

Polish version of *the Hinting Task* – pilot study with patients with schizophrenia

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Summary

Aim. The main goal of the study was an adaptation and validation of *the Hinting Task* to Polish language. The Hinting Task is the main instrument used to assess theory of mind deficits in individuals with schizophrenia.

Methods. Two groups were compared in the course of the study: individuals with schizophrenia and people without a history of mental and neurological disorders. Psychometric properties of the instrument were analyzed. Between-group difference in the mean scores of *the Hinting Task* was also calculated. Additionally, in the clinical group, the correlation of the severity of psychopathological symptoms with the result of *the Hinting Task* was also assessed.

Results. Results indicated satisfactory psychometric properties (internal consistency, inter-rater reliability and external validity) sufficient for between-group comparisons for research purposes. The presented test highly distinguished two assessed groups: individuals with schizophrenia and healthy controls. Contrary to the expectations, in the clinical group scores in *the Hinting Task* did not correlate with the severity of psychopathological symptoms.

Conclusions. Polish translation of *the Hinting Task* has psychometric properties appropriate for the research setting. Usefulness of *the Hinting Task* in other clinical groups should be addressed in future research.

Key words: social cognition, schizophrenia, theory of mind

Introduction

Social cognition (SC) is the domain of human functioning that allows us to successfully operate within social environment [1]. It encompasses a set of different functions and sub-domains, ranging from basic social perception skills (perception of social

signals, e.g., perception and processing of facial image or perception of emotions) to more complex processes like theory of mind (ToM). In the literature, ToM is often used interchangeably with the term mentalizing, mindreading or mental state attribution. Frith [2, p. 2078] defined ToM as the “automatic attribution of mental states, such as desires and beliefs, to self and others to predict and explain behavior”. Processes of mentalization play a vital role in understanding and reacting appropriately to people’s behavior in complex social environments.

The term ‘theory of mind’ was introduced by Premack and Woodruff [3] in the pioneering article on mentalizing abilities in primates. Since then, ToM was thoroughly investigated especially in the context of autism spectrum disorders (ASD) [4]. Disruptions in the area of ToM have also been observed in individuals with schizophrenia [4–7]. The exact profile of mentalizing deficits in schizophrenia and autism has been suggested to be of opposite nature. To capture specificity of mentalizing problems in schizophrenia, the term ‘hypermentalization’ (or ‘hyperintentionality’) has been coined [8]. It refers to the tendency to attribute too much meaning to neutral or incidental events. Corcoran and Frith [9] proposed that positive symptoms are linked to the tendency to hypermentalize, and negative symptoms with the tendency to hypomentalize (attribute too less meaning to social situations). Specific ‘negative bias’ (tendency to interpret neutral or positive stimuli as negative) has also been observed in this context in patients with schizophrenia [10].

It is still under debate, whether ToM deficits in schizophrenia have trait – or state-like character. The literature provides evidence of a close relationship between ToM deficits and an active psychotic phase of schizophrenia [11]. However, ToM deficits have also been observed in remitted patients and in their relatives without schizophrenia diagnosis [12,13]. Thus, ToM deficits and, more broadly, social cognition deficits, may be part of the endophenotype characteristic of schizophrenia [14]

Social cognitive skills in schizophrenia can predict patients’ level of functioning more accurately than general neurocognitive skills [15]. Moreover, social cognition is being chosen with increasing frequency as a target for effective therapeutic interventions [16, 17].

Numerous methods have been proposed to measure ToM impairments, however, a great part of them has been designed to assess ToM specifically in children, or they do not adequately reflect mentalizing deficits typical for schizophrenia [18]. *The Hinting Task* was designed to precisely tap into schizophrenia-like ToM impairments [9]. HT performance has been shown to distinguish patients with schizophrenia from healthy individuals in the original English version of the task [19–24], as well as Brazilian-Portuguese [25], Spanish [18], Finnish [26], and Dutch translations [27]. The task was further evaluated by Pinkham [28–30] as a part of *the Social Cognition Psychometric Evaluation* (SCOPE) battery.

Increasing body of research reveal vast impairments in the area of social cognition, especially theory of mind, in individuals with schizophrenia [12]. Therefore, numerous authors recognized the need to include social cognition domain to routine neuropsychological assessment and thus the need to develop the necessary tools [31]. Taking into account discussed differences in the profile of ToM impairments between ASD and schizophrenia groups, applying methods designed specifically for ASD to assess patients with schizophrenia may lead to inaccurate results [16]. Moreover, a substantial share of existing ToM tests is mainly used to assess social and cognitive functioning in children.

Hence, there is a need for an instrument appropriate to use with adult participants diagnosed with schizophrenia. So far, *the Hinting Task* was not available in Poland, which, in consequence, was highly reducing the possibility to conduct research on theory of mind in individuals with schizophrenia. The main goal of presented research was validation and adaptation of the Polish version of *the Hinting Task*.

Material and method

Participants

Fifty individuals with the diagnosis of schizophrenia (F20) according to ICD-10 and 50 healthy controls took part in a research on social cognition in schizophrenia. In the clinical group (SCZ), patients were recruited from mental health clinics, psychiatric wards and self-help community centers. At the time of data collection, none of these patients was in care facility, such as a social welfare home (DPS) or a care and treatment facility (ZOL). Forty three people (86%) lived with their family, six lived alone, and one lived temporarily in a sheltered housing. At the time of data collection all participants were outpatients and all but one were medicated. Schizophrenia diagnosis was confirmed by a psychiatrist during initial clinical assessment. Clinical stability and symptoms severity were assessed with the Positive and Negative Syndrome Scale (PANSS) [32].

Main inclusion criteria accounted for stable clinical state and stable medication regimen during 4 weeks prior to the study. The mean daily dose of antipsychotic drugs, based on the equivalent dose of chlorpromazine, was 314 mg. The scores in the individual PANSS subscales are presented in Table 1.

Table 1. Schizophrenia patients' PANSS scores divided into subscales

PANSS subscale	Score	
	M	SD
Positive symptoms	12.9	5.1
Negative symptoms	17.5	5.8
General psychopathology	29.3	7.4
Total score	30.5	7.5
PANSS 5F-Pos	14.3	6.2
PANSS 5F-Neg	16.9	6.3
PANSS 5F-Dis	19.3	5.2
PANSS 5F-Exc	12.7	3.9
PANSS 5F-Emo	16.5	5.9

PANSS 5F-Pos – five-factor scale – Positive symptoms

PANSS 5F-Neg – five-factor scale – Negative symptoms

PANSS 5F-Dis – five-factor scale – Disorientation

PANSS 5F-Exc – five-factor scale – Excitement

PANSS 5F-Emo – five-factor scale – Emotional distress

Participants in the control group (HC) were recruited via advertisements on online platforms. Individuals reporting history of psychiatric disorders and/or other diseases of the central nervous system were excluded from the study. Each volunteer underwent a clinical screening with the Mini International Neuropsychiatric Interview (MINI) [33], performed by a qualified psychologist. Candidates with symptoms meeting the criteria of mental disorders were excluded from the study.

Groups were matched for age ($t(96) = 1.08$, n.s.) and gender (31 men and 19 women in each group). There was no difference in education level measured in years of education ($t(96) = -1.82$, n.s.). The numbers of people in each of the age groups are presented in Table 2

Table 2. Number of participants in each age group for SCZ and HC

Age group	Number of participants (SCZ)	Number of participants (HC)
18–29	15	19
30–39	19	20
40–49	16	10
≥ 50	0	1

Procedure

The Original English version of *the Hinting Task* was acquired from authors and translated into Polish. Back-translation was carried out by a psychologist with additional specialization in linguistics and approved by the original author – Rhiannon Corcoran. Scoring criteria developed by Pinkham were sent directly to the authors of this validation and then translated into Polish language.

All participants completed *the Hinting Task* as a part of a larger battery of neurocognitive tests. External validity of *the Hinting Task* has been established by the comparison with the Reading Mind in the Eyes Test (RMET) – another task often used to measure theory of mind [34]. Examination has been carried out by qualified psychologists, Ethical Committee of the Institute of Psychology, Polish Academy of Sciences

Positive and Negative Syndrome Scale

The severity of symptoms in the SCZ group was assessed by a qualified psychiatrist using the Positive and Negative Syndrome Scale (PANSS) [32]. Results were calculated in positive, negative and general psychopathology subscales. All but one patient showed predominance of negative symptoms. Additionally, scores were calculated in five subscales according to 5-factor model proposed by van der Gaag et al. [35] (positive symptoms, negative symptoms, disorganization, excitement, and emotional distress).

Hinting Task

The Hinting Task consists of 10 short stories, each describing verbal interaction between two characters. One of them is making an indirect statement (giving a ‘hint’), requiring the other to infer implicitly expressed intentions. Experimenter conducting an assessment reads all 10 stories aloud. Participants’ task is then to interpret an ambiguous remark. If they miss the point, the second hint is given.

The Hinting Task was carried out in line with the procedure suggested by Pinkham (the exact description of the procedure was provided by the author via e-mail). Participants were instructed to give answers to the experimenter, who wrote them down in a booklet. Participants were assigned 2 points when they had given the right answer after the first hint followed with a question “What does the character really mean when he/she says this?”. When the answer was not correct, the second hint was given. Participants received 1 point when they were able to answer correctly after the second hint and then 0 points if they did not succeed to give a correct answer. In items 1., 7. and 8. one point was given for a partially correct answer after the first hint.

The answers were then independently rated by two psychologists according to settled scoring criteria. Final score is a sum of individual scores and falls between 0 and 20.

Reading Minds in the Eyes Task

During RMET, participants received a folder containing test items – photos depicting faces cropped to show only the eyes of the model. Participants were asked to choose one of the four suggested mental states corresponding with each picture. The whole task contains 36 test items and 1 practice item that does not contribute to the final score. Time was not limited – participants were browsing the folder in their own pace and each time they were communicating answer to the experimenter. The Polish version of the task was developed by Jankowiak-Siuda et.al. [36]. It has satisfactory psychometric properties, comparable with the original, English version of the task.

Statistical analysis

Standard validation procedure was used to assess psychometric properties of *the Hinting Task*. To analyze test reliability, Cronbach's alpha, which measures internal consistency, was calculated. Furthermore, Cohen's kappa was calculated as a measure of inter-rater reliability. To analyze external validity, Pearson's r coefficient was calculated for correlation between *the Hinting Task* and Reading the Mind in the Eyes Test (RMET) – another tool for measuring theory of mind. To assess between-group differences, Student's t-test for independent samples was used. In order to assess the relationship between psychopathological symptoms and *the Hinting Task* and RMET results, Pearson's r correlation coefficient was used.

Results

Internal consistency

At first, psychometric properties of the full scale (10 stories) were calculated. Given the recommendations made by Coaley [37], according to which reliability analysis should be carried with a minimal sample of 100 individuals, Cronbach's alpha was calculated based on all observations pooled together. Total Cronbach's alpha coefficient was 0.62. To increase internal consistency of the instrument, item 10, which had low discriminant power due to a strong ceiling effect, was removed from the scale. Shortened 9-item scale had better psychometric properties, with Cronbach's alpha coefficient 0.64. Similar analyses were performed by the Spanish research group – they proposed a shortened 5-item scale with the best psychometric properties [18].

Inter-rater reliability

To assess inter-rater reliability, independent ratings were obtained from two investigators. On this basis, Cohen's kappa coefficient was calculated. Kappas for each item are presented in Table 3. It should be noted, that item 10 with low kappa value was excluded from our version of the scale due to unsatisfying level of internal consistency. All items but 6 and 7 had moderate level of inter-rater agreement [38].

Table 3. **Kappa Values for each item in the Hinting Task with the Cronbach's alpha value after removing the item from the entire scale**

Item no.	Kappa value	Cronbach's alpha after the item had been removed
1.	0.696	0.618
2.	0.700	0.562
3.	0.730	0.596
4.	0.730	0.595
5.	0.698	0.524
6..	0.476	0.606
7.	0.507	0.579
8.	0.633	0.579
9.	0.730	0.587
10.	0.404	0.632

External validity

To assess external validity, Pearson's r correlation coefficient between the results of *the Hinting Task* and RMET score was calculated, revealing weak, but significant correlation ($r = 0.30$; $p < 0.01$). After removing two outliers correlations, coefficient changed to $r = 0.31$; $p < 0.01$. Correlations between those two variables are presented on Figure 1.

Between-group differences

In line with expectations and previous studies, *the Hinting Task* significantly differentiated group of patients with schizophrenia from the control group. SCZ group scored significantly lower than HC group in both analyzed versions of the HT: full 10-item scale ($t(94) = -4.049$; $p < 0.001$; Cohen's $d = 0.81$), as well as a shortened 9-item scale ($t(94) = -3.04$; $p < 0.006$; Cohen's $d = 0.61$). Mean score in SCZ group was 15.32 ($SD = 2.77$), and in the HC group – 17.33 ($SD = 2.21$). In the shortened,

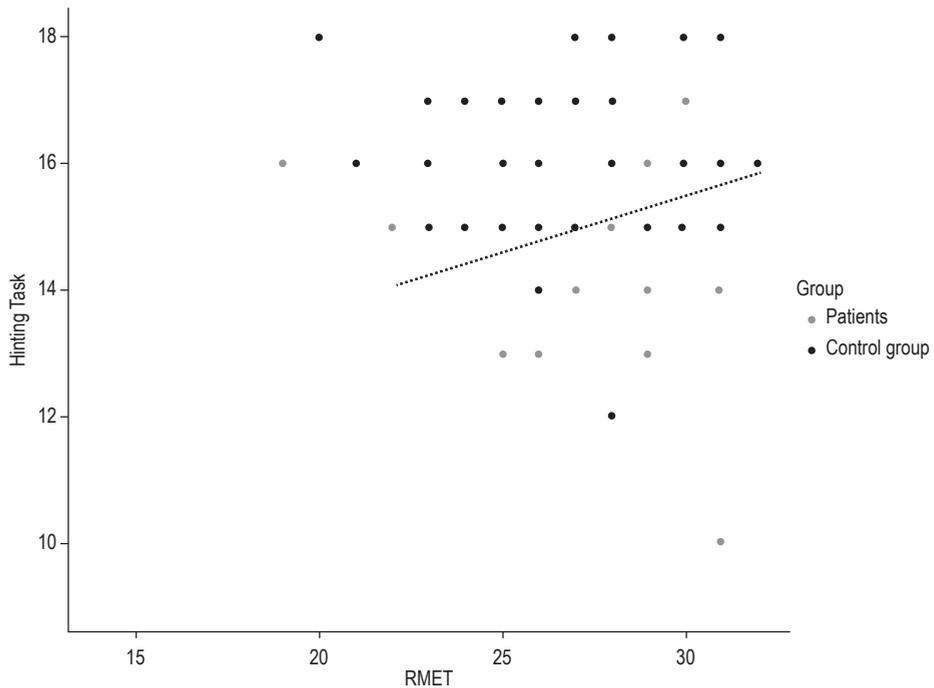


Figure 1. Correlation between the Hinting Task and RMET

9-item version mean scores were 14.28 for SCZ group ($SD = 2.28$) and 15.52 for HC group ($SD = 1.78$). Detailed scores are presented in Table 4.

Table 4. Detailed scores in the Hinting Task for each item divided into groups

Test item	SCZ group		HC group		Level of significance
	M	SD	M	SD	p
1	1.04	0.493	1.27	0.569	< 0.05
2	1.76	0.555	1.88	0.389	< 0.05
3	1.78	0.582	1.94	0.317	< 0.05
4	1.67	0.591	1.92	0.277	< 0.05
5	1.50	0.789	1.82	0.441	< 0.05
6	1.29	0.677	1.73	0.491	< 0.01
7	1.84	0.422	1.96	0.200	< 0.05
8	1.16	0.842	1.27	0.811	n.s.

table continued on the next page

9	1.40	0.808	1.65	0.522	< 0.05
10	1.90	0.505	1.90	0.306	n.s.
Total score	15.32	2.770	17.33	2.212	< 0.001
Short version score	14.28	2.28	15.52	1.78	< 0.005

M – mean; SD – standard deviation; n.s. – not significant

Hinting Task scores and symptoms severity

None of the evaluated PANSS subscales correlated with HT score or with RMET score.

Discussion of the results

The main goal of the presented study was an adaptation and validation of Polish translation of *the Hinting Task*. Final, shortened version was obtained after exclusion of one item, which was the least consistent with the rest of the scale and had the lowest inter-rater reliability coefficient. Psychometric properties of the scale, namely: internal consistency, inter-rater reliability and external validity were comparable to the original version [28] and appropriate to use in between-group comparisons [37, 38].

Polish translation of *the Hinting Task* differentiated patients with schizophrenia and healthy control group, consistently with the original version, as well as other language translations: Spanish [18], Portuguese [25], Finnish [26], and Dutch [27]. According to previous expectations, individuals with schizophrenia obtained significantly lower scores than healthy controls. Presented results are compatible with previous reports on mentalization deficits in patients with schizophrenia [4, 6, 7]. Lower mean score in the clinical group corresponds with findings on poorer understanding of pragmatic function of language, poorer understanding of non-direct, vague communicates, as well as poorer ability to use context-based reasoning.

It should be noted that results obtained in the current study are somewhat higher than those reported in the SCOPE project [29]. These discrepancies may be attributed to cultural differences related to the interpretation of phenomena in interpersonal communication, which are included in the descriptions of the situation in the test under study. In our group, 72% of patients presented the predominance of negative symptomatology, with residual positive symptoms, such as delusions or hallucinations, which did not interfere with everyday functioning. It should be noted, though, that participants in our clinical group had higher overall severity of symptoms than patients described for instance by Pinkham [29].

Additional advantage of *the Hinting Task* lays in its simple procedure, accessibility and applicability for people with schizophrenia. Whole procedure takes approximately 10 minutes. Instructions can be repeated, which is important in the context of attentional and memory problems experienced by individuals with schizophrenia [39].

One of the main limitations of the Polish, as well as original version of *the Hinting Task* are psychometric properties not sufficient to use the test in individual comparisons, especially in the clinical setting. It should be mentioned, though, that the test serves mainly the purpose of between-group comparison for research, not the diagnosis of theory of mind deficits.

Future research should address the possibility of using the HT in research with other clinical groups in which theory of mind deficits have been presented or suggested, such as ASD, bipolar disorder or borderline personality disorder.

Conclusions

1. Polish version of *the Hinting Task* has psychometric properties comparable to the original version and is suitable to between-group comparisons.
2. Presented test distinguishes individuals with schizophrenia from healthy controls.
3. The specificity of observed differences is yet to be determined, therefore the applicability of *the Hinting Task* in studies of other clinical groups requires further studies in other patient populations.

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Polish version of the Hinting Task, with scoring criteria, is available at: <https://osf.io/6ka4y/>

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