^1, 2, 5\).

See PRISMA checklist for review quality assessments.

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**Conclusions**

- High quality evidence suggests impaired self-awareness, particularly sense of agency, in people with schizophrenia compared to controls.
- Moderate quality evidence suggests small effects of people experiencing hallucinations or hallucination proneness having increased thoughts of uncontrollability and danger, cognitive confidence, and cognitive self-consciousness compared to people not experiencing hallucinations or hallucination proneness.
- Moderate quality evidence suggests a medium to large effect of poorer self-recognition and new item recognition in people with schizophrenia compared to controls. There is a medium effect of poorer self-recognition, but not new item recognition, in people with schizophrenia who experience auditory hallucinations compared to people with schizophrenia who do not experience auditory hallucinations.
Signs and Symptoms - Metacognition and self-awareness

*Hur J, Kwon JS, Lee TY, Park S*

**The crisis of minimal self-awareness in schizophrenia: A meta-analytic review**

*Schizophrenia Research 2014; 152: 58-64*

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<table>
<thead>
<tr>
<th>Comparison</th>
<th>Self-awareness in people with schizophrenia vs. controls.</th>
</tr>
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<tbody>
<tr>
<td>Summary of evidence</td>
<td>High quality evidence (consistent, precise, direct, large samples) suggests impaired self-awareness, particularly sense of agency in people with schizophrenia.</td>
</tr>
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</table>

**Self-awareness**

A significant medium effect of impaired self-awareness, particularly sense of agency;

Overall: 25 studies, N = 1669, $g^t = 0.51$, 95%CI 0.26 to 0.76, $p < 0.001$, $I^2 = 0\%$, $p = 1.000$

Sense of agency: 15 studies, N = 753, $g = 0.49$, 95%CI 0.17 to 0.81, $p = 0.003$, $I^2 = 0\%$, $p = 1.000$

Trend effects for impaired sense of body ownership and sense of self;

Sense of body and ownership: 4 studies, N = 202, $g = 0.91$, 95%CI $−0.05$ to $1.86$, $p = 0.062$, $I^2 = 0\%$, $p = 0.994$

Sense of self: 6 studies, N = 731, $g = 0.57$, 95%CI $−0.05$ to $1.19$, $p = .072$, $I^2 = 0\%$, $p = 0.923$

**Consistency in results**

Consistent

**Precision in results**

Precise for overall self-awareness and sense of agency only.

**Directness of results**

Direct

*Varese F, Bentall RP*

**The metacognitive beliefs account of hallucinatory experiences: A literature review and meta-analysis**

*Clinical Psychology Review 2011; 31: 850–864*

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| Comparison | Metacognitive beliefs in hallucinating people vs. non- |

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<table>
<thead>
<tr>
<th>hallucinating people, and in hallucination prone people vs. non-hallucination prone people.</th>
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<td><strong>Summary of evidence</strong></td>
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<tr>
<th><strong>Metacognition</strong></th>
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<tbody>
<tr>
<td>25 studies, N = 3222</td>
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<tr>
<td>When both clinical and non-clinical studies are pooled, metacognitive factors are significantly associated with hallucinations or hallucination proneness;</td>
</tr>
<tr>
<td>Uncontrollability/danger (medium to large effect): ( g = 0.71, 95%CI\ 0.50\ to\ 0.93, \ p &lt; 0.001, \ I^2\ 83% )</td>
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<tr>
<td>Cognitive confidence (medium effect): ( g = 0.54, 95%CI\ 0.37\ to\ 0.70, \ p &lt; 0.001, \ I^2\ 69% )</td>
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<tr>
<td>Negative beliefs about thought (medium effect): ( g = 0.45, 95%CI\ 0.29\ to\ 0.61, \ p &lt; 0.001, \ I^2\ 69% )</td>
</tr>
<tr>
<td>Cognitive self-consciousness (medium effect): ( g = 0.54, 95%CI\ 0.40\ to\ 0.7, \ p &lt; 0.001, \ I^2\ 57% )</td>
</tr>
<tr>
<td>Positive beliefs (small to medium effect): ( g = 0.31, 95%CI\ 0.20\ to\ 0.43, \ p &lt; 0.001, \ I^2\ 39% )</td>
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<tr>
<td>Authors report that after controlling for comorbid symptoms, the effects of positive beliefs about worry and general negative beliefs were no longer statistically significant and the magnitude of the effect for uncontrollability and danger, cognitive confidence and cognitive self-consciousness reduced to small.</td>
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<tr>
<td>Subgroup analysis of clinical samples vs. non-clinical samples showed non-clinical samples had effect sizes of similar magnitude to those reported above, however, clinical samples showed the only significant factors were cognitive self-consciousness and positive beliefs about worry, both showing small effects.</td>
</tr>
</tbody>
</table>

| **Consistency in results** | Inconsistent |
| **Precision in results** | Precise |
| **Directness of results** | Direct |
**Signs and Symptoms - Metacognition and self-awareness**

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**Waters F, Woodward T, Allen P, Aleman A, Sommer I**

**Self-recognition deficits in schizophrenia patients with auditory hallucinations: a meta-analysis of the literature**

*Schizophrenia Bulletin* 2012; 38(4): 741-750

View review abstract online

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Self-recognition in people with schizophrenia vs. controls and patients with auditory hallucinations in the week prior to testing vs. those without auditory hallucinations in the week prior to testing.</th>
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<td>Summary of evidence</td>
<td>Moderate quality evidence (large samples, consistent, unable to assess precision, direct) suggests a medium to large effect of poorer self-recognition and new item recognition in people with schizophrenia compared with controls. There was a medium effect of poorer self-recognition, but not new item recognition, in people with schizophrenia with auditory hallucinations compared with people with schizophrenia without auditory hallucinations.</td>
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### Self-recognition and new item recognition

*Significant medium to large effect of poorer self-recognition accuracy and new item recognition in people with schizophrenia compared with controls;*

Self-recognition accuracy: 23 studies, \(N = 1370, g = -0.73, \text{CI not reported}, p < 0.00001, I^2 = 52\%\)

   *Omitting 1 study reduced \(I^2\) to 41\%, and increased \(g\) to -0.71.*

   *No evidence of publication bias.*

New item recognition: 23 studies, \(N = 1370, g = -0.39, \text{CI not reported}, p < 0.00001, I^2 = 45\%\)

   *Possible publication bias.*

*Significant medium effect of poorer self-recognition, but not new item recognition, in people with schizophrenia with auditory hallucinations compared with people with schizophrenia without auditory hallucinations;*

Self-recognition accuracy: 9 studies, \(N = 315, g = -0.58, \text{CI not reported}, p < 0.00001, I^2 = 17\%\)

   *New item recognition: 5 studies, \(N = 214, g = -0.13, \text{CI not reported}, p = 0.352, I^2 = 71\%*\)

   *No evidence of publication bias.*
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<table>
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<tr>
<th>Consistency in results</th>
<th>Consistent for both control comparisons, and for self-recognition in patients with hallucinations vs. patients without hallucinations.</th>
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<tbody>
<tr>
<td>Precision in results</td>
<td>Unable to assess</td>
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<tr>
<td>Directness of results</td>
<td>Direct</td>
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</table>

Explanation of acronyms

CI = Confidence Interval, $g = $Hedges’ $g =$ standardised mean differences (see below for interpretation of effect size) $I^2 =$ the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), N = number of participants, $p =$ statistical probability of obtaining that result ($p < 0.05$ generally regarded as significant), vs. = versus
Explanation of technical terms

* Bias has the potential to affect reviews of both RCT and observational studies. Forms of bias include; reporting bias – selective reporting of results; publication bias - trials that are not formally published tend to show less effect than published trials, further if there are statistically significant differences between groups in a trial, these trial results tend to get published before those of trials without significant differences; language bias – only including English language reports; funding bias - source of funding for the primary research with selective reporting of results within primary studies; outcome variable selection bias; database bias - including reports from some databases and not others; citation bias - preferential citation of authors. Trials can also be subject to bias when evaluators are not blind to treatment condition and selection bias of participants if trial samples are small\(^6\).

† Different effect measures are reported by different reviews.

Prevalence refers to how many existing cases there are at a particular point in time. Incidence refers to how many new cases there are per population in a specified time period. Incidence is usually reported as the number of new cases per 100,000 people per year. Alternatively some studies present the number of new cases that have accumulated over several years against a person-years denominator. This denominator is the sum of individual units of time that the persons in the population are at risk of becoming a case. It takes into account the size of the underlying population sample and its age structure over the duration of observation.

Reliability and validity refers to how accurate the instrument is. Sensitivity is the proportion of actual positives that are correctly identified (100% sensitivity = correct identification of all actual positives) and specificity is the proportion of negatives that are correctly identified (100% specificity = not identifying anyone as positive if they are truly not).

Mean difference scores refer to mean differences between treatment and comparison groups after treatment (or occasionally pre- to post-treatment) and in a randomised trial there is an assumption that both groups are comparable on this measure prior to treatment. Standardised mean differences are divided by the pooled standard deviation (or the standard deviation of one group when groups are homogenous) that allows results from different scales to be combined and compared. Each study’s mean difference is then given a weighting depending on the size of the sample and the variability in the data. Less than 0.4 represents a small effect, around 0.5 a medium effect, and over 0.8 represents a large effect\(^6\).

Relative risk (RR) refers to the probability of a reduction (< 1) or an increase (> 1) in a particular outcome in a treatment group, or a group exposed to a risk factor, relative to the comparison group. For example, a RR of 0.75 translates to a reduction in risk of an outcome of 25% relative to those not receiving the treatment or not exposed to the risk factor. Conversely, a RR of 1.25 translates to an increased risk of 25% relative to those not receiving treatment or not having been exposed to a risk factor. A RR of 1.00 means there is no difference between groups. A medium effect is considered if RR > 2 or < 0.5 and a large effect if RR > 5 or < 0.2\(^7\). Odds ratios (ORs) are similar to RRs, but they are based on the probability of an event occurring divided by the probability of that event not
occurring. ORs and RRs are similar in size when the event is rare, such as with schizophrenia. lnOR stands for logarithmic OR where a lnOR of 0 shows no difference between groups. Hazard ratios (HRs) measure the effect of an explanatory variable on the hazard or risk of an event.

Correlation coefficients (eg, r) indicate the strength of association or relationship between variables. They can provide an indirect indication of prediction, but do not confirm causality due to possible and often unforseen confounding variables. An r of 0.10 represents a weak association, 0.25 a medium association and 0.40 and over represents a strong association. Unstandardised (b) regression coefficients indicate the average change in the dependent variable associated with a one unit change in the independent variable, statistically controlling for the other independent variables. Standardised regression coefficients represent the change being in units of standard deviations to allow comparison across different scales.

Inconsistency refers to differing estimates of effect across studies (i.e. heterogeneity or variability in results) that is not explained by subgroup analyses and therefore reduces confidence in the effect estimate. I² is the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance) - 0% to 40%: heterogeneity might not be important, 30% to 60%: may represent moderate heterogeneity, 50% to 90%: may represent considerable heterogeneity and over this is considerable heterogeneity. I² can be calculated from Q (chi-square) for the test of heterogeneity with the following formula:

$$I^2 = \left( \frac{Q - df}{Q} \right) \times 100\%$$

Imprecision refers to wide confidence intervals indicating a lack of confidence in the effect estimate. Based on GRADE recommendations, a result for continuous data (standardised mean differences, not weighted mean differences) is considered imprecise if the upper or lower confidence limit crosses an effect size of 0.5 in either direction, and for binary and correlation data, an effect size of 0.25. GRADE also recommends downgrading the evidence when sample size is smaller than 300 (for binary data) and 400 (for continuous data), although for some topics, these criteria should be relaxed.

Indirectness of comparison occurs when a comparison of intervention A versus B is not available but A was compared with C and B was compared with C that allows indirect comparisons of the magnitude of effect of A versus B. Indirectness of population, comparator and/or outcome can also occur when the available evidence regarding a particular population, intervention, comparator, or outcome is not available and is therefore inferred from available evidence. These inferred treatment effect sizes are of lower quality than those gained from head-to-head comparisons of A and B.

This topic is yet to be reviewed by a content expert.
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References