The Neuropsychological Basis of Competence to Consent in First-Episode Schizophrenia: A Pilot Metacognitive Study

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Background: *This study was designed to explore the neuropsychological basis of competence to consent to treatment in first-episode schizophrenia by evaluating its differential and joint links with cognitive versus metacognitive performance.*

Methods: *Twenty-one first-episode patients were assessed with the MacArthur Competence Assessment Tool for Treatment (MacCAT-T) and a metacognitive version of the Wisconsin Card Sorting Test (WCST). In addition to the standard administration of the WCST, subjects were also asked to rate their level of confidence in the correctness of each sort (prior to getting the feedback) and to choose whether they wanted each sort to be "counted" toward their overall performance score on the test. Each "ventured" sort received a bonus of 10 cents if correct but an equal penalty if wrong.*

Results: *Compromised capacity to consent was more strongly related to deficits at the metacognitive level than to cognitive deficits per se. Moreover, prediction of competence to consent significantly improved when adding the new, free-choice metacognitive measures to the conventional WCST measures but not the other way around.*

Conclusions: *These preliminary results suggest that metacognition plays a fundamental role in capacity to consent, which might be at least equally important for decision-making competence as cognitive deficits per se.*

Key Words: Decision-making competence, first-episode schizophrenia, neurocognitive deficits, metacognition

The adequacy of patients' informed consent to treatment or research is the focus of an ongoing public and professional debate (Capron 1999; Carpenter et al 2000). Recently, it has been recognized by the US National Institute of Mental Health (NIMH) as a research topic of highest priority (Shore and Hyman 1999). At the core of this controversy is the wish to protect two potentially conflicting human rights: the right of competent patients to make profound choices about their medical care and the right of incompetent patients to be protected from the potential harm of their decisions (Grisso and Appelbaum 1998a). Ascertaining competence to consent in persons with schizophrenia is of special concern, since: 1) patients often refuse treatment; 2) antipsychotic medications have serious adverse side effects (some of which, like tardive dyskinesia, may be irreversible); 3) patients are often asked to participate in experimental research which may be potentially harmful (e.g., medication discontinuation, symptom provocation); and 4) impaired cognitive functioning is a common feature of the illness (Brabbins et al 1996).

Evidence gathered over the past three decades suggests that, on balance, patients with schizophrenia are capable of consent even though as a group they are less able to understand, retain, and process consent information than comparison groups of healthy subjects or patients with other medical or psychiatric illnesses (Grisso and Appelbaum 1995; Meisel and Roth 1981; Roth et al 1987; Stanley et al 1981; Sugarman 1999). However, many schizophrenia patients, even when acutely ill, perform no worse on these tasks than the general population (Grisso and Appelbaum 1995; Grisso et al 1997). In addition, once treatment begins, these deficits greatly improve among those who are less capable to a level similar to that of non-ill groups (Grisso and Appelbaum 1995).

While competence to consent is clearly compromised by impaired cognitive functioning (Carpenter et al 2000), relatively little is known about the underlying neuropsychological functions on which it is dependent. Recent studies suggest that impaired decisional capacity in schizophrenia may be associated with various cognitive deficits, such as immediate and delayed memory, attention, and abstract reasoning (Carpenter et al 2000; Kovnick et al 2003; Moser et al 2002). However, correlations in these studies between cognitive measures and competence were wide-ranging and fit no particular explanatory pattern. Moreover, since none of these studies were designed to test specific hypotheses about the nature of this relationship, almost nothing is known about the mechanisms that may mediate between basic neurocognitive deficits and poor capacity for informed consent.

Our perspective is that the hypothesis suggesting a relationship between performance on neurocognitive tests and impaired decisional capacity is overly simplistic. Rather, the current study was motivated by the view that decision-making competence does not only require one to be able to solve certain tasks (i.e., good cognitive skills) but also–perhaps primarily–to correctly assess one's ability or inability to solve that task and to direct one's performance based on this assessment. According to this view, the major limitation of previous studies is their failure to address deficits at a metacognitive level of functioning, which, reflecting one's monitoring of one's knowledge and the ensuing regulation of one's performance, are fundamental enablers of competent decision making.

Previous studies concerning the neuropsychological basis of competence to consent have generally relied on standardized forced-responding tasks (Nelson and Narens 1994) that do not allow patients the freedom to decide whether to volunteer or withhold their answers. Consequently, they failed to take into

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account the role of subjects' control over their performance that is common in real-life contexts, like competence to consent to treatment. Moreover, in so doing, they focused exclusively on the input-bound quantity aspect of performance, that is, on the number or percentage of the presented (input) items that could be correctly remembered, answered, or solved. Yet, as pointed out by Koriat and Goldsmith (1994, 1996), input-bound quantity measures essentially ignore an equally important and unique aspect of performance in real-life tasks–its output-bound accuracy or dependability, that is, the extent to which the person's freely volunteered responses (output) can be trusted. Output-bound accuracy measures are calculated as the percentage of correct responses of those freely volunteered (Koriat and Goldsmith 1994).

Thus, at the heart of our study is the belief that output-bound accuracy performance is a crucial enabler of competent decision making, which is not less important than input-bound quantity performance. Whereas the latter reflects the actual ability to solve certain tasks (e.g., remember and understand the various pros and cons), the former reflects the ability to know when one is remembering or understanding correctly and when one is not and to control one's performance accordingly, responding only when one is able to respond correctly and abstaining (seeking help or further information) otherwise. These two aspects need not be interdependent. For example, although a person may forget or be unable to understand the information needed for correct responding (low input-bound quantity performance), he or she may nevertheless act only when he or she does understand correctly and seek further advice otherwise (high output-bound accuracy performance). Conversely, a person may understand correctly in most situations (high input-bound quantity performance), yet be unable to discern those situations in which understanding is lacking and act in those situations, as well, perhaps with serious consequences.

For the purpose of illustration, imagine two patients who are having trouble understanding the two benefits and two risks disclosed to them about a treatment they are asked to take. Patient A understands one benefit and one risk correctly but being unaware that he or she does not accurately comprehend the other two correctly (poor monitoring ability), decides to accept the treatment (with potentially dangerous results). Patient B, on the other hand, also understands one benefit and one risk correctly but being aware that he or she does not fully understand the other two (good monitoring ability), refrains from making a decision until he or she is able to ask for further explanation. Note, now, that both patients have equal input-bound quantity performance (two out of four benefits/risks are correctly understood = 50%). However, while Patient B's output-bound accuracy performance is perfect (two out of the two benefits/risks are correct = 100%), Patient A's output-bound accuracy performance is much lower (two out of the four benefits/risks are correct = 50%). Put another way, when Patient B does not know something, he or she does not act on his or her knowledge (but rather, seeks help), whereas Patient A continues to act on his or her incorrect knowledge in any case, either because he or she is unaware that he or she lacks the required knowledge (poor monitoring) or because he or she is indifferent to this lack (good monitoring but poor control).

The issues and psychological processes underlying output-bound accuracy in "free-response" situations have been addressed in experimental psychology in the study of metacognition. Metacognition is a term used to distinguish between a person's cognitive abilities and the person's knowledge regarding those abilities and how that metaknowledge is used by the person to control actual performance. Hence, two important components of metacognitive functioning are monitoring (the mechanism that is used to subjectively assess the correctness of one's knowledge) and control (the mechanism that controls one's cognitive performance on the basis of the monitoring output) (see Nelson and Narens 1990, 1994).

The aim of the present study was to explore the neuropsychological basis of competence to consent in patients in their first episode of schizophrenia by evaluating its differential and joint links with cognitive versus metacognitive performance. The focus on first-episode schizophrenia was motivated by the sparse data that exist in the literature on the nature and depth of competence-related deficits early in the course of the illness. In addition, studies of this population allow us to examine the association between competence to consent and neurocognition without the potential confounds of illness chronicity.

We hypothesized that prediction of impaired competence to consent would be considerably improved when adding to conventional measures of how much the person knows ("performance quantity"), measures of how much this knowledge can be trusted ("performance accuracy"), which depend on metacognitive processes of self-monitoring and self-directed action. To assess this hypothesis, we adapt a model of the monitoring and control processes underlying the strategic regulation of memory accuracy (Goldsmith and Koriat 1999; Koriat and Goldsmith 1996) and its associated experimental methodology. In this model, when answering questions from memory, one does not simply report all of the information that comes to mind. Rather, one monitors the correctness of one's candidate answers and then controls one's reporting accordingly, volunteering only those items that one is confident enough about.

Although the Koriat and Goldsmith (1996) model was targeted to memory performance and the mediating role of metamemory processes, its basic logic can be applied to any type of cognitive performance in which discrete responses (that may be correct or incorrect) are arrived at. Thus, in the present study, we applied the model to the performance of participants on the Wisconsin Card Sorting Test (WCST). The WCST was selected because the literature, including works from our own group (Koren et al 1998; Seidman et al 2002), suggests that abstract reasoning and problem solving are among the more salient and persistent cognitive deficits in schizophrenia and because performance on the test showed one of the most robust associations with functional outcome in schizophrenia (Green et al 2000).

Methods and Materials

Participants

Participants in the study were 21 patients (13 male patients, 8 female patients; age 23.9 ± 4.5 years; years of formal education 12.2 ± 1.8) hospitalized for a first episode of schizophrenia or schizophreniform disorder at Tirat Ha'carmel Mental Health Center (Israel). Patients were diagnosed according to the criteria of the *Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition* (DSM-IV) (American Psychiatric Association 1994). Since to date there are almost no data in the literature on the potential effect of certain neurological conditions on the relationship between cognition and metacognition, we excluded from the study patients with 1) neurological disorders; 2) substance abuse in the past 6 months or lifetime history of substance dependence; 3) history of head injury with loss of consciousness greater than 5 minutes; 4) mental retardation; and 5) medical illnesses associated with neurocognitive impairment. Ten patients were receiving haldol (mean = 12.8 mg/d), 8 patients were receiving olanzapine (mean = 12.5 mg/d), 2 patients were receiving risperdal (mean = 4.5 mg/d), and 1 patient was receiving clozapine (mean = 125mg/d).

The study was approved by the Institutional Review Board of the Tirat Ha'Carmel Mental Health Center. All patients provided written informed consent after receiving detailed explanation of the study and after being assessed for competency to consent to participate in the study by their treating clinician.

Measures and Procedures

All patients were assessed within the first 2 weeks of admission as soon as they were deemed by their treating clinicians stable enough to participate and cooperate with neuropsychological testing. Initial level of minimal stabilization was chosen as a criterion for approaching our patients to minimize state-dependent effects and maximize testing validity. It is important to note, first, that no patients were excluded from the study based on their being nonresponsive to treatment and, second, that despite being stabilized all patients were still rather symptomatic at the time of the study. This notion is supported by the high average number of symptoms (9.8 ± 4.7) observed by treating clinicians on the 17-item Symptom Checklist that comes with the Scale to Assess Unawareness of Mental Disorder (SUMD) (Amador et al 1994).

Clinical Assessment

Patient diagnoses were derived from structured interviewing using the Structured Clinical Interview for DSM-IV (SCID) (First et al 1996), a systematic review of the medical record and clinician information. A senior psychiatrist, expert in diagnosis (MP), carried out the SCID interview and reviewed all available information to determine the diagnoses. The diagnostian was blind to the competence and neuropsychological test results.

Exclusion criteria were assessed based on systematic review of medical records and a special neuropsychological status interview that was specifically developed by L.J. Seidman (Faraone et al 1995) for screening purposes of factors (e.g., history of neurological problems, brain injuries, substance dependence, electroconvulsive therapy, sensory-motor problems, etc.) that might affect cognitive performance in potential candidates for neuropsychological studies.

Finally, to assess degree of overt psychosis-agitation and level of cooperation during testing, the examiner rated each subject at the end of each session. Possible scores ranged from 0 (essentially normal effort) to 6 (very poor effort or high degree of psychosis). All patients were rated in the 0 to 2 range (that was designed a priori to quantify normal to mildly abnormal behaviors) on either of these scales.

Competence to Consent Assessment

Competence to consent to treatment was assessed using the MacArthur Competence Assessment Tool for Treatment (MacCAT-T) (Grisso and Appelbaum 1998b). The MacCAT-T is a semistructured interview that provides a patient with information about the medical/psychiatric condition that needs intervention, the type of treatment being recommended, its risks and benefits, and other possible treatments and their probable consequences. During this process, the MacCAT-T prompts the clinician to ask questions that assess four areas of decisional capacity reflecting commonly applied legal standards for competence to consent to treatment: understanding relevant information, appreciation of the information for one's own situation, reasoning with the information in a decisional process, and expressing a choice (Grisso and Appelbaum 1998a). Studies using the MacCAT-T have demonstrated good interrater reliability and concurrent validity as a capacity assessment tool (Grisso and Appelbaum 1995; Grisso et al 1995, 1997). Trained research assistants (graduate level clinical psychology students) administered the MacCAT-T according to explicit criteria provided by a scoring manual. Intraclass correlation coefficients for the raters were .82 (Understanding), .85 (Appreciation), .77 (Reasoning), and .91 (Expressing a Choice).

Neuropsychological and Metacognitive Assessment

Because our goal was to minimize state-dependent effects, patients were tested when they were clinically stable, as judged by clinical staff who were familiar with them. Administration of the WCST followed the standard administration instructions. However, prior to getting the feedback, we also asked our subjects: 1) to rate their level of confidence in the correctness of that sort on a 0 (Just guessing) to 100 (Completely confident) scale and 2) to decide whether they wanted that sort to be "counted" toward their overall performance score on the test. Each "volunteered" sort received a bonus of 10 cents if correct but an equal penalty if wrong. Thus, in addition to the standard "forced response" measures that reflect the patient's ability to perform the sorting task, our procedure also yielded measures of "free response" performance that depended on the patient's metacognitive knowledge. The key metacognitive variables that were derived were:

1. Accuracy score: The proportion of correct volunteered responses;
2. Free choice improvement: The difference between the Accuracy score and the Quantity score (percent of total correct sorts).
3. Global monitoring: The veridicality of one's overall sense of one's level of knowledge, defined as the difference between the total number of correct sorts and the total number of sorts asked to be counted.
4. Monitoring resolution: The extent to which the confidence judgments distinguished between correct and incorrect sorts, evaluated with a Kruskal-Goodman gamma correlation calculated across all sorts between the level of confidence and the correctness of the sort;
5. Control sensitivity: The degree to which the control process was dependent on the monitoring process, assessed with a gamma correlation calculated across all sorts between the level of confidence and the decision to venture the sort; and
6. Monetary gains: the amount of monetary rewards gained, calculated as the difference within all ventured sorts between those that were correct and those that were incorrect.

Given the additional tasks, the 64-card WCST form was administered. Prior to administration of the metacognitive version of the WCST, subjects' understanding of the concept of level of confidence was assessed with a questionnaire specifically designed for this study. The questionnaire was comprised of five brief vignettes describing a person characterizing his or her level of confidence with respect to a certain answer he or she gave (e.g., "Mary was asked about the name of her mother. After answering the question, she was asked how sure she was that this was her mom's name. She said she was absolutely sure this was her name."). The patient was then asked to mark on the same 0 to 100% scale used in the study, the number that best

Table 1. Pearson Correlations of Competence to Consent to Treatment with Conventional and Metacognitive WCST Scores in 21 Patients with Episode Schizophrenia

	Understanding			Appreciation		Reasoning	
	Diagnosis	Treatment	Risks	Diagnosis	Treatment	Generating Alternatives	Logic
Performance Quantity:							
Conventional WCST Scores							
Quantity score[a]	.16	.20	.21	.31	−.21	.05	.23
Number of categories	.33	.23	.20	.41[g]	−.07	.05	.31
Number of trials to first category	−.35	−.22	−.23	−.31	.18	.08	−.32
Perseverative responses (%)	.24	.19	.16	−.02	.16	−.02	.20
Perseverative errors (%)	.25	.18	.12	−.02	.16	−.04	.20
Performance Accuracy:							
New Free-Choice Metacognitive Measures							
Accuracy score[b]	.20	.22	.30	.35	−.15	.13	.29
Free choice improvement[c]	.26	.21	.57[i]	.08	.28	.43[g]	.42[g]
Global monitoring[d]	.23	.31	.49[h]	−.08	.23	.18	.41[g]
Monitoring resolution[e]	−.18	.21	.50[h]	−.13	−.12	.16	.20
Control sensitivity[f]	−.04	.60[i]	.47[h]	−.03	.31	.05	.39
Monetary gains	.10	.20	.16	.40[g]	−.19	.01	.12
IQ Estimates							
WAIS-R: similarities	−.02	.19	.33	.28	−.14	−.01	.28
WAIS-R: block design	.30	.10	.04	.53[h]	−.14	−.09	.30

WCST, Wisconsin Card Sorting Task; WAIS-R, Wechsler Adult Intelligence Scale-Revised.
[a]Percent of correct sorts out of total number of trials.
[b]Percent of correct sorts out of total number of "volunteered" trials.
[c]The difference between the Accuracy and the Quantity scores.
[d]The difference between the total number of correct sorts and the total number of sorts asked to be counted.
[e]Kruskal-Goodman gamma correlation between the level of confidence in the correctness of each sort and its actual correctness.
[f]Kruskal-Goodman gamma correlation between the level of confidence in the correctness of each sort and the decision to "venture" it.
[g]$P < .10$.
[h]$P < .05$.
[i]$P < .001$.

depicts the level of confidence of that hypothetical subject. Subjects took the WCST only after they assigned an appropriate number for each of the five vignettes.

Estimation of Intelligence Quotient

The Wechsler Adult Intelligence Scale-Revised (WAIS-R) Similarities[1] and Block Design subtests of the WAIS-R were administered as an estimate of intelligence quotient (IQ). Trained research assistants (graduate level clinical psychology students) administered the WCST and the IQ tests (under the supervision of D.K.). To ensure blindness, the neuropsychological and cognitive tests were performed by different research assistants than those who did the interview of competence to consent.

Statistical Analyses

Initially, to establish the strength and directionality of associations between poor competence to consent and the cognitive versus metacognitive measures, a set of bivariate Pearson correlation matrices was calculated (SAS: Proc CORR; SAS Institute Inc. 1999). Next, to test our main hypothesis regarding the incremental contribution of the novel metacognitive measures to the prediction of competence to consent (over and above that of the conventional cognitive ones), we conducted a hierarchical series of linear regression analyses (SAS: Proc REG; SAS Institute Inc. 1999). For each of the three competence-related abilities (i.e., understanding, appreciation, and reasoning), three separate regression models were initially created, each containing only those variables in the respective predictor domain (cognitive and metacognitive). Next, a subsequent, overall regression model was created for each of the three competence measures in which predictors from both domains were included. By subtracting the variance accounted for by each one of the initial models from the overall model, we were able to assess the unique contribution of each domain to the prediction of competence.

Results

Mean ratings on the MaCAT-T main scales were 1.67 ± .47 for Understanding, 1.48 ± .62 for Appreciation, 1.28 ± .79 for Reasoning, and 1.83 ± .51 on Choice. These ratings, reflecting moderately impaired competency, are slightly better than those reported in other chronic samples (Carpenter et al 2000). Similarly, the average level of WCST performance (number of categories completed = 1.57 ± 1.50, percentage of perseverative responses = 18.57 ± 10.31) was comparable to that of similar samples in the literature, suggesting that the additional metacognitive tasks did not substantially affect WCST performance.

Table 1 presents data on the relationships between the three competence-related abilities of the MacCAT-T and key conventional scores of the WCST on one hand (performance quantity) and with the metacognitive measures on the other (performance quality). Overall, the conventional WCST scores had zero to low correlations with the three MacCAT-T subdomains. The only exception to this general pattern was a near-significant correlation between the Number of Categories and Appreciation of

[1]The Similarities subtest was chosen since, at the time of the study, the Hebrew version of the WAIS-R did not include a standardized translation of Vocabulary, which is the subtest commonly used for this purpose.

Table 2. R-Squares and Uniqueness Indices[a] Obtained in a Sequential Multiple Regression Analysis Predicting Competence

	Competence to Consent Ability					
	Understanding		Appreciation		Reasoning	
	R^2	U[a]	R^2	U[a]	R^2	U[a]
Model 1: Conventional WCST Predictors Alone	.25	.13	.35	.18	.15	.11
Model 2: Metacognitive Predictors Alone	.64[c]	.52[c]	.53[b]	.36	.52[b]	.47[b]
Model 3: All Predictors from Both Domains	.77[c]		.71[b]		.63	

WCST, Wisconsin Card Sorting Task.
[a]Uniqueness index indicates the percentage of variance accounted for by that set of predictors beyond the variance accounted for by the other set.
[b]$P < .10$.
[c]$P < .05$.

Diagnosis. In contrast, the correlations among the metacognitive measures and the same MacCAT-T measures were generally higher, with four of them reaching significance and another five approaching significance. Of particular interest were the high and significant correlations among most of the metacognitive measures and Understanding of Risks, which is a key element of competence to consent (Grisso and Appelbaum 1998a).

Since this part of the study was exploratory in nature, we wanted to rule out the possibility of Type I error inflation due to the relatively high number of independent tests. A binomial distribution computation revealed that the probability that 9 of the 35 significance tests resulted in a Type I error was .005. While not guaranteeing the correctness of each individual test, this probability suggests that the likelihood of getting this number of significant correlations by chance alone is rather low.

To control for a potential confounding effect of IQ, we repeated these correlations, partialling out the WAIS-R Block Design and Similarities scores. Interestingly, the only significant correlation of impaired competence with one of the conventional WCST measures disappeared when controlling for IQ. On the other hand, the significant correlations of poor competence and the metacognitive measures remained significant even after controlling for IQ. Similarly, to control for a potential confounding effect of medications, we recalculated the correlations in Table 1, partialling out medication dosage, expressed in defined daily dose (DDD) (World Health Organization Collaborating Center for Drug Statistics 2000). Overall, the pattern of correlations between impaired competence and both the cognitive and metacognitive measures remained unchanged, with all the significant correlations remaining significant.

Next, to evaluate the relative importance of cognitive versus metacognitive measures to the prediction of poor competence, we used a hierarchical set of multiple regression analyses. Table 2 presents the amount of variance in competence accounted for by each set of predictors both separately (i.e., independent of the other set of predictors) and uniquely (i.e., over and above the variance explained by the other set). As can be seen, the model containing the five conventional WCST scores (quantity, number of categories completed, percentage of perseverative responses, number of trials to the first category, and percentage of perseverative errors) accounted for a small to moderate proportion of variance in the three competence-related abilities, with none of these prediction equations reaching significance. In contrast, the model containing the new metacognitive variables (accuracy, free-choice gain, global monitoring, monitoring resolution, control sensitivity, and monetary gains) as predictors accounted for a moderate to high portion of the variance in the three competence-related abilities, with the one related to Understanding (R^2 = .64) reaching significance. When predictors from both domains were entered in a final model, the amount of accounted variance reached moderate to high levels. The model predicting Understanding was statistically significant (R^2 = .77) and the one predicting Appreciation was near significant (R^2 = .71).

The findings regarding the uniqueness indices generally matched those for the R-squares. The conventional WCST scores accounted for only a small to moderate proportion of the unique variance in competence. In contrast, the new metacognitive measures accounted for larger parts of the unique variance in poor competence, with their uniqueness index for Understanding (U = .57) reaching significance. Interestingly, the independent and unique variances in poor competence accounted for by the conventional WCST variables were almost identical, suggesting that the addition of metacognition just adds to the variance explained by these variables but does not reduce it.

Next, to find the most economic overall model, we conducted a stepwise regression with all predictors from both sets. For Understanding, the most economic model included global monitoring (standardized beta = .73, $p < .005$) and monetary gains (standardized beta = .59, $p < .01$) that together accounted for 41% of the variance. For Appreciation, no single variable met the significance criteria (p = .15) for entering the model, and for Reasoning, the only variable that entered the model was free-choice improvement (standardized beta = .41, $p < .10$) that accounted for 17% of the variance.

Lastly, from a qualitative point of view, it is worth noting that two low-competency patients (MacCAT Total score < 1.0) displayed a rather dramatic impairment at the metacognitive level. Their decisions regarding which sorts they wanted to volunteer appeared to be totally independent of, or even opposite to, their self-monitoring processes (i.e., sorts with relatively low rates of confidence were chosen to be included, while high-confidence sorts were left out).

Discussion

It is a consensus view that patients who are capable of consenting to treatment need to understand, reason, and act on the key elements of informed consent presented to them (Grisso and Appelbaum 1998a). Preliminary findings from this pilot study support our main hypothesis that decision-making competence does not only depend on how much one knows (performance quantity) but also on how much this knowledge can be trusted (performance accuracy). First, they suggest that compromised capacity to consent–particularly, the ability to understand the risks associated with the proposed treatment–may be at least equally, if not more strongly, related to deficits at the metacognitive level as to cognitive deficits per se. And second, they indicate that prediction of competence to consent can be significantly improved by adding the novel metacognitive measures to conventional WCST measures. Taken together, these preliminary findings suggest that free-response, output-bound accuracy performance, which depends on metacognitive skills of monitoring and control, provides an important link between basic level cognitive skills and competent decision making. Interestingly, this notion is far from being novel or recent. One can track its origins to Confucius' "real knowledge is to know the extent of one's ignorance" or to Socrates' "a wise man recognizes how little he knows." For some reason, however, these old maxims have evaded previous efforts to bridge between cognitive deficits and decision-making competence.

Our findings suggest that the association between metacognition and impaired capacity to consent cannot be accounted for by IQ. This conclusion, however, should be made with caution, since estimation of IQ in this study was done with Similarities, which is known to be more influenced by schizophrenia than Vocabulary.

It should be emphasized that the present findings are not trivial in the sense of reflecting mere association among awareness measures in two different domains. First, experimental measures of monitoring and control processes on a sort-by-sort basis are quite different from straightforward, face-valid global judgments of one's own level of performance (and hence are less susceptible to bias or coaching). Second, consistent with previous works that looked at memory confidence in schizophrenia, our results showed that less competent patients were more confident about the correctness of their incorrect sorts (Moritz et al 2003). Moreover, in line with Danion et al (2001) findings, our results also revealed a small subgroup of low-competence patients whose decisions regarding which sorts they wanted to volunteer appeared to be independent of their self-monitoring processes.

Even though the WCST is more than just a test of executive functions, our data suggest that despite obvious conceptual similarities, metacognitive control differs in important ways from common conceptualizations and measures of executive functions. Most prominently, the metacognitive control we are concerned with is specifically involved in regulating the accuracy of one's cognitive performance in free-response tasks. Thus, the control function is fed by a monitoring process that evaluates the likelihood that one's answer or solution to a specific problem is correct and on that basis decides whether to act on the answer (e.g., volunteer it) or not (e.g., respond "don't know" or ask for help). Executive functions, in contrast, are commonly defined as a set of higher-order processes that modulate lower-level schemas according to one's intentions (Norman and Shallice 1980/1986) and consciously direct one's behavior toward a selected goal (Stuss 1992). As such, they are much broader, both in the range of goals that they serve and in the types of processing and information output that they supervise and coordinate. Moreover, most if not all current measures of executive functioning, such as the WCST, are derived from "forced-response" tests that focus on input-bound quantity-based performance. Such tests do not even allow the type of metacognitive monitoring and control that determines the output-bound accuracy of free-response performance. Thus, although metacognitive control over responding may be a specific type of executive functioning, it is certainly not one that is tapped directly by current measures of executive functioning.

Similarly, metacognition, as conceptualized and measured in this article, is quite different from other "meta-level" abilities, such as theory of mind (ToM), source monitoring, and signal detection theory, that are commonly referred to as metacognition. First, our notion of metacognition refers to a global, overarching meta-level of performance, which monitors and controls (if allowed to do so) the correctness of performance in all types of cognitive tasks, including those just considered. Second and no less importantly, the performance effects of the metacognitive monitoring and control functions addressed here cannot be examined with forced-response tests that focus solely on input-bound quantity-based performance. Rather, its evaluation depends on incorporation of free-response tasks and output-bound, accuracy-based performance measures–both cognitive and metacognitive–into current testing procedures.

Another issue that we wish to address briefly is the relationship between metacognitive processes and cognitive processes in general: Are the monitoring and control processes used to evaluate the degree (correctness) of one's knowledge and to direct one's performance accordingly essentially the same or different than other cognitive processes, in particular, the specific cognitive processes that are being monitored and controlled? At present, there is no consensus on this issue. On the one hand, it has been proposed that essentially the same processes are responsible for both cognitive and metacognitive performance (Dunning et al 2003). In support of this idea, performance on an exam is often positively correlated with the ability to monitor the correctness of one's answers (e.g., Maki and Berry 1984; Sinkavich 1995), and good performers are less able than poor performers to evaluate the performance of others (e.g., Kruger and Dunning 1999).

On the other hand, many influential theories view metacognitive processes as being tied to, yet functionally separate from, the cognitive processes that they monitor (see Metcalfe 2000; Nelson 1996; Nelson and Narens 1994; Yzerbyt et al 1998). In this view, metacognitive judgments are based on a variety of inferential cues, some of which relate to the object-level cognitive process (e.g., ease, speed, amount and fluency of information retrieval) (Koriat 1993, 1995; Nelson and Narens 1990), whereas others do not (e.g., the perceived familiarity of the question itself) (Metcalfe et al 1993; Reder and Ritter 1992). These metacognitive judgments (and their accuracy) can therefore be dissociated from actual cognitive performance. For example, advance priming of potential answers to general knowledge questions increases subjective confidence in those answers regardless of whether they are right or wrong (Kelley and Lindsay 1993), and advance priming of the question increases feeling-of-knowing judgments, again without having any effect on actual performance (e.g., Reder and Ritter 1992; Schwartz and Metcalfe 1992). Such dissociations imply that there is, at most, a partial overlap between the meta-level monitoring processes and the object-level cognitive processes (see also Koriat and Levy-Sadot 1999; Nelson 1996). The same can certainly be said for the overlap between meta-level control processes and object-level processes (e.g., Barnes et al 1999; Goldsmith et al 2002; Koriat 2000; Koriat and Goldsmith 1996; Nelson 1993; Nelson et al 1992). In summary, although the issue is surely more complex than our brief treatment here allows, we believe that the treatment of metacognitive processes as at least partially distinct from cognitive processes is justified, both theoretically and empirically.

The study's main advantage is that the added predictive value of the new metacognitive measures, over and above that of the conventional WCST measures (which in and of themselves accounted for quite a lot), was detected in a single integrated process, rather than by two separate sets of tests. A key question in this regard, however, is to what extent the additional metacognitive tasks affect WCST performance. As already mentioned, the average level of WCST performance of participants in this study was comparable to that of similar samples in the literature, providing an indirect evidence of minimal, or negligible, effect of such kind. In addition, data we have in an ongoing study in which we give patients both versions of the test within 2 weeks of each other (in a counterbalanced design) does not reveal any major or consistent differences in performance on the two versions of the test.

The study's main limitation is its small sample size and the exploratory nature of some of its analyses (especially the numerous bivariate correlations between the several competence-related abilities and the individual cognitive and metacognitive variables). While it is consistent with our findings regarding the neuropsychological basis of poor insight in first-episode schizophrenia (Koren et al 2004), replication and further validation of the new method, applied to other neuropsychological domains, in larger and more heterogeneous samples is necessary. In addition, it should be noted that while metacognitive monitoring and control are quite necessary for competent performance, they are definitely not sufficient for it. Poor performance can be affected by many other factors, such as demand characteristics and level of motivation, which were not assessed in this study.

If further validated, the new paradigm may provide a novel, accuracy-oriented approach to neuropsychological models of other clinically or functionally meaningful phenomena in which free choice and self-directed action are inherent elements, such as adherence to treatment, success in rehabilitation programs, and social competence. Moreover, the new approach can provide an experimental foundation for future studies relating such measures to brain function and structure in these patients. Ultimately, it may have important implications for identification and selection of the most appropriate deficits as prime targets for competence remediation programs.

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