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Research Article

Cold executive function processes and their *hot* analogs in schizotypy

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Abstract

Objective: To examine cold (based on logical reasoning) versus hot (having emotional components) executive function processes in groups with high individual schizotypal traits. **Method:** Two-hundred and forty-seven participants were administered the Schizotypal Personality Questionnaire and were allocated into schizotypal (cognitive-perceptual, paranoid, negative, disorganized) or control groups according to pre-specified criteria. Participants were also administered a battery of tasks examining working memory, complex selective attention, response inhibition, decision-making and fluid intelligence and their affective counterparts. The outcome measures of each task were reduced to one composite variable thus formulating five cold and five hot cognitive domains. Between-group differences in the cognitive domains were examined with repeated measures analyses of covariance. **Results:** For working memory, the control and the cognitive-perceptual groups outperformed negative schizotypes, while for affective working memory controls outperformed the disorganized group. Controls also scored higher compared with the disorganized group in complex selective attention, while both the control and the cognitive-perceptual groups outperformed negative schizotypes in complex affective selective attention. Negative schizotypes also had striking difficulties in response inhibition, as they scored lower compared with all other groups. Despite the lack of differences in fluid intelligence, controls scored higher compared with all schizotypal groups (except from cognitive-perceptual schizotypes) in emotional intelligence; the latter group reported higher emotional intelligence compared with negative schizotypes. **Conclusion:** Results indicate that there is no categorical association between the different schizotypal dimensions with solely cold or hot executive function processes and support impoverished emotional intelligence as a core feature of schizotypy.

Keywords: Schizophrenia spectrum; working memory; selective attention; response inhibition; emotional intelligence; affective

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Introduction

As T.W. Robbins notes in his Editorial paper *"In general, cognition refers to those, sometimes mysterious, covert processes that have to be inferred from behavior. Cognitive processes include seemingly miraculous products of modular processing to produce, for example, representational knowledge such as language, and mechanisms that intervene between stimulus and response . . . "* (Robbins, 2011; p. 1). It can be, thus, easily understood that the integrated functioning of cognitive processes plays a crucial role for goal-directed behavior (e.g., Bouton, 2021; Chai et al., 2018; Rinaldi & Lefebvre, 2016). Cognitive processes can be further analyzed into "*cold*" or "*hot*," with cold cognitive processing relying on logic while hot cognition involves processing of stimuli with emotional components/representations (David & Matu, 2020). Human behavior is the outcome of complex interactions between individual cognitive processes and this operationally useful categorization actually refers to complementary processes (Todd et al., 2020) – every cold cognitive process has its hot analog (Salehinejad et al., 2021) – that rely on interacting brain circuitries (M'Barek et al., 2022; Salehinejad et al., 2021).

Studies in clinical populations have revealed that both cold and hot cognition is impaired in patients with major psychiatric disorders such as schizophrenia (Duggirala et al., 2020; Gebreegziabhere et al., 2022), bipolar disorder (Keramatian et al., 2022; Vedel Kessing & Miskowiak, 2018) or major depressive disorder (Roiser & Sahakian, 2013), in accordance with the widespread (or non-specific) nature of these phenomena in disease states (Millan et al., 2012). Genetically high-risk populations for psychiatric disorders, such as the unaffected first-degree relatives of patients, present with milder cognitive impairments compared with probands (Bortolato et al., 2015; Luperdi et al., 2019). Although the available literature examining direct comparisons of cold and hot cognitive processes is still scarce, preliminary evidence indicates a pattern of associations in this group: relatives of bipolar disorder patients show (a) most prominent deficits in

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hot compared with cold cognitive computations (Miskowiak et al., 2017) and (b) more pronounced deficits in hot cognition, when compared with the relatives of schizophrenia patients (Besnier et al., 2009). MacKenzie et al. (2017) also studied cold and hot cognitive processes in very young individuals with a familial high-risk for severe mental disorders, a percentage of whom were also diagnosed with depression or anxiety disorders or attention-deficit/hyperactivity disorder, and found that only hot executive functioning was associated with psychotic symptoms.

In the psychosis continuum, unaffected relatives of patients are positioned one step before the patients in terms of severity of symptoms, cognitive deficits and daily functioning (Duggirala et al., 2020). Prior to the patients' relatives, high schizotypal individuals are placed. This group is characterized by subthreshold psychotic-like experiences and is prone to the development of schizophrenia spectrum disorders (Debbané et al., 2015). With regard to schizotypy, it refers to personality traits, it is not a new construct and was first described by S. Rado (1953). Since Rado's observations, a significant amount of research has described the cognitive (Giakoumaki, 2012; Ettinger et al., 2014; Ettinger et al., 2015; Mohr & Ettinger, 2014; Siddi et al., 2017; Steffens et al., 2018), affective (Giakoumaki, 2016; Zouraraki, Karamanouna, et al., 2023), psychophysiological (Giakoumaki, 2012; Wan et al., 2017), neuroanatomical (Ettinger et al., 2015; Kirschner et al., 2022; Tonini et al., 2021) and genetic (Ettinger et al., 2014; Mohr & Ettinger, 2014; Walter et al., 2016) correlates of schizotypy, which highly overlap with schizophrenia's respective indices.

The three widely used self-assessment instruments for the assessment of schizotypal traits include the Wisconsin Schizotypy Scales (Chapman et al., 1982; Chapman et al., 1976, 1978; Eckblad & Chapman, 1983), the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE; Mason & Claridge, 2006; Mason et al., 1995) and the Schizotypal Personality Questionnaire (SPQ; Raine, 1991). The main difference between the three scales is that they are based on different theoretical approaches, occasionally hampering the direct comparison and integrated interpretation of individual study findings (Oezgen & Grant, 2018; Tonini et al., 2021).

A prominent model of schizotypy, as assessed with the SPQ, classifies schizotypal traits into three factors, namely cognitive-perceptual (positive), interpersonal (negative) and disorganized, in accordance with the main symptom-clusters of schizophrenia spectrum disorders (Raine, 1991). A four-factor model has been tested in several countries and has been reported to have comparable psychometric properties with the three-factor model (Barron et al., 2015; Bedwell et al., 2014; Compton et al., 2009; Fonseca-Pedrero, Compton, et al., 2014, Fonseca-Pedrero, Fumero, et al., 2014, Fonseca-Pedrero et al., 2018; Mohamed et al., 2014; Rabella et al., 2018; Stefanis et al., 2004; Tsaousis et al., 2015; Xi et al., 2020). According to this four-factor approach, positive schizotypal traits are further organized into paranoid and cognitive-perceptual, with the latter latent construct referring to individuals experiencing unusual perceptual experiences and believing in supernatural forces/experiences; negative and disorganized schizotypy are retained as in the three-factor model. Studies employing the analytical four-factor model have revealed an intriguing pattern of neuropsychological (Giakoumaki et al., 2021; Giakoumaki et al., 2020; Karagiannopoulou et al., 2016; Karamaouna et al., 2021; Smyrnis et al., 2007; Zouraraki et al., 2016; Zouraraki et al., 2017) and related to neuropsychological (Giakoumaki et al., 2020; Theleritis et al., 2012; Zouraraki, Kyriklaki, et al., 2023) weaknesses and strengths of individuals scoring high in the different schizotypal dimensions. Thus, (a) negative and to a lesser extent paranoid schizotypy have been associated with deficiencies in numerous cognitive domains (Karagiannopoulou et al., 2016; Karamaouna et al., 2021; Smyrnis et al., 2007) and sensorimotor gating (Giakoumaki et al., 2020); (b) differences in executive working memory between unaffected relatives of schizophrenia patients and controls are sensitive to the effects of both paranoid and negative schizotypy (Zouraraki et al., 2017); (c) only negative schizotypy has been associated with neurological soft signs (Theleritis et al., 2012); (d) negative and disorganized schizotypy are associated with higher levels of subjective cognitive failures (Giakoumaki et al., 2021) and visual perception indices (Zouraraki, Kyriklaki, et al., 2023) and (e) cognitive-perceptual schizotypes consistently perform equally with controls in cognitive, psychophysiological and neurological measures (Giakoumaki et al., 2021; Karagiannopoulou et al., 2016; Karamaouna et al., 2021; Smyrnis et al., 2007; Theleritis et al., 2012).

As there is currently a lack of research on the analogy of cold and hot cognitive processing in high schizotypal individuals, the aim of the present study was to attempt a direct comparison of cold executive function processes and their hot counterparts in groups with high individual schizotypal traits, as defined with the four-factor model of schizotypy. Based on the literature, we hypothesized that (a) the negative schizotypal group would show poorer performance in the tasks assessing cold executive functions and (b) the cognitive-perceptual group would perform similarly to controls in tasks examining cold executive functions. Due to the proximity of negative schizotypy with the negative symptoms of schizophrenia and the widespread deficiencies observed in negative schizotypes, we also hypothesized that this group would also present with diminished scores in tasks assessing hot executive function processes.

Method

Participants

Two-hundred and fifty-nine participants from the community were recruited via advertisements in local media. Exclusion criteria were (a) personal history of head trauma or medical conditions, (b) current use of prescribed/recreational drugs, (c) personal/family (up to second-degree) history of DSM-5 (*Diagnostic and Statistical Manual of Mental Disorders–Fifth Edition*; American Psychiatric Association, 2013) disorders and (d) inability, for any reason, to provide written informed consent. One participant was excluded due to the presence of psychiatric symptoms and another one withdrew consent, resulting in a sample of 257 participants (67 males/190 females, age mean ± SD = 35.97 ± 10.09 years, age range = 18–57 years). The study was approved by the Research Ethics Committee of the University of Crete (approval number: 4/2018/19-03-2018); the research was completed in accordance with Helsinki Declaration. Following presentation of the study's aims and methods, all participants received written detailed information and gave written informed consent prior to participation.

Following the assessment of schizotypal traits, participants were allocated into groups according to criteria that were derived by a normative sample in Greece (Tsaousis et al., 2015). In detail, participants were included in a schizotypal group if their score in the respective schizotypal factor fell in the upper 10% and the scores in the remaining schizotypal factors did not fulfill this criterion. The upper 10% cutoff scores were ≥7 for cognitive-perceptual, ≥14 for paranoid, ≥18 for negative and ≥8 for disorganized schizotypy. For example, participants in the cognitive-perceptual schizotypal group had scores ≥7 for this factor and scores <14 for the paranoid, <18 for the negative and <8 for the disorganized factors, and so on. The control group included participants who did not meet the criteria for any schizotypal factor. Ten participants were excluded from the analyses as their scores fulfilled the criteria for inclusion in more than one groups (two participants fulfilled the criteria for inclusion in the cognitive-perceptual and paranoid groups, two participants could be classified as both paranoid and disorganized schizotypals, one participant could be included in the cognitive-perceptual, paranoid or negative schizotypal groups, two participants reached the cutoff scores for inclusion in the paranoid, negative and disorganized groups, two participants fulfilled the criteria for inclusion in the cognitive-perceptual, paranoid and disorganized groups and one participant had scores falling in the upper 10% for all schizotypal factors). Thus, the final sample consisted of 247 participants (64 males/183 females, age mean ± SD = 36.08 ± 10.01 years, age range = 18–57 years) divided into cognitive-perceptual (n = 36, 8 males/28 females, age mean ± SD = 37.83 ± 10.36 years, age range = 18–56 years), paranoid (n = 24, 4 males/20 females, age mean ± SD = 30.42 ± 9.23 years, age range = 18–50 years), negative (n = 14, 4 males/10 females, age mean ± SD = 30.14 ± 8.56 years, age range = 21–47 years), disorganized (n = 41, 16 males/25 females, age mean ± SD = 34.80 ± 9.88 years, age range = 19–53 years) and control (n = 132, 32 males/100 females, age mean ± SD = 37.66 ± 9.66 years, age range = 18–57 years) groups.

Schizotypal personality questionnaire

Schizotypal traits were assessed with the Greek version (Tsaousis et al., 2015) of the Schizotypal Personality Questionnaire (SPQ; Raine, 1991). The SPQ is a 74-dichotomous-item questionnaire and items are grouped into nine subscales that are organized into four schizotypal factors (cognitive – perceptual, paranoid, negative and disorganized) according to the four-factor model of schizotypy. A detailed description is provided in Supplementary material.

Neuropsychological tasks

Working memory (WM) was assessed with a computerized version of an N-back sequential letter task (Giakoumaki et al., 2011) and *Affective working memory* (AWM) with a computerized N-back task that included images from the International Affective Picture System (IAPS; Lang & Bradley, 2005). *Complex selective attention* was examined with a pencil-paper version of the Stroop task (Golden, 1978) and *Complex affective selective attention* (CASA) with a modified computerized version of an affective Stroop task (Genov et al., 2002). *Response Inhibition* (RI) was evaluated with the Stop-Signal task and *Affective response inhibition* (ARI) with the Affective Go/No-go task of the Cambridge Automated Neuropsychological Test Automated Battery (CANTAB; Robbins et al., 1998). *Decision-making* (DM) was examined with the Stockings of Cambridge (SoC) task, which is also part of CANTAB, and *Affective* DM was examined with the Iowa Gambling task (IGT; Bechara et al., 2000; Bechara et al., 1994). *Fluid intelligence* (FI) was assessed with Raven's Progressive Matrices (RPM; Raven et al., 2003) while trait *Emotional intelligence* (EI) was assessed with the Greek Emotional Intelligence Scale (GEIS; Tsaousis, 2008). Tasks were administered in the order they are reported here and the testing session lasted approximately 60 minutes. A detailed description of the tasks and outcome measures is provided in Supplementary material.

Visual Analogue Scales and Self-Assessment Manikin

Upon arrival at the lab, participants self-rated their mood and feelings on a battery of 16-item visual analog scales (VAS; Bond & Lader, 1974; Norris, 1971). The Self-Assessment Manikin (SAM; Bradley & Lang, 1994) was administered after completion of the AWM task for participants to rate their "pleasure" and "arousal" after viewing each image. A detailed description of both instruments is provided in Supplementary material.

Statistical analyses

Between-group differences in (a) demographic variables (age, years of education, smoking habits), VAS and SPQ scores were examined with either parametric or non-parametric analyses according to normality of the distribution and (b) sex were examined with chi-square analysis. Significant between-group differences were followed up with either Bonferroni post hoc or Mann-Whitney tests, respectively. The raw data of each variable for every neuropsychological task were transformed into z scores. For the tasks yielding more than one outcome measures, we calculated the average of the z scores, so that each task was represented by one composite variable (when the outcome measures included correct responses and errors, errors were negatively marked so that higher scores indicated superior performance, in accordance with correct responses). Thus, five cold cognitive domains and their hot counterparts were produced: *working memory* (N-back metrics) and *affective working memory* (affective *N*-back metrics), *complex selective attention* (Stroop task metrics) and *complex affective selective attention* (affective Stroop task metrics), *response inhibition* (Stop-signal task) and *affective response inhibition* (Affective Go/No-go task), DM (SoC metrics) and *affective* DM (IGT metrics), *fluid intelligence* (RPM metrics) and *emotional intelligence* (GEIS metrics). Between-group differences in the cognitive areas were examined with repeated measures analyses of covariance (ANCOVA) with (a) group (five levels, i.e., four schizotypal and one control groups) as the between-subjects' factor, (b) type of task (two levels, i.e., affective or non-affective) as the within-subjects' factor and (c) age, VAS anxiety and discontentment as covariates (we included these variables in our models as covariates, as significant between-group differences were detected). Significant group main effects were followed up with Bonferroni post hoc tests and significant type of task × group interactions were followed up with separate univariate ANCOVAs with the same factorial design, as previously. To reduce the probability of type I error, Bonferroni correction was applied [0.05/10 cognitive areas = 0.005]; therefore, only p values<0.005 were considered significant and p values ≤ 0.01 were considered as trends for significance.

Results

Demographics, VAS and SPQ scores

There was a significant group main effect in (a) age [$F(4,246) = 4.68$, $p < 0.001$] with the paranoid group being younger compared with the control ($p < 0.01$) and the cognitive-perceptual ($p < 0.05$) groups; (b) VAS discontentment [$F(4,246) = 5.88$, $p < 0.001$] and VAS anxiety (Kruskal Wallis chi-square = 14.14, $p < 0.01$) with the control group scoring lower compared with both the paranoid (both p values < 0.005) and the negative (both p values < 0.05) groups. The remaining between-group differences were not significant (all p values > 0.06). A detailed description is provided in Supplementary Table 1. As

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regards SPQ scores, the main findings were that (a) the control group scored lower compared with all schizotypal groups in all schizotypal factors (all p values < 0.001) and (b) every schizotypal group scored higher compared to all the other schizotypal groups in the respective factor scores. A detailed description is provided in Supplementary Table 2.

Self-Assessment Manikin (SAM)

With the procedure described in Statistical analyses, we calculated separate composite scores for pleasure and arousal and examined between-group differences with univariate ANCOVAs. These analyses did not reveal significant group main effect for pleasure ($p > 0.19$). However, a significant main effect of group was revealed for arousal [$F(4,246) = 3.91$, $p = 0.004$, partial eta-squared $= 0.061$] with the control group scoring lower compared with the cognitive-perceptual group ($p = 0.009$).

Neuropsychological task performance

A detailed description of all neuropsychological task raw scores (mean ± SD) is provided in Supplementary Table 3. A graphical presentation of the significant between-group differences is provided in Figure 1. For the purposes of the presentation, we set the mean for every cognitive domain of the control group to zero by subtracting the actual mean of the control group from each participant in the schizotypal groups.

Working Memory (WM) and Affective Working Memory (AWM)

The repeated measures ANCOVA revealed a significant main effect of group [$F(4,239) = 5.83$, $p < 0.001$, partial eta-squared $= 0.089$] and significant type of task × group interaction [$F(4,239) = 4.07$, $p = 0.003$, partial eta-squared $= 0.064$] while no other significant main effects or interactions were found (all p values > 0.08). Follow-up of the aforementioned interaction with univariate ANCOVAS revealed a different pattern of results. Thus, we found a significant group main effect [$F(4,246) = 5.31$, $p < 0.001$, partial eta-squared $= 0.082$] for WM with the control ($p = 0.004$, Cohen's $d = 0.78$) and the cognitive-perceptual ($p = 0.001$, Cohen's $d = 0.93$) groups outperforming the negative schizotypal group. We also found a significant main effect of group [$F(4,246) = 5.03$, $p < 0.001$, partial eta-squared $= 0.078$] for AWM, but this time the control group outperformed the disorganized group ($p < 0.001$, Cohen's $d = 0.49$) and the cognitive-perceptual group tended to score higher ($p = 0.008$, Cohen's $d = 0.47$) compared with the disorganized group.

As we found a significant between-group difference in SAM arousal, we repeated the analyses including this variable in the list of covariates. The group main effect in the repeated measures ANCOVA was retained [$F\ (4,237) = 5.83$, $p < 0.001$, partial eta-squared $= 0.090$] as was the type of task × group interaction [$F(4,237) = 4.26$, $p = 0.002$, partial eta-squared $= 0.067$]. Further following this up with a univariate ANCOVA for AWM, we found the exact same pattern as previously [group main effect: $F\ (4,246) = 4.95$, $p < 0.001$, partial eta-squared $= 0.077$] with the control group having superior performance ($p < 0.001$) and the cognitive-perceptual group tending to have superior performance ($p = 0.015$) compared with the disorganized group.

Complex Selective Attention (CSA) and Complex Affective Selective Attention (CASA)

The repeated measures ANCOVA revealed both a significant main effect of group [$F(4,239) = 4.93$, $p < 0.001$, partial eta-squared $= 0.076$] and a significant type of task × group interaction [$F(4,239) = 4.09$, $p = 0.003$, partial eta-squared $= 0.064$] while no other significant main effects or interactions were found (all p values > 0.28). Follow-up of the significant interaction with univariate ANCOVAS revealed a different pattern of results, as previously. Thus, we found a significant group main effect [$F(4,246) = 4.36$, $p = 0.002$, partial eta-squared $= 0.068$] for CSA with the control group outperforming the disorganized group ($p = 0.001$; Cohen's $d = 0.24$). We also found a significant main effect of group [$F(4,246) = 4.98$, $p < 0.001$, partial eta-squared $= 0.077$] for CASA, but this time the control and the cognitive-perceptual groups outperformed the negative schizotypal group (both p values < 0.001; Cohen's d of controls vs negative $= 0.60$ and Cohen's d of cognitive-perceptual vs. negative $= 0.67$).

Response Inhibition (RI) and Affective Response Inhibition (ARI)

The repeated measures ANCOVA revealed a significant main effect of group [$F(4,239) = 3.79$, $p = 0.005$, partial eta-squared $= 0.060$] while the critical type of task × group interaction was also significant [$F(4,239) = 4.00$, $p = 0.004$, partial eta-squared $= 0.063$]; no other significant main effects or interactions were found (all p values > 0.05). Follow-up of the significant interaction with univariate ANCOVA for RI showed a significant group main effect [$F(4,246) = 5.15$, $p < 0.001$, partial eta-squared $= 0.079$] the negative group presenting with poorer performance compared with all other groups (negative vs. controls: $p < 0.001$, Cohen's $d = 1.29$; negative vs. cognitive-perceptual: $p = 0.001$ Cohen's $d = 1.34$; negative vs. paranoid: $p = 0.005$, Cohen's $d = 1.28$; negative vs. disorganized: $p = 0.002$, Cohen's $d = 1.11$). Identical analysis for ARI revealed only a trend for significant group-main effects [$F(4,246) = 3.71$, $p = 0.006$, partial eta-squared $= 0.058$] with the control group tending to outperform the disorganized group ($p = 0.006$, Cohen's $d = 0.60$).

DM and Affective DM

Identical repeated measures ANCOVA as with the previous tasks did not reveal any significant group main effects of interactions involving group (all p values > 0.17).

Fluid Intelligence (FI) and Emotional Intelligence (EI)

The repeated measures ANCOVA revealed a significant main effect of group [$F(4,239) = 8.60$, $p < 0.001$, partial eta-squared $= 0.126$] and type of task × group interaction [$F(4,239) = 6.07$, $p < 0.001$, partial eta-squared $= 0.092$] while no other significant main effects or interactions were found (all p values > 0.01). Follow-up of the significant interaction with univariate ANCOVA for FI did not reveal any significant effects (all p values > 0.20). However, the identical analysis for EI did reveal a significant group main effect [$F(4,246) = 15.14$, $p < 0.001$, partial eta-squared $= 0.202$] with (a) the control group scoring higher compared with the paranoid ($p = 0.005$, Cohen's $d = 1.10$), negative ($p < 0.001$, Cohen's $d = 1.95$) and disorganized ($p < 0.001$, Cohen's $d = 0.96$) groups and (b) the cognitive-perceptual group scoring higher ($p < 0.001$, Cohen's $d = 1.98$) compared with the negative group; the disorganized group tended to score higher ($p = 0.007$, Cohen's $d = 1.25$) compared with the negative group.

Discussion

In the present study, a detailed analysis of schizotypal traits was conducted using the four-factor model of schizotypy to examine

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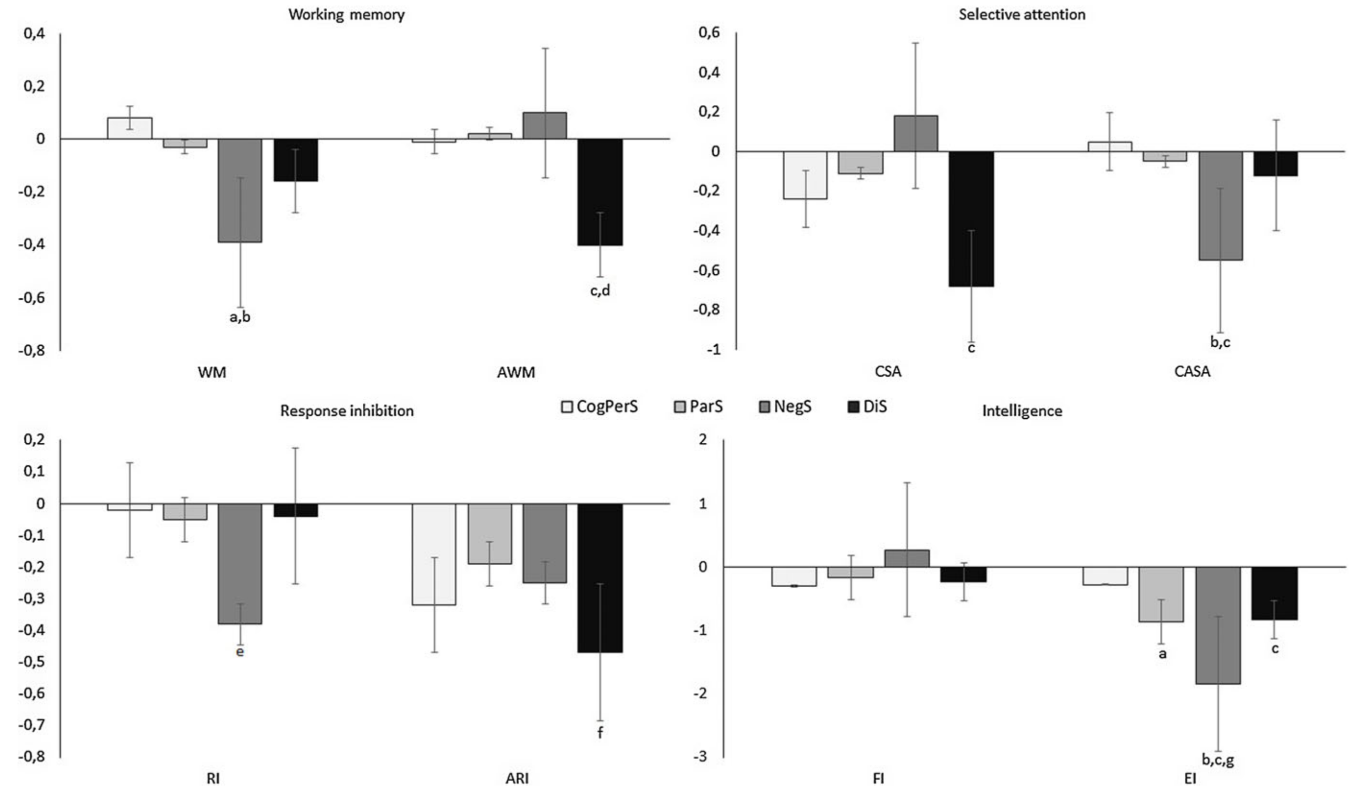

Figure 1. Between-group differences in affective and non-affective aspects of working memory (upper left panel), complex selective attention (upper right panel), response inhibition (bottom left panel) and intelligence (bottom right panel). ARI: Affective Response Inhibition; AWM: Affective Working Memory; CASA: Complex Affective Selective Attention; CSA: Complex Selective Attention; EI: Emotional Intelligence; FI: Fluid Intelligence; RI: Response Inhibition; WM: Working memory. CogPer: Cognitive-Perceptual schizotypes; DiS: Disorganized schizotypes; NegS: Negative schizotypes; ParS: Paranoid schizotypes. a: < control group ($p < 0.005$); b: < cognitive-perceptual group ($p < 0.001$); c: < control group ($p < 0.001$); d: < cognitive-perceptual group (trend level); e: < all groups ($p < 0.005$); *f*: < control group (trend level); *g*: < disorganized group (trend level).

the associations of each schizotypal dimension with *cold* (i.e., based on logical reasoning) and *hot* (i.e., involving emotional processes) executive functions. The results showed that these two types of cognitive processes are associated in different ways with the different facets of schizotypy.

Thus, negative schizotypes were found to have striking difficulties in response inhibition – they performed poorly compared to all other groups – in working memory and in complex affective selective attention, which was examined with an affective Stroop task. The finding of impoverished working memory and reduced response inhibition, two highly interconnected cognitive processes (Bissett et al., 2022), is in direct agreement with previous findings in the schizotypy literature (Ettinger et al., 2018; Karagiannopoulou et al., 2016; Karamaouna et al., 2021; Matheson & Langdon, 2008; Park & McTigue, 1997). It is also supported by evidence from (a) neuroimaging studies indicating commonalities in the neural substrate between the three constructs (Emch et al., 2019; Kühn et al., 2012; Pfarr & Nenadić, 2020; Sutcliffe et al., 2016; Wiebels et al., 2016) and (b) studies linking the negative symptom cluster of schizophrenia symptoms with both cognitive processes (e.g., Bora & Murray, 2014; Gotra et al., 2020; Khalil et al., 2020; Shin et al., 2013) as well as schizotypal personality disorder symptoms with impairments in working memory (Mitropoulou et al., 2002, 2005; Rosell et al., 2014). The finding that negative schizotypes performed worse in the affective Stroop task compared to controls is interesting, given that there were no group differences in this group on the classical version of the task or in affective working memory, affective response inhibition or affective DM. A speculative but plausible explanation for this finding has to do with the nature of the task used in the present study, since all emotional words were adjectives describing mental/emotional states. Negative schizotypy – characterized by excessive social anxiety, lack of close friends, constricted affect and suspiciousness – has been associated with poor interactions/activities involving other people (Cohen et al., 2015). Although no causal relationships between the two can be easily detected, the net result of this association could be that negative schizotypes end up being more prone to a tendency for self-referencing and attribution of emotional states to themselves instead of perceiving them as conditions applying to all people (more self-focused rather than equally oriented into self and others) – in analogy to schizophrenia patients (van der Weiden et al., 2015). This tendency could leave them more vulnerable to the interfering effects of emotionally laden stimuli.

Disorganized schizotypes, on the other hand, were identified with poorer affective working memory and affective response inhibition along with poorer complex selective attention. Although there is currently a lack of literature addressing emotional cognitive processes, as assessed with typical neuropsychological tasks, in disorganized schizotypy, there is ample evidence associating this schizotypal dimension with irregular affective states (Kemp et al., 2018; Kemp et al., 2022; Kerns & Becker, 2008; Kerns, 2006; Kwapil et al., 2020) and deficient processing of emotional stimuli (Brown & Cohen, 2010; Zouraraki et al., 2023a). A frontal-temporal-parietal network has been reported to mediate disorganized schizotypy (Pfarr & Nenadić, 2020; Wang et al., 2020; Wiebels

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et al., 2016) as well as working memory for affective stimuli (García-Pacios et al., 2017) and affective response inhibition (Puiu et al., 2020), which may account for our present findings. In contrast to previous studies that reported non-significant associations between performance on the Stroop task and disorganized traits (Ettinger et al., 2018; Szöke et al., 2009; Thomas et al., 2019), we found that disorganized schizotypes showed poorer performance in the task. However, the difference between the present finding and the findings of the aforementioned studies, is likely due to methodological issues [i.e., in the Thomas et al. (2019) study, schizotypy was assessed with the O-LIFE; Ettinger et al. (2018) and Szöke et al. (2009) administered the SPQ but they both analyzed other performance metrics of the task; Szöke et al. (2009) also included relatives of schizophrenia patients along with control individuals in their analyses]. Moreover, the finding is consistent with the schizophrenia literature linking disorganized symptoms with Stroop task performance (Brazo et al., 2002; Woodward et al., 2003) and supporting the linear decline of selective attention in the schizophrenia spectrum (Catalan et al., 2021; Hou et al., 2016).

Cognitive-perceptual schizotypy (comprising magical thinking and unusual perceptual experiences) is the least studied of all schizotypal dimensions, being "conflated" with paranoid schizotypy under positive schizotypy in the three-factor model prevalent in the literature. So, thus far we know that cognitive-perceptual schizotypes perform comparably well to controls in both typical neuropsychological tasks (Karagiannopoulou et al., 2016) and in subjective measures of cognition (Giakoumaki et al., 2021); they also outperform other schizotypal groups in some cases [e.g., they have superior executive working memory abilities compared with negative schizotypes (Karagiannopoulou et al., 2016)]. Accordingly, cognitive-perceptual schizotypy does not mediate the differences in neurocognition observed between unaffected relatives of schizophrenia patients and control individuals (Zouraraki et al., 2017), it is not characterized by sensorimotor gating deficits (Giakoumaki et al., 2020), it is not subject to the effects of visual illusions (Zouraraki et al., 2023b), it is associated with superior psychological well-being (Giakoumaki et al., 2021) and remains stable over a 4-year period (Karamaouna et al., 2021). To further add to the profile of cognitive-perceptual schizotypy, in the present study we found that the cognitive-perceptual group did not differ from the control group in any measure and that they had better working memory and higher emotional intelligence compared with the negative schizotypes. All this accumulated evidence points to a close resemblance of cognitive-perceptual schizotypy with healthy schizotypy. The latter term was first introduced by McCreery and Claridge (2002) to describe individuals with increased aberrant perceptions and beliefs in the absence of negative and disorganized traits. A detailed review of the related literature is provided by Mohr & Claridge (2015). In brief, this group reports that they are not distressed by their schizotypal experiences (McCreery & Claridge, 1996), they are highly creative (Nettle & Clegg, 2006) and they have high well-being (Tabak & Weisman de Mamani, 2013). In accordance to these findings, Cimino & Haywood (2008; p. 2) note that "... *the manifestation of positive symptoms may result in rewarding outcomes, such as spiritual experiences ... psychologically healthy high schizotypes may be prone to psychotic-like experiences, but not be adversely affected by them,*" possibly explaining the non-detrimental effects of cognitive-perceptual schizotypy. It remains to be seen whether this schizotypal dimension explains a percentage of the variance observed in the conversion rates of schizotypes into disease states.

Finally, while there were no group differences in fluid intelligence, a "broad" impoverishment in emotional intelligence was observed, as negative, paranoid and disorganized schizotypes scored lower compared to controls, in accordance with previous studies associating schizotypy scores with emotional (Aguirre et al., 2008; Albacete et al., 2016) but not fluid (Cochrane et al., 2012) intelligence. It seems, therefore, that the well-reported association of fluid reasoning abilities with emotional intelligence (Olderbak et al., 2019; Simonet et al., 2021) is dissociated in schizotypy irrespective of the prevailing schizotypal dimension; the only exception being cognitive-perceptual schizotypy. As emotional intelligence is a core component of social cognition (Salovey & Mayer, 1990), the finding also adds further evidence on the decline of this complex function observed in schizotypy (e.g., Bora, 2020; Kong et al., 2021; Pflum & Gooding, 2018; Buck et al., 2017; Nahal et al., 2021; Wang et al., 2015; Wastler & Lenzenweger, 2021; Morrison et al., 2013).

In conclusion, the present study (a) indicates that there is no categorical association between the different schizotypal dimensions with solely cold or hot executive functions – both negative and disorganized schizotypy were linked with poor performance in both types of cognition, (b) supports that impoverished emotional intelligence is a central feature of schizotypy and (c) further establishes cognitive-perceptual schizotypy as the latest analog of healthy schizotypy. The limitations of the study include (a) the examination of schizotypy with a self-report scale carrying weaknesses potentially limiting the validity of findings (e.g., people often do not disclose the truth in questions they find embarrassing/too personal/undesirable; responses can be biased by the respondent's self-perception; forced-choice dichotomous responses do not categorically apply to all situations), (b) the lack of assessment of the effects of other personality (e.g., Hatzimanolis et al., 2018) or autistic (e.g., Nenadić et al., 2021) traits as well as genetic (e.g., Roussos et al., 2013; Tsang et al., 2015) and environmental (e.g., O'Hare et al., 2022; Vargas et al., 2019) factors known to interact with schizotypy and/or cognitive processing, (c) the cross-sectional design of the study which does not allow for conclusions on the stability of our findings over time, (d) the limited selection of neuropsychological tasks assessing specific executive functions and (e) although we examined a quite large sample, our grouping approach led to fairly small sample sizes with predominantly female participants for each schizotypal group; we employed strict statistical criteria in order to avoid false positive findings but one cannot exclude the possibility of the small sample sizes masking potential additional between-group differences and/or affecting the power of the findings.

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References

Aguirre, F., Sergi, M. J., & Levy, C. A. (2008). Emotional intelligence and social functioning in persons with schizotypy. *Schizophrenia Research*, *104*(1-3), 255–264. https://doi.org/10.1016/j.schres.2008.05.007

Albacete, A., Bosque, C., Custal, N., Crespo, J. M., Gilabert, E., Albiach, A., Menchón, J. M., & Contreras, F. (2016). Emotional intelligence in non-psychotic first-degree relatives of people with schizophrenia. *Schizophrenia Research*, *175*(1-3), 103–108. https://doi.org/10.1016/j.schres.2016.04.039

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

Barron, D., Swami, V., Towell, T., Hutchinson, G., & Morgan, K. D. (2015). Examination of the factor structure of the Schizotypal Personality Questionnaire among British and Trinidadian adults. *BioMed Research International*, *2015*, 258275. https://doi.org/10.1155/2015/258275

Bechara, A., Damasio, H., & Damasio, A. R. (2000). Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex*, *10*(3), 295–307. https://doi.org/10.1093/cercor/10.3.295

Bechara, A., Damasio, A. R., Damasio, H., & Anderson, S. W. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition*, *50*(1-3), 7–15. https://doi.org/10.1016/0010-0277(94)90018-3

Bedwell, J. S., Compton, M. T., Jentsch, F. G., Deptula, A. E., Goulding, S. M., & Tone, E. B. (2014). Latent factor modeling of four schizotypy dimensions with theory of mind and empathy. *PLoS One*, *9*(11), e113853. https://doi.org/10.1371/journal.pone.0113853

Besnier, N., Richard, F., Zendjidjian, X., Kaladjian, A., Mazzola-Pomietto, P., Adida, M., & Azorin, J. M. (2009). Stroop and emotional stroop interference in unaffected relatives of patients with schizophrenic and bipolar disorders: Distinct markers of vulnerability? *The World Journal of Biological Psychiatry*, *10*(4-3), 809–818. https://doi.org/10.1080/15622970903131589

Bissett, P. G., Jones, H. M., Hagen, M. K. P., Bui, T. T., Li, J. K., Rios, J. A. H., Mumford, J. A., Shine, J. M., & Poldrack, R. A. (2022). A dual-task approach to inform the taxonomy of inhibition-related processes. *Journal of Experimental Psychology: Human Perception and Performance. Advance online publication*, *49*(3), 277–289. https://doi.org/10.1037/xhp0001073

Bond, A. J., & Lader, M. H. (1974). The use of analogue scales in rating subjective feelings. *British Journal of Medical Psychology*, *47*(3), 211–218. https://doi.org/10.1111/j.2044-8341.1974.tb02285.x

Bora, E. (2020). Theory of mind and schizotypy: A meta-analysis. *Schizophrenia Research*, *222*, 97–103. https://doi.org/10.1016/j.schres.2020.04.024

Bora, E., & Murray, R. M. (2014). Meta-analysis of cognitive deficits in ultra-high risk to psychosis and first-episode psychosis: Do the cognitive deficits progress over, or after, the onset of psychosis? *Schizophrenia Bulletin*, *40*(4), 744–755. https://doi.org/10.1093/schbul/sbt085

Bortolato, B., Miskowiak, K. W., Köhler, C. A., Vieta, E., & Carvalho, A. F. (2015). Cognitive dysfunction in bipolar disorder and schizophrenia: A systematic review of meta-analyses. *Neuropsychiatric Disease and Treatment*, *11*, 3111–3125. https://doi.org/10.2147/NDT.S76700

Bouton, M. E. (2021). Context, attention, and the switch between habit and goal-direction in behavior. *Learning & Behavior*, *49*(4), 349–362. https://doi.org/10.3758/s13420-021-00488-z

Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *Journal of Behavioral Therapy and Experimental Psychiatry*, *25*(1), 49–59. https://doi.org/10.1016/0005-7916(94)90063-9

Brazo, P., Marié, R. M., Halbecq, I., Benali, K., Segard, L., Delamillieure, P., Langlois-Théry, S., Van Der Elst, A., Thibaut, F., Petit, M., & Dollfus, S. (2002). Cognitive patterns in subtypes of schizophrenia. *European Psychiatry*, *17*(3), 155–162. https://doi.org/10.1016/s0924-9338(02)00648-x

Brown, L. A., & Cohen, A. S. (2010). Facial emotion recognition in schizotypy: The role of accuracy and social cognitive bias. *Journal of the International Neuropsychological Society*, *16*(3), 474–483. https://doi.org/10.1017/S135561771000007X

Buck, B., Hester, N., Penn, D. L., & Gray, K. (2017). Differential patterns in mind perception in subclinical paranoia: Relationships to self-reported empathy. *Cognitive Neuropsychiatry*, *22*(2), 137–144. https://doi.org/10.1080/13546805.2017.1287692

Catalan, A., Salazar de Pablo, G., Aymerich, C., Damiani, S., Sordi, V., Radua, J., Oliver, D., McGuire, P., Giuliano, A. J., Stone, W. S., & Fusar-Poli, P. (2021). Neurocognitive functioning in individuals at Clinical High risk for psychosis: A systematic review and meta-analysis. *JAMA Psychiatry*, *78*(8), 859–867. https://doi.org/10.1001/jamapsychiatry.2021.1290

Chai, W. J., Abd Hamid, A. I., & Abdullah, J. M. (2018). Working memory from the psychological and neurosciences perspectives: A review. *Frontiers in Psychology*, *9*, 401. https://doi.org/10.3389/fpsyg.2018.00401

Chapman, L. J., Chapman, J. P., & Miller, E. N. (1982). Reliabilities and intercorrelations of eight measures of proneness to psychosis. *Journal of Consulting and Clinical Psychology*, *50*(2), 187–195. https://doi.org/10.1037//0022-006x.50.2.187

Chapman, L. J., Chapman, J. P., & Raulin, M. L. (1976). Scales for physical and social anhedonia. *Journal of Abnormal Psychology*, *85*(4), 374–382. https://doi.org/10.1037//0021-843x.85.4.374

Chapman, L. J., Chapman, J. P., & Raulin, M. L. (1978). Body-image aberration in Schizophrenia. *Journal of Abnormal Psychology*, *87*(4), 399–407. https://doi.org/10.1037//0021-843x.87.4.399

Cimino, M., & Haywood, M. (2008). Inhibition and facilitation in schizotypy. *Journal of Clinical and Experimental Neuropsychology*, *30*(2), 187–198. https://doi.org/10.1080/13803390701336866

Cohen, A. S., Mohr, C., Ettinger, U., Chan, R. C. K., & Park, S. (2015). Schizotypy as an organizing framework for social and affective sciences. *Schizophrenia Bulletin*, *41*, S427–35. https://doi.org/10.1093/schbul/sbu195

Cochrane, M., Petch, I., & Pickering, A. D. (2012). Aspects of cognitive functioning in schizotypy and schizophrenia: Evidence for a continuum model. *Psychiatry Research*, *196*, 230–234. https://doi.org/10.1016/j.psychres.2012.02.010

Compton, M. T., Goulding, S. M., Bakeman, R., & McClure-Tone, E. B. (2009). Confirmation of a four-factor structure of the schizotypal personality questionnaire among undergraduate students. *Schizophrenia Research*, *111*, 46–52. https://doi.org/10.1016/j.schres.2009.02.012

David, D., & Matu, S. (2020). Cold cognition. In V. Zeigler-Hill, & T. K. Shackelford (Eds.), *Encyclopedia of personality and individual differences* (pp. 757–761). Springer. https://doi.org/10.1007/978-3-319-24612-3_967

Debbané, M., Eliez, S., Badoud, D., Conus, P., Flückiger, R., & Schultze-Lutter, F. (2015). Developing psychosis and its risk states through the lens of schizotypy. *Schizophrenia Bulletin*, *41*, S396–407. https://doi.org/10.1093/schbul/sbu176

Duggirala, S. X., Schwartze, M., Pinheiro, A. P., & Kotz, S. A. (2020). Interaction of emotion and cognitive control along the psychosis continuum: A critical review. *International Journal of Psychophysiology*, *147*, 156–175. https://doi.org/10.1016/j.ijpsycho.2019.11.004

Eckblad, M., & Chapman, L. J. (1983). Magical Ideation as an indicator of schizotypy. *Journal of Consulting and Clinical Psychology*, *51*(2), 215–225. https://doi.org/10.1037//0022-006x.51.2.215

Emch, M., von Bastian, C. C., & Koch, K. (2019). Neural correlates of verbal working memory: An fMRI meta-analysis. *Frontiers in Human Neuroscience*, *13*, 180. https://doi.org/10.3389/fnhum.2019.00180

Ettinger, U., Aichert, D. S., Wöstmann, N., Dehning, S., Riedel, M., & Kumari, V. (2018). Response inhibition and interference control: Effects of schizophrenia, genetic risk, and schizotypy. *Journal of Neuropsychology*, *12*(3), 484–510. https://doi.org/10.1111/jnp.12126

Ettinger, U., Mohr, C., Gooding, D. C., Cohen, A. S., Rapp, A., Haenschel, C., & Park, S. (2015). Cognition and brain function in schizotypy: A selective review. *Schizophrenia Bulletin*, *41*, S417–S426. https://doi.org/10.1093/schbul/sbu190

Ettinger, U., Meyhöfer, I., Steffens, M., Wagner, M., & Koutsouleris, N. (2014). Genetics, cognition, and neurobiology of schizotypal personality: A review of the overlap with schizophrenia. *Frontiers in Psychiatry*, *5*, 18. https://doi.org/10.3389/fpsyt.2014.00018

Fonseca-Pedrero, E., Compton, M. T., Tone, E. B., Ortuño-Sierra, J., Paino, M., Fumero, A., & Lemos-Giráldez, S. (2014). Cross-cultural invariance of the factor structure of the Schizotypal Personality Questionnaire across Spanish and American college students. *Psychiatry Research*, *220*(3), 1071–1076. https://doi.org/10.1016/j.psychres.2014.06.050

Fonseca-Pedrero, E., Debbané, M., Ortuño-Sierra, J., Chan, R. C. K., Cicero, D. C., Zhang, L. C., Brenner, C., Barkus, E., Linscott, R. J., Kwapil, T., Barrantes-Vidal, N., Cohen, A., Raine, A., Compton, M. T., Tone, E. B., Suhr, J., Muñiz, J., Fumero, A., Giakoumaki, S., . . . Jablensky, A. (2018). The structure of schizotypal personality traits: A cross-national study. *Psychological Medicine*, *48*(3), 451–462. https://doi.org/10.1017/S0033291717001829

Fonseca-Pedrero, E., Fumero, A., Paino, M., de Miguel, A., Ortuño-Sierra, J., Lemos-Giráldez, S., & Muñiz, J. (2014). Schizotypal personality questionnaire: New sources of validity evidence in college students. *Psychiatry Research*, *219*(1), 214–220. https://doi.org/10.1016/j.psychres.2014.04.054

García-Pacios, J., Garcés, P., Del Río, D., & Maestú, F. (2017). Tracking the effect of emotional distraction in working memory brain networks: Evidence from an MEG study. *Psychophysiology*, *54*(11), 1726–1740. https://doi.org/10.1111/psyp.12912

Gebreegziabhere, Y., Habatmu, K., Mihretu, A., Cella, M., & Alem, A. (2022). Cognitive impairment in people with schizophrenia: An umbrella review. *European Archives of Psychiatry and Clinical Neuroscience*, *272*(7), 1139–1155. https://doi.org/10.1007/s00406-022-01416-6

Genov, A., Shay, I., & Boone, R. T. (2002). *Genov modified Stroop task (GMST) [Computer software and manual]*. Retrieved September 7, 2005, from http://facpub.stjohns.edu/∼booner/GMSTsite/index.htm

Giakoumaki, S. G. (2012). Cognitive and prepulse inhibition deficits in psychometrically high schizotypal subjects in the general population: Relevance to schizophrenia research. *Journal of International Neuropsychological Society*, *18*(4), 643–656. https://doi.org/10.1017/S135561771200029X

Giakoumaki, S. G. (2016). Emotion processing deficits in the different dimensions of psychometric schizotypy. *Scandinavian Journal of Psychology*, *57*(3), 256–270. https://doi.org/10.1111/sjop.12287

Giakoumaki, S. G., Karagiannopoulou, L., Karamaouna, P., Zouraraki, C., & Bitsios, P. (2020). The association of schizotypal traits with prepulse inhibition: A double approach exploration. *Cognitive Neuropsychiatry*, *25*(4), 281–293. https://doi.org/10.1080/13546805.2020.1779679

Giakoumaki, S. G., Karamaouna, P., Karagiannopoulou, L., & Zouraraki, C. (2021). Self-perceived cognitive lapses and psychological well-being in schizotypy: Generalized and domain-specific associations. *Scandinavian Journal of Psychology*, *62*(2), 134–140. https://doi.org/10.1111/sjop.12704

Giakoumaki, S. G., Roussos, P., Pallis, E. G., & Bitsios, P. (2011). Sustained attention and working memory deficits follow a familial pattern in schizophrenia. *Archives of Clinical Neuropsychology*, *26*(7), 687–695. https://doi.org/10.1093/arclin/acr060

Golden, C. (1978). *Stroop color and word test manual (Cat.30150M)*. Stoelting.

Gotra, M. Y., Hill, S. K., Gershon, E. S., Tamminga, C. A., Ivleva, E. I., Pearlson, G. D., Keshavan, M. S., Clementz, B. A., McDowell, J. E., Buckley, P. F., Sweeney, J. A., & Keedy, S. K. (2020). Distinguishing patterns of impairment on inhibitory control and general cognitive ability among bipolar with and without psychosis, schizophrenia, and schizoaffective disorder. *Schizophrenia Research*, *223*, 148–157. https://doi.org/10.1016/j.schres.2020.06.033

Hatzimanolis, A., Avramopoulos, D., Arking, D. E., Moes, A., Bhatnagar, P., Lencz, T., Malhotra, A. K., Giakoumaki, S. G., Roussos, P., Smyrnis, N., Bitsios, P., & Stefanis, N. C. (2018). Stress-dependent association between polygenic risk for schizophrenia and schizotypal traits in young army recruits. *Schizophrenia Bulletin*, *44*(2), 338–347. https://doi.org/10.1093/schbul/sbx074

Hou, C.-L., Xiang, Y.-T., Wang, Z.-L., Everall, I., Tang, Y., Yang, C., Xu, M.-Z., Correll, C. U., & Jia, F.-J. (2016). Cognitive functioning in individuals at ultra-high risk for psychosis, first-degree relatives of patients with psychosis and patients with first-episode schizophrenia. *Schizophrenia Research*, *174*(1-3), 71–76. https://doi.org/10.1016/j.schres.2016.04.034

Karagiannopoulou, L., Karamaouna, P., Zouraraki, C., Roussos, P., Bitsios, P., & Giakoumaki, S. G. (2016). Cognitive profiles of schizotypal dimensions in a community cohort: Common properties of differential manifestations. *Journal of Clinical and Experimental Neuropsychology*, *38*(9), 1050–1063. https://doi.org/10.1080/13803395.2016.1188890

Karamaouna, P., Zouraraki, C., & Giakoumaki, S. G. (2021). Cognitive functioning and schizotypy: A four-years study. *Frontiers in Psychiatry*, *11*, 613015. https://doi.org/10.3389/fpsyt.2020.613015

Kemp, K. C., Gross, G. M., Barrantes-Vidal, N., & Kwapil, T. R. (2018). Association of positive, negative, and disorganized schizotypy dimensions with affective symptoms and experiences. *Psychiatry Research*, *270*, 1143–1149. https://doi.org/10.1016/j.psychres.2018.10.031

Kemp, K. C., Sperry, S. H., Hernández, L., Barrantes-Vidal, N., & Kwapil, T. R. (2022). Affective dynamics in daily life are differentially expressed in positive, negative, and disorganized schizotypy. *Journal of Psychopathology and Clinical Science*, *132*(1), 110–121. https://doi.org/10.1037/abn0000799

Keramatian, K., Torres, I. J., & Yatham, L. N. (2022). Neurocognitive functioning in bipolar disorder: What we know and what we don't. *Dialogues in Clinical Neuroscience*, *23*(1), 29–38. https://doi.org/10.1080/19585969.2022.2042164

Kerns, J. G. (2006). Schizotypy facets, cognitive control, and emotion. *Journal of Abnormal Psychology*, *115*(3), 418–427. https://doi.org/10.1037/0021-843X.115.3.418

Kerns, J. G., & Becker, T. M. (2008). Communication disturbances, working memory, and emotion in people with elevated disorganized schizotypy. *Schizophrenia Research*, *100*(1-3), 172–180. https://doi.org/10.1016/j.schres.2007.11.005

Khalil, A. H., El-Meguid, M. A., Bastawy, M., Rabei, S., Ali, R., & Abd Elmoneam, M. H. E. (2020). Correlating cognitive functions to symptom domains and insight in Egyptian patients with schizophrenia. *International Journal of Social Psychiatry*, *66*(3), 240–248. https://doi.org/10.1177/0020764019897697

Kirschner, M., Hodzic-Santor, B., Antoniades, M., Nenadic, I., Kircher, T., Krug, A., Meller, T., Grotegerd, D., Fornito, A., Arnatkeviciute, A., Bellgrove, M. A., Tiego, J., Dannlowski, U., Koch, K., Hülsmann, C., Kugel, H., Enneking, V., Klug, M., Leehr, E. J., . . . Modinos, G. (2022). Cortical and subcortical neuroanatomical signatures of schizotypy in 3004 individuals assessed in a worldwide ENIGMA study. *Molecular Psychiatry*, *27*(2), 1167–1176. https://doi.org/10.1038/s41380-021-01359-9

Kong, W., Koo, S. J., Seo, E., Park, H. Y., Lee, E., & An, S. K. (2021). Empathy and theory of mind in ultra-high risk for psychosis: Relations with schizotypy and executive function. *Psychiatry Investigation*, *18*(11), 1109–1116. https://doi.org/10.30773/pi.2021.0111

Kühn, S., Schubert, F., & Gallinat, J. (2012). Higher prefrontal cortical thickness in high schizotypal personality trait. *Journal of Psychiatric Research*, *46*(7), 960–965. https://doi.org/10.1016/j.jpsychires.2012.04.007

Kwapil, T. R., Kemp, K. C., Mielock, A., Sperry, S. H., Chun, C. A., Gross, G. M., & Barrantes-Vidal, N. (2020). Association of multidimensional schizotypy with psychotic-like experiences, affect, and social functioning in daily life: Comparable findings across samples and schizotypy measures. *Journal of Abnormal Psychology*, *129*(5), 492–504. https://doi.org/10.1037/abn0000522

Lang, P. J., & Bradley, M. M. (2005). *International affective picture system (IAPS): Affective ratings of pictures and instruction manual. Technical Report A-6*. University of Florida.

Luperdi, S. C., Tabarés-Seisdedos, R., Livianos, L., Vieta, E., Cuesta, M. J., & Balanzá-Martínez, V. (2019). Neurocognitive endophenotypes in schizophrenia and bipolar disorder: A systematic review of longitudinal family studies. *Schizophrenia Research*, *210*, 21–29. https://doi.org/10.1016/j.schres.2019.06.014

MacKenzie, L. E., Patterson, V. C., Zwicker, A., Drobinin, V., Fisher, H. L., Abidi, S., Greve, A. N., Bagnell, A., Propper, L., Alda, M., Pavlova, B., & Uher, R. (2017). Hot and cold executive functions in youth with psychotic symptoms. *Psychological Medicine*, *47*(16), 2844–2853. https://doi.org/10.1017/S0033291717001374

Mason, O., & Claridge, G. (2006). The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE): Further description and extended norms. *Schizophrenia Research*, *82*(2-3), 203–211. https://doi.org/10.1016/j.schres.2005.12.845

Mason, O., Claridge, G., & Jackson, M. (1995). New scales for the assessment of schizotypy. *Personality and Individual Differences*, *18*(1), 7–13. https://doi.org/10.1016/0191-8869(94)00132-C

Matheson, S., & Langdon, R. (2008). Schizotypal traits impact upon executive working memory and aspects of IQ. *Psychiatry Research*, *159*(1-2), 207–214. https://doi.org/10.1016/j.psychres.2007.04.006

M'Barek, L., Mercy, G., Gautier, C., Legros-Lafarge, E., Fiegl, L., Fiard, D., & Allain, P. (2022). Frontal lobe functions in schizophrenia: Interest of the

Stuss approach. *Brain and Cognition*, *160*, 105878. https://doi.org/10.1016/j.bandc.2022.105878

McCreery, C., & Claridge, G. (1996). A study of hallucination in normal subjects-I. Self-report data. *Personality and Individual Differences*, *21*(5), 739–747. https://doi.org/10.1016/0191-8869(96)00115-8

McCreery, C., & Claridge, G. (2002). Healthy schizotypy: The case of out-of-the-body experiences. *Personality and Individual Differences*, *32*(1), 141–154. https://doi.org/10.1016/S0191-8869(01)00013-7

Millan, M. J., Agid, Y., Brüne, M., Bullmore, E. T., Carter, C. S., Clayton, N. S., Connor, R., Davis, S., Deakin, B., DeRubeis, R. J., Dubois, B., Geyer, M. A., Goodwin, G. M., Gorwood, P., Jay, T. M., Joëls, M., Mansuy, I. M., Meyer-Lindenberg, A., Murphy, D., . . . Young, L. J. (2012). Cognitive dysfunction in psychiatric disorders: Characteristics, causes and the quest for improved therapy. *Nature Reviews Drug Discovery*, *11*(2), 141–168. https://doi.org/10.1038/nrd3628

Miskowiak, K. W., Kjærstad, H. L., Meluken, I., Petersen, J. Z., Maciel, B. R., Köhler, C. A., Vinberg, M., Kessing, L. V., & Carvalho, A. F. (2017). The search for neuroimaging and cognitive endophenotypes: A critical systematic review of studies involving unaffected first-degree relatives of individuals with bipolar disorder. *Neuroscience and Biobehavioral Reviews*, *73*, 1–22. https://doi.org/10.1016/j.neubiorev.2016.12.011

Mitropoulou, V., Harvey, P. D., Maldari, L. A., Moriarty, P. J., New, A. S., Silverman, J. M., & Siever, L. J. (2002). Neuropsychological performance in schizotypal personality disorder: Evidence regarding diagnostic specificity. *Biological Psychiatry*, *52*(12), 1175–1182. https://doi.org/10.1016/s0006-3223(02)01426-9

Mitropoulou, V., Harvey, P. D., Zegarelli, G., New, A. S., Silverman, J. M., & Siever, L. J. (2005). Neuropsychological performance in schizotypal personality disorder: Importance of working memory. *American Journal of Psychiatry*, *162*(10), 1896–1903. https://doi.org/10.1176/appi.ajp.162.10.1896

Mohamed, A. L., Leila, G., Faouzia, B., & Anwar, M. (2014). Psychometric properties of the arabic version of the schizotypal personality questionnaire in Tunisian university students. *La Tunisie Medicale*, *92*(5), 318–322.

Mohr, C., & Claridge, G. (2015). Schizotypy—Do not worry, it is not all worrisome. *Schizophrenia Bulletin*, *41*(suppl 2), S436–S443. https://doi.org/10.1093/schbul/sbu185

Mohr, C., & Ettinger, U. (2014). An overview of the association between schizotypy and dopamine. *Frontiers in Psychiatry*, *5*, 184. https://doi.org/10.3389/fpsyt.2014.00184

Morrison, S. C., Brown, L. A., & Cohen, A. S. (2013). A multidimensional assessment of social cognition in psychometrically defined schizotypy. *Psychiatry Research*, *210*(3), 1014–1019. https://doi.org/10.1016/j.psychres.2013.08.020

Nahal, P., Hurd, P. L., Read, S., & Crespi, B. (2021). Cognitive empathy as imagination: Evidencef reading the Mind in the Eyes in autism and schizotypy. *Frontiers in Psychiatry*, *12*, 665721. https://doi.org/10.3389/fpsyt.2021.665721

Nenadić, I., Meller, T., Evermann, U., Schmitt, S., Pfarr, J. K., Abu-Akel, A., & Grezellschak, S. (2021). Subclinical schizotypal vs. autistic traits show overlapping and diametrically opposed facets in a non-clinical population. *Schizophrenia Research*, *231*, 32–41. https://doi.org/10.1016/j.schres.2021.02.018

Nettle, D., & Clegg, H. (2006). Schizotypy, creativity and mating success in humans. *Proceedings, Biological Sciences*, *273*(1586), 611–615. https://doi.org/10.1098/rspb.2005.3349

Norris, H. (1971). The action of sedatives on brain stem oculomotor systems in man. *Neuropharmacology*, *10*(2), 181–191. https://doi.org/10.1016/0028-3908(71)90039-6

Oezgen, M., & Grant, P. (2018). Odd and disorganized–Comparing the factor structure of the three major schizotypy inventories. *Psychiatry Research*, *267*, 289–295. https://doi.org/10.1016/j.psychres.2018.06.009

O'Hare, K., Watkeys, O., Whitten, T., Dean, K., Laurens, K. R., Tzoumakis, S., Harris, F., Carr, V. J., & Green, M. J. (2022). Cumulative environmental risk in early life: Associations with schizotypy in childhood. *Schizophrenia Bulletin*. https://doi.org/10.1093/schbul/sbac

Olderbak, S., Semmler, M., & Doebler, P. (2019). Four-branch model of ability emotional intelligence with fluid and crystallized intelligence: A meta-analysis of relations. *Emotion Review*, *11*, 166–183. https://doi.org/10.1177/1754073918776

Park, S., & McTigue, K. (1997). Working memory and the syndromes of schizotypal personality. *Schizophrenia Research*, *26*(2-3), 213–220. https://doi.org/10.1016/s0920-9964(97)00051-0

Pfarr, J. K., & Nenadić, I. (2020). A multimodal imaging study of brain structural correlates of schizotypy dimensions using the MSS. *Psychiatry Research Neuroimaging*, *302*, 111104. https://doi.org/10.1016/j.pscychresns.2020.111104

Pflum, M. J., & Gooding, D. C. (2018). Context matters: Social cognition task performance in psychometric schizotypes. *Psychiatry Research*, *264*, 398–403. https://doi.org/10.1016/j.psychres.2018.03.075

Puiu, A. A., Wudarczyk, O., Kohls, G., Bzdok, D., Herpertz-Dahlmann, B., & Konrad, K. (2020). Meta-analytic evidence for a joint neural mechanism underlying response inhibition and state anger. *Human Brain Mapping*, *41*(11), 3147–3160. https://doi.org/10.1002/hbm.25004

Rabella, M., Grasa, E., Trujols, J., Gich, I., Torrubia, R., Corripio, I., Pérez, V., & Riba, J. (2018). Validation of a Spanish version of the Schizotypal Personality Questionnaire (SPQ): Psychometric characteristics and underlying factor structure derived from a healthy university student sample. *Actas Espanolas de Psiquiatria*, *46*(5), 159–173.

Rado, S. (1953). Dynamics and classification of disordered behavior. *American Journal of Psychiatry*, *140*(6), 1167–1171. https://doi.org/10.1176/ajp.110.6.406

Raine, A. (1991). The SPQ: A scale for the assessment of schizotypal personality disorder based on DSM-III-R criteria. *Schizophrenia Bulletin*, *17*(4), 555–564. https://doi.org/10.1093/schbul/17.4.555

Raven, J., Raven, J. C., & Court, J. H. (2003). *Manual for Raven's progressive matrices and vocabulary scales. section 1: General overview*. Harcourt Assessment.

Rinaldi, R., & Lefebvre, L. (2016). Goal-directed behaviors in patients with schizophrenia: Concept relevance and updated model. *Psychiatry and Clinical Neurosciences*, *70*(9), 394–404. https://doi.org/10.1111/pcn.12401

Robbins, T. W. (2011). Cognition: The ultimate brain function. *Neuropsychopharmacology*, *36*(1), 1–2. https://doi.org/10.1038/npp.2010.171

Robbins, T. W., James, M., Owen, A. M., Sahakian, B. J., Lawrence, A. D., McInnes, L., & Rabbitt, P. M. (1998). A study of performance on tests from the CANTAB battery sensitive to frontal lobe dysfunction in a large sample of normal volunteers: Implications for theories of executive functioning and cognitive aging. *Journal of the International Neuropsychological Society*, *4*(05), 474–490. https://doi.org/10.1017/S1355617798455073

Roiser, J. P., & Sahakian, B. J. (2013). Hot and cold cognition in depression. *CNS Spectrums*, *18*(3), 139–149. https://doi.org/10.1017/S1092852913000072

Rosell, D. R., Futterman, S. E., McMaster, A., & Siever, L. J. (2014). Schizotypal personality disorder: A current review. *Current Psychiatry Reports*, *16*(7), 452. https://doi.org/10.1007/s11920-014-0452-1

Roussos, P., Bitsios, P., Giakoumaki, S. G., McClure, M. M., Hazlett, E. A., New, A. S., & Siever, L. J. (2013). CACNA1C as a risk factor for schizotypal personality disorder and schizotypy in healthy individuals. *Psychiatry Research*, *206*(1), 122–123. https://doi.org/10.1016/j.psychres.2012.08.039

Salehinejad, M. A., Ghanavati, E., Ar Rashid, H., & Nitsche, M. A. (2021). Hot and cold executive functions in the brain: A prefrontal-cingular network. *Brain and Neuroscience Advances*, *5*, 23982128211007769. https://doi.org/10.1177/23982128211007769

Salovey, P., & Mayer, J. (1990). Emotional intelligence. *Imagination, Cognition and Personality*, *9*, 185–211. https://doi.org/10.2190/DUGG-P24E-52WK-6CD

Shin, Y. S., Kim, S. N., Shin, N. Y., Jung, W. H., Hur, J-W., Byun, M. S., Jang, J. H., An, S. K., Kwon, J. S., & Zhang, X. Y. (2013). Increased intra-individual variability of cognitive processing in subjects at risk mental state and schizophrenia patients. *PLoS One*, *8*(11), e78354. https://doi.org/10.1371/journal.pone.0078354

Siddi, S., Petretto, D. R., & Preti, A. (2017). Neuropsychological correlates of schizotypy: A systematic review and meta-analysis of cross-sectional studies. *Cognitive Neuropsychiatry*, *22*(3), 186–212. https://doi.org/10.1080/13546805.2017.1299702

Simonet, D. V., Miller, K. E., Askew, K. L., Sumner, K. E., Mortillaro, M., & Schlegel, K. (2021). How multidimensional is emotional intelligence? Bifactor modeling of global and broad emotional abilities of the Geneva

Emotional Competence Test. *Journal of Intelligence*, *9*(1), 14. https://doi.org/10.3390/jintelligence9010014

Smyrnis, N., Avramopoulos, D., Evdokimidis, I., Stefanis, C. N., Tsekou, H., & Stefanis, N. C. (2007). Effect of schizotypy on cognitive performance and its tuning by COMT val158 met genotype variations in a large population of young men. *Biological Psychiatry*, *61*(7), 845–853. https://doi.org/10.1016/j.biopsych.2006.07.019

Stefanis, N. C., Smyrnis, N., Avramopoulos, D., Evdokimidis, I., Ntzoufras, I., & Stefanis, C. N. (2004). Factorial composition of self-rated schizotypal traits among young males undergoing military training. *Schizophrenia Bulletin*, *30*(2), 335–350. https://doi.org/10.1093/oxfordjournals.schbul.a007083

Steffens, M., Meyhöfer, I., Fassbender, K., Ettinger, U., & Kambeitz, J. (2018). Association of schizotypy with dimensions of cognitive control: A meta-analysis. *Schizophrenia Bulletin*, *44*, S512–S524. https://doi.org/10.1093/schbul/sby030

Sutcliffe, G., Harneit, A., Tost, H., & Meyer-Lindenberg, A. (2016). Neuroimaging intermediate phenotypes of executive control dysfunction in schizophrenia. *Biological Psychiatry. Cognitive Neuroscience and Neuroimaging*, *1*(3), 218–229. https://doi.org/10.1016/j.bpsc.2016.03.002

Szöke, A., Méary, A., Ferchiou, A., Trandafir, A., Leboyer, M., & Schürhoff, F. (2009). Correlations between cognitive performances and psychotic or schizotypal dimensions. *European Psychiatry*, *24*(4), 244–250. https://doi.org/10.1016/j.eurpsy.2008.10.007

Tabak, N. T., & Weisman de Mamani, A. G. (2013). Latent profile analysis of healthy schizotypy within the extended psychosis phenotype. *Psychiatry Research*, *210*(3), 1008–1013. https://doi.org/10.1016/j.psychres.2013.08.006

Theleritis, C., Vitoratou, S., Smyrnis, N., Evdokimidis, I., Constantinidis, T., & Stefanis, N. C. (2012). Neurological soft signs and psychometrically identified schizotypy in a sample of young conscripts. *Psychiatry Research*, *198*(2), 241–247. https://doi.org/10.1016/j.psychres.2012.03.007

Thomas, E. H. X., Rossell, S. L., Tan, E. J., Neill, E., Van Rheenen, T. E., Carruthers, S. P., Sumner, P. J., Louise, S., Bozaoglu, K., & Gurvich, C. (2019). Do schizotypy dimensions reflect the symptoms of schizophrenia? *Australian and New Zealand Journal of Psychiatry*, *53*(3), 236–247. https://doi.org/10.1177/0004867418769746

Todd, R. M., Miskovic, V., Chikazoe, J., & Anderson, A. K. (2020). Emotional objectivity: Neural representations of emotions and their interaction with cognition. *Annual Review of Psychology*, *71*(1), 25–48. https://doi.org/10.1146/annurev-psych-010419-051044

Tonini, E., Quidé, Y., Kaur, M., Whitford, T. J., & Green, M. J. (2021). Structural and functional neural correlates of schizotypy: A systematic review. *Psychological Bulletin*, *147*(8), 828–866. https://doi.org/10.1037/bul0000260

Tsang, J., Fullard, J. F., Giakoumaki, S. G., Katsel, P., Katsel, P., Karagiorga, V. E., Greenwood, T. A., Braff, D. L., Siever, L. J., Bitsios, P., Haroutunian, V., & Roussos, P. (2015). The relationship between dopamine receptor D1 and cognitive performance. *NPJ Schizophrenia*, *1*(1), 14002. https://doi.org/10.1038/npjschz.2014.2

Tsaousis, I. (2008). Measuring trait emotional intelligence: Development and psychometric properties of the Greek Emotional Intelligence Scale (GEIS). *Psychology*, *15*(2), 200–218. https://doi.org/10.12681/psy_hps.23835

Tsaousis, I., Zouraraki, C., Karamaouna, P., Karagiannopoulou, L., & Giakoumaki, S. G. (2015). The validity of the Schizotypal Personality Questionnaire in a Greek sample: Tests of measurement invariance and latent mean differences. *Comprehensive Psychiatry*, *62*, 51–62. https://doi.org/10.1016/j.comppsych.2015.06.003

van der Weiden, A., Prikken, M., & van Haren, N. E. M. (2015). Self-other integration and distinction in schizophrenia: A theoretical analysis and a review of the evidence. *Neuroscience and Biobehavioral Reviews*, *57*, 220–237. https://doi.org/10.1016/j.neubiorev.2015.09.004

Vargas, T., Lam, P. H., Azis, M., Osborne, K. J., Lieberman, A., & Mittal, V. A. (2019). Childhood trauma and neurocognition in adults with psychotic disorders: A systematic review and meta-analysis. *Schizophrenia Bulletin*, *45*(6), 1195–1208. https://doi.org/10.1093/schbul/sby150

Vedel Kessing, L., & Miskowiak, K. (2018). Does cognitive dysfunction in bipolar disorder qualify as a diagnostic intermediate phenotype? A perspective paper. *Frontiers in Psychiatry*, *9*, 490. https://doi.org/10.3389/fpsyt.2018.00490

Walter, E. E., Fernandez, F., Snelling, M., & Barkus, E. (2016). Genetic consideration of schizotypal traits: A review. *Frontiers in Psychology*, *7*, 1769. https://doi.org/10.3389/fpsyg.2016.01769

Wan, L., Thomas, Z., Pisipati, S., Jarvis, S. P., & Boutros, N. N. (2017). Inhibitory deficits in prepulse inhibition, sensory gating, and antisaccade eye movement in schizotypy. *International Journal of Psychophysiology*, *114*, 47–54. https://doi.org/10.1016/j.ijpsycho.2017.02.003

Wang, Y., Liu, W.-H., Li, Z., Wei, X.-H., Jiang, X.-Q., Neumann, D. L., Shum, D. H. K., Cheung, E. F. C., & Chan, R. C. (2015). Dimensional schizotypy and social cognition: An fMRI imaging study. *Frontiers in Behavioral Neuroscience*, *9*, 133. https://doi.org/10.3389/fnbeh.2015.00133

Wang, Y.-M., Yang, Z.-Y., Wang, Y., Wang, Y.-Y., Cai, X.-L., Zhang, R.-T., Hu, H.-X., Cheung, E. F. C., & Chan, R. C. K. (2020). Grey matter volume and structural covariance associated with schizotypy. *Schizophrenia Research*, *224*, 88–94. https://doi.org/10.1016/j.schres.2020.09.021

Wastler, H. M., & Lenzenweger, M. F. (2021). Cognitive and affective theory of mind in positive schizotypy: Relationship to schizotypal traits and psychosocial functioning. *Journal of Personality Disorders*, *35*(4), 538–553. https://doi.org/10.1521/pedi_2020_34_473

Wiebels, K., Waldie, K. E., Roberts, R. P., & Park, H. R. (2016). Identifying grey matter changes in schizotypy using partial least squares correlation. *Cortex*, *81*, 137–150. https://doi.org/10.1016/j.cortex.2016.04.011

Woodward, T. S., Ruff, C. C., Thornton, A. E., Moritz, S., & Liddle, P. F. (2003). Methodological considerations regarding the association of Stroop and verbal fluency performance with the symptoms of schizophrenia. *Schizophrenia Research*, *61*(2-3), 207–214. https://doi.org/10.1016/s0920-9964(02)00211-6

Xi, C., Cai, Y., Peng, S., Lian, J., & Tu, D. (2020). A diagnostic classification version of Schizotypal Personality Questionnaire using diagnostic classification models. *International Journal of Methods in Psychiatric Research*, *29*(1), e1807. https://doi.org/10.1002/mpr.1807

Zouraraki, C., Karamaouna, P., & Giakoumaki, S. G. (2023). Facial emotion recognition and schizotypal traits: A systematic review of behavioural studies. *Early Intervention in Psychiatry*, *17*(2), 121–140. https://doi.org/10.1111/eip.13328

Zouraraki, C., Karamaouna, P., Karagiannopoulou, L., & Giakoumaki, S. G. (2017). Schizotypy-independent and schizotypy-modulated cognitive impairments in unaffected first-degree relatives of schizophrenia-spectrum patients. *Archives of Clinical Neuropsychology*, *32*(8), 1010–1025. https://doi.org/10.1093/arclin/acx029

Zouraraki, C., Kyriklaki, A., Economou, E., & Giakoumaki, S. G. (2023). The moderating role of early traumatic experiences on the association of schizotypal traits with visual perception. *Scandinavian Journal of Psychology*, *64*(1), 10–20. https://doi.org/10.1111/sjop.12859

Zouraraki, C., Tsaousis, I., Karamaouna, P., Karagiannopoulou, L., Roussos, P., Bitsios, P., & Giakoumaki, S. G. (2016). Associations of differential schizotypal dimensions with executive working memory: A moderated-mediation analysis. *Comprehensive Psychiatry*, *71*, 39–48. https://doi.org/10.1016/j.comppsych.2016.08.010