People with High Schizotypy Experience More Illusions in the Pattern Glare Test: Consistent with the Hyperexcitability Hypothesis

Wendy Torrens[1], Jenna Pablo[1], Jorja Shires[1], Sarah Haigh[1], and Marian Berryhill[1]

[1]University of Nevada Reno

November 11, 2022

Abstract

Individuals diagnosed with schizophrenia spectrum disorders (SSD) exhibit a constellation of sensory and perceptual impairments, including hyporeactivity to external input. However, individuals with SSD also report subjective experiences of sensory flooding, suggesting sensory hyperexcitability. To identify the extent to which behavioral indices of hyperexcitability are related to non-psychotic symptoms of schizophrenia, we tested a non-clinical population measured for schizophrenia-like traits (schizotypy), and a behavioral measure of sensory hyperexcitability, specifically the number of illusions seen in the Pattern Glare Test. Two samples totaling 913 individuals completed an online version of the Schizotypal Personality Questionnaire – Brief Revised (SPQ-BR) and the Pattern Glare Test. Individuals with higher schizotypy traits reported more illusions in the Pattern Glare Test. Additionally, one of the three SPQ-BR factors, the disorganized factor, significantly predicted the number of illusions reported. These data illustrate the potential for research in non-clinical samples to inform clinically relevant research.

Introduction

Schizophrenia spectrum disorders (SSDs) are characterized by abnormal sensory and perceptual processing. An enduring question is the puzzling dichotomy between schizophrenia patients' subjective sensory experiences which contrast with neurobiological and behavioral measures of sensory responses. Individuals with SSD tend to exhibit *hyporeactivebehavioral responses such as higher, less sensitive, thresholds in auditory and visual discrimination tasks (Ramsay et al., 2020; Todd et al., 2003).* Indeed, hyporeactivity to sensory input is a distinguishing trait of schizophrenia and a putative biomarker of disease progression (Javitt et al., 2018; Koshiyama et al., 2020). However, the subjective experience of SSD individuals is not captured by the hyporeactive response account. Instead, people with schizophrenia and SSD report sensory overload, or sensory flooding, consistent with sensory *hyperexcitability* (Bunney et al., 1999; Micoulaud-Franchi et al., 2012). These conflicting observations describe a mismatch between objective and subjective *behavioral* responses to sensory stimuli in individuals with SSD.

Hyperexcitability and Sensory Flooding

A sizable literature characterizes *hyperexcitability* in people with SSD amid subjective reports of *sensory flooding* (McGhie & Chapman, 1961). Sensory flooding refers to hyper-awareness of ambient sounds, impaired selective attention, enhanced visual illusions (e.g., heightened colors), and detecting meaning within meaningless stimuli (Bunney et al., 1999; McGhie & Chapman, 1961; Micoulaud-Franchi et al., 2012). *One of the potential causes of sensory flooding* is abnormal sensory gating - differential modulation of neural responses to relevant or irrelevant stimuli. Deficits in *inhibitory* sensory gating manifest as sensory flooding (Freedman et al., 2020; Hetrick et al., 2012; Patterson et al., 2008; Potter et al., 2006). Sensory gating impairments in schizophrenia are observed *in abnormal P50 gating responses (Atagun et al., 2020; Javitt &*

Freedman, 2015; Patterson et al., 2008), occur across SSD *(e.g., schizotypal individuals with genetic predisposition for schizophrenia, newborns of schizophrenic parents and ultra-high risk adolescents),* and increase with disease progression (Brockhaus-Dumke et al., 2008; Luo et al., 2019). However, the sensory gating deficits observed in schizotypal personality disorder (Cadenhead et al., 2000; Hazlett et al., 2015; *Javitt & Freedman, 2015*) and high schizotypy (Croft et al., 2001; Park et al., 2015; Wang et al., 2004) are smaller in magnitude compared to the deficits observed in schizophrenia. Abnormal sensory processing, consistent with*hyperexcitability* is evident across the schizophrenia spectrum.

Current Study

A simple *behavioral* tool to identify sensory*hyperexcitability* is the Pattern Glare Test (PGT; Wilkins & Evans, 2001). Participants report visual illusions *and sensations*detected in static spatial gratings. Typical reports include illusory colors, stripes bending, moving, disappearing, blurring, and*sensations of visual discomfort, such as pain and nausea* (Evans & Stevenson, 2008; Wilkins et al., 1984). *Higher numbers of illusions are reported when viewing the mid-range spatial frequency grating pattern, compared to the lower or high spatial frequency pattern, due to our visual systems being maximally sensitive between 1-5cpd (Campbell & Robson, 1968). Mid-range spatial frequencies tend to evoke a large metabolic response in the visual cortex that is even larger in those who are visually sensitive (Coutts et al., 2012; Huang et al., 2003). Certain clinical conditions such as those with migraine, stroke, autism, or synesthesia report higher numbers of illusions in the PGT and are all associated with a hyper-excitable cortex (Beasley & Davies, 2012; Fong et al., 2019, 2020; Harle et al., 2006; Ward et al., 2017). As a result, the illusions (i.e., visual perceptual distortions and sensations) induced by the PGT are thought to be due to excess cortical excitation in early visual cortex that spreads to neighboring parts of the cortex, creating the perception of illusions (Bargary et al., 2015; Evans & Stevenson, 2008). The relationship between the PGT and cortical hyperexcitability is so strong that the PGT is now being used to identify cortical hyperexcitability in other conditions such as major depressive disorder (Qi et al., 2019) and out-of-body experiences (Braithwaite et al., 2013). These illusions are not to be confused with visual hallucinations that manifest in the absence of external stimuli (Spencer & McCarley, 2005; Teeple et al., 2009).*

Here, we used the PGT to test for *behavioral evidence of*hyperexcitability as a function of schizotypy symptomatology in the*non-clinical* population. *Schizotypy refers to individuals in the general population that vary in schizotypal traits* (Broyd et al., 2016; González-Rodríguez et al., 2021; Kwapil & Barrantes-Vidal, 2015). The *non-clinical* population is appealing because it avoids concerns related to the effects of antipsychotic medications (see Ettinger et al., 2015 for review; Kelemen et al., 2013), high schizotypy individuals have similar sensory profiles to SSD (Broyd et al., 2016; Moussa-Tooks et al., 2021; Myles et al., 2017; Nelson et al., 2013), and they are accessible.

Hyperexcitability predicts that individuals with higher schizotypy scores should report more illusions. If so, we can then examine whether*the number of reported illusions* loads on one or more factors of schizotypy symptomatology (e.g., cognitive perceptual, interpersonal, disorganization). Alternatively, hypo*re* activity would be associated with reduced reports of illusions as a function of higher symptomatology. The value of clearer understanding of the pattern of behavior is to *uncover links* between *anomalous sensory experiences* and *potential* neural mechanisms in the pursuit of meaningful biomarkers in the SSD population.

Methods

Participants

The study was conducted in two samples. The first sample included 436 undergraduates (304 females, M = 19.37 (range: 18-45) years of age) recruited from undergraduate psychology courses who received course bonus credit. The replication sample included 477 undergraduates (314 females, $M = 20.07$ (range: 18-56) years of age). *Both samples were comprised of non-clinical individuals varying in schizotypal traits.* Participation criteria included: (1) normal hearing; (2) normal or corrected-to-normal vision; (3) no history of epilepsy; and (4) no history of major neurological or psychiatric illness (e.g., traumatic brain injury, multiple sclerosis, autism, bipolar disorder). *Information regarding participants' medication intake was not collected. However,* *data were excluded if participants indicated that they had a neurological disease or psychiatric problem. Thus, we can infer that participants included in both samples were not under the effects of antipsychotic medication.* Protocols were approved by the University of Nevada, Reno's Institutional Review Board *(#1395718)* . Participants completed an online survey (Qualtrics) including demographic questions, the SPQ-BR (Cohen et al., 2010), and the PGT (Wilkins et al., 1984).

Schizotypal Personality Questionnaire – Brief Revised (SPQ-BR)

The SPQ-BR (Cohen et al., 2010) is a 32-item self-report assessment requiring responses on a five-point Likert scale (0 "strongly disagree" to 4 "strongly agree"). The SPQ-BR consists of three factors: Interpersonal [IP], Cognitive-Perceptual [CP], and Disorganized [DIS]. SPQ-BR scores range from 0 - 128 with higher scores indicating greater schizotypy trait severity.

Pattern Glare Test

Participants viewed one of the grating patterns from the PGT (Wilkins et al., 1984). Because the online format precluded monitor calibration and validations of cycles per degree were not possible. Because it is high contrast and robust to various screen settings, *we presented a medium spatial frequency image (horizontal square-wave grating at a Michelson contrast of ˜0.7) for 5 seconds, based on Pattern 2 of Wilkins and Evans (2001) PGT* ; see Figure 1. Participants were asked to fixate on the central fixation point embedded in the image. They were asked to endorse percepts via mouse click from the following options: pain/discomfort, shadowy shapes amongst the lines, shimmering of the lines, flickering, colors, blur, bending of the lines, nausea/dizziness, unease, other, and none of the following. Participants could select as many options as they wished.

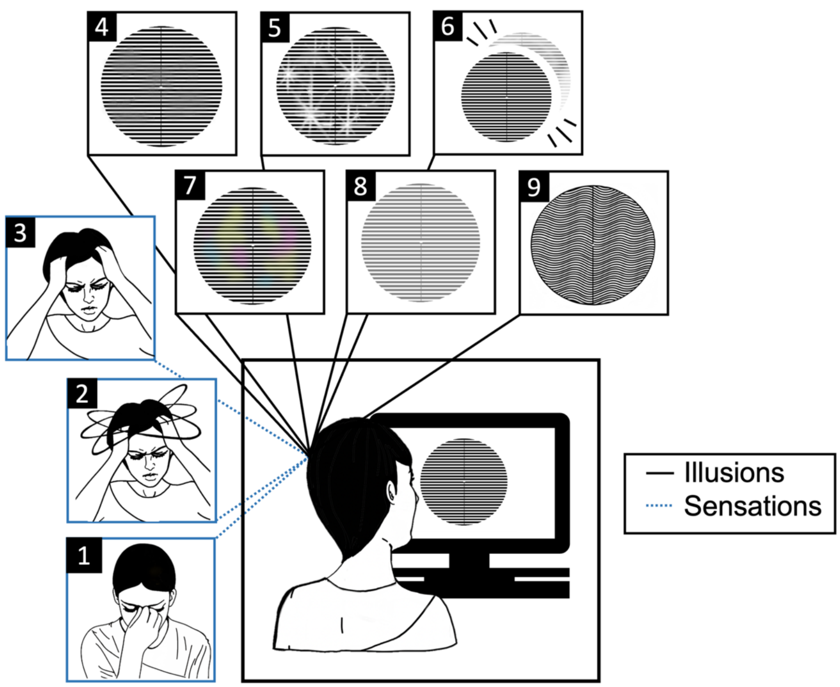


Figure 1. *Illusions and sensations experienced from viewing the Pattern Glare Test (5 sec.): pain/discomfort (1), nausea/dizziness (2), unease (3), shadowy shapes amongst the lines (4), shimmering of the lines (5), flickering (6), Colors (7), blur (8), and bending of the lines (9).*

Data Analysis

SPQ-BR total scores were calculated by summing across all 32-items (see Figure 2a), following standard instructions. The interpersonal, cognitive-perceptual, and disorganized factors were calculated following convention from various subfactors (Cohen et al., 2010; see Figure 2c). The interpersonal factor (range 0-40) was the sum of no close friends (CF), constricted affect (CA), and social anxiety (SA) subfactor items (CF1, CF2, CF3, CA4, CA5, CA6, SA1, SA2, SA3, SA4). The cognitive-perceptual factor (range 0-56) was the sum of the ideas of reference (IR), suspiciousness (S), magical thinking (MT), and unusual perceptions (UP) subfactor items (S1, S2, S3, IR4, IR5, IR6, MT1, MT2, MT3, MT4, UP1, UP2, UP3, UP4). Lastly, the disorganized factor (range 0-32) was the sum of the eccentric behavior (EB) and odd speech (OS) subfactor items (EB1, EB2, EB3, EB4, OS1, OS2, OS3, OS4). *We also assessed the relationship between number of illusions seen in the Pattern Glare Test and the seven subfactors of schizotypy: no close friends/constricted affect, social anxiety, ideas of reference/suspiciousness, magical thinking, unusual perceptions, eccentric behavior, and odd speech (Cohen et al., 2010). See the supplementary materials for the results of this analysis.*

Pattern Glare score was the total number of illusory responses reported by the participant (see Figure 2b). *The "other" response option counted as 1 illusion.* The "none of the following" response option counted as 0 illusions.

To test for a relationship between schizotypal traits (SPQ-BR total score) and the number of reported illusions in the PGT (Pattern Glare score), data were first analyzed using the non-parametric Spearman's rank correlation. The Spearman's correlation corrected for a positive skewed distribution in the Pattern Glare score. Correlations were conducted for each sample.

We conducted negative binomial regressions for each sample to understand which subfactor of the SPQ-BR (interpersonal, cognitive-perceptual, and disorganized) best predicted the Pattern Glare score. Negative binomial regressions were used to adjust for overdispersion in Poisson regressions and to accommodate the skewed distribution of the outcome variable (number of reported illusions in the Pattern Glare). All assumptions were met when conducting regressions. Additionally, there were no influential outliers as assessed by the Cook's distance values being less than one (all $D_i < .04$).

All tests were corrected for multiple comparisons with a Bonferroni adjusted alpha level of .02. Statistical analyses were carried out using Statistical Package for the Social Sciences (SPSS Version 27).

Finally, we conducted an analysis of whether the types of illusions seen in the PGT were related to SPQ scores. Reporting 'bending of the lines' was the only type of illusion that was significantly related to SPQ (see supplementary materials for details).

The data that support the findings of this study are available at the Open Science Foundation (https://osf.io/kzwrd/).

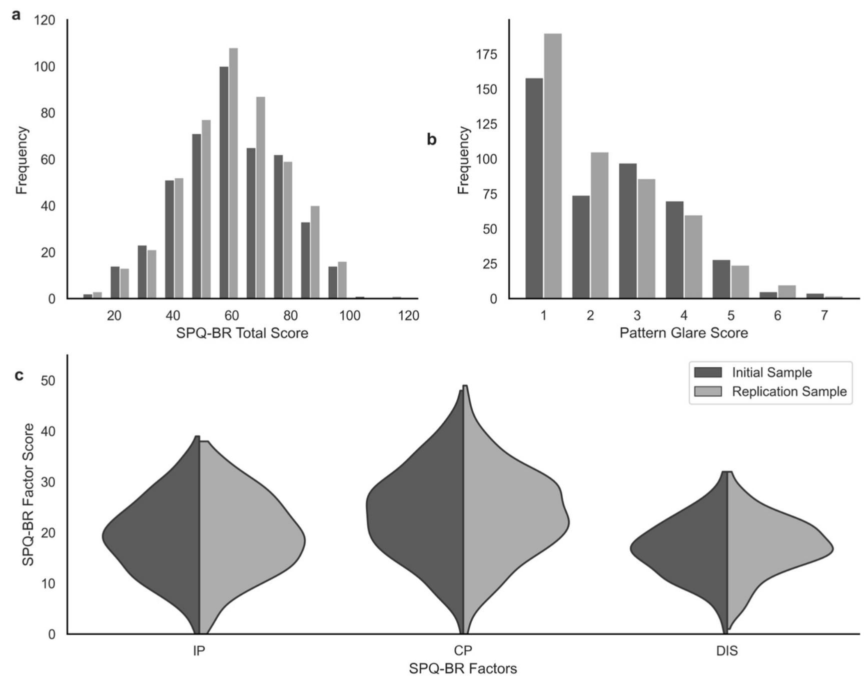


Figure 2. *Consistent distributions of SPQ-BR scores and Pattern Glare scores across samples. (a) Frequency histogram of SPQ-BR total score for the initial sample (dark gray) and replication sample (light gray). (b) Frequency histogram of Pattern Glare scores for both samples. (c) Violin plots demonstrating the distribution of the three SPQ-BR factor scores (interpersonal [IP], cognitive-perceptual [CP], and disorganized [DIS]).*

Results

Initial Sample

There was a positive correlation between SPQ-BR total scores and Pattern Glare scores (Spearman's: $r_s(434) = .25$, $p < .001$*); see Figure 3. The results indicate that individuals with more schizotypy traits experience a greater number of illusions in the PGT.*

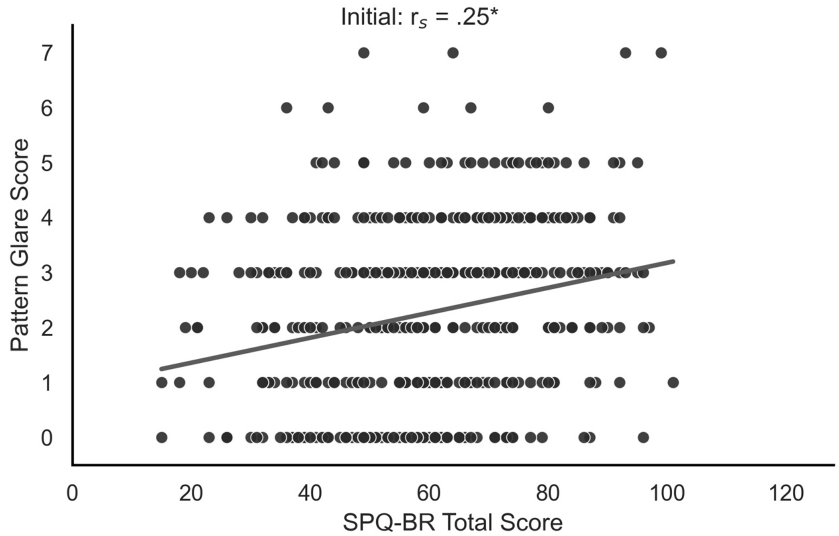


Figure 3. *High schizotypy traits relate to a greater number of illusions. In the initial sample, the SPQ-BR total score positively correlates with the Pattern Glare score. *p < .001*

Α νεγατιε βινομιαλ ρεγρεσσιον τεστεδ ωηιςη οφ τηε τηρεε ΣΠΧ-ΒΡ συβφαςτορς (ιντερπερσοναλ, ςογνιτιε-περςεπτυαλ, δισοργανιζεδ) βεστ πρεδιςτεδ τηε Παττερν Γλαρε σςορε. Τηε οεραλλ μοδελ ωας σιγνιφιςαντ, χ2(3) = 33.84, π <.001· σεε Ταβλε 1. Τηε δισοργανιζατιον φαςτορ ποσιτιελψ πρεδιςτεδ τηε νυμβερ οφ ιλλυσιονς ρεπορτεδ (β = .03, χ2 = 19.17, π < .001), ωηερεας τηε ιντερπερσοναλ (π = .20) ανδ ςογνιτιε–περςεπτυαλ (π = .91) φαςτορς ωερε νοτ σιγνιφιςαντ ςοντριβυτορς· σεε Φιγυρε 4. Τηε ινςιδενςε ρατε ρατιο συγγεστς τηατ φορ εερψ ονε υνιτ ινςρεασε ον τηε δισοργανιζεδ φαςτορ, τηερε ις α πρεδιςτεδ 3.2% ινςρεασε ιν Παττερν Γλαρε σςορε. Ιν σιμπλερ τερμς, τηοσε ωιτη ηιγηερ δισοργανιζατιον φαςτορ σςορες ρεπορτ α γρεατερ νυμβερ οφ ιλλυσιονς.

Table 1

Negative Binomial Regression of SPQ-BR Factors and Pattern Glare score for the Initial Sample

Parameter
(Intercept)
IP
CP
DIS

Note. Exp(B) = exponentiated values of B or incidence rate ratio; CI = confidence intervals of Exp(B); IP = interpersonal;

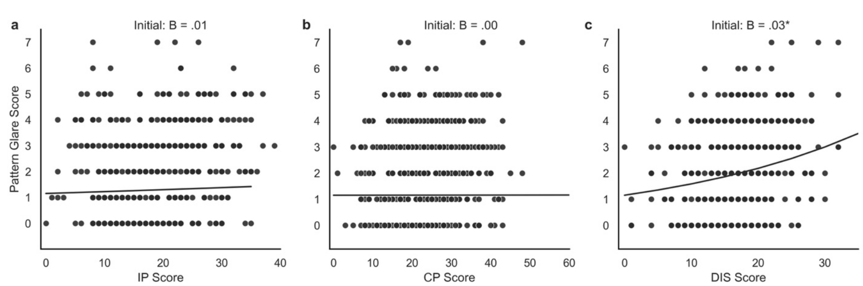


Figure 4. *Disorganization factor best predicts the Pattern Glare score. Negative binomial regression results of (a) interpersonal factor (IP) score. (b) cognitive-perceptual (CP) factor score, and (c) disorganized (DIS) factor score, and the Pattern Glare score for the initial sample. In all graphs, the x-axis was limited to possible scores. *p <.001*

Replication Sample

We repeated the same analyses for the replication sample and observed the same general results. Again, there was a positive correlation between SPQ-BR score and Pattern Glare score (Spearman's $r_s(475) = .25$, $p <$ .001); *σεε Φιγυρε 5. Τηε νεγατιε βινομιαλ ρεγρεσσιον μοδελ φορ τηε ρεπλιςατιον σαμπλε ωας σιγνιφιςαντ, χ2(3) = 28.54, π <.001· σεε Ταβλε 2. Ονςε αγαιν, τηε δισοργανιζατιον φαςτορ ποσιτιελψ πρεδιςτεδ Παττερν Γλαρε σςορε (β = .02, χ2 = 6.96, π < .01) ανδ ςογνιτιε-περςεπτυαλ (π = .10) ωας νοτ α σιγνιφιςαντ ςοντριβυτορ. Τηε ονε διφφερενςε φρομ τηε ινιτιαλ σαμπλε ωας τηατ τηε ιντερπερσοναλ φαςτορ νοω ονλψ αππροαςηεδ σιγνιφιςανςε (π = .04)· σεε Φιγυρε 6. Τηε ινςιδενςε ρατε ρατιο ωας σλιγητλψ λοωερ ιν τηε ρεπλιςατιον σαμπλε ωιτη τηε δισοργανιζεδ φαςτορ πρεδιςτινγ α 2% ινςρεασε ιν τηε Παττερν Γλαρε σςορε. Ηοωεερ, τηε οεραλλ φινδινγ ρεμαινς ςονσιστεντ ιν ωηιςη ινδιιδυαλς ωιτη μορε δισοργανιζατιον τραιτς εξπεριενςε α γρεατερ νυμβερ οφ ιλλυσιονς ιν τηε ΠΓΤ.*

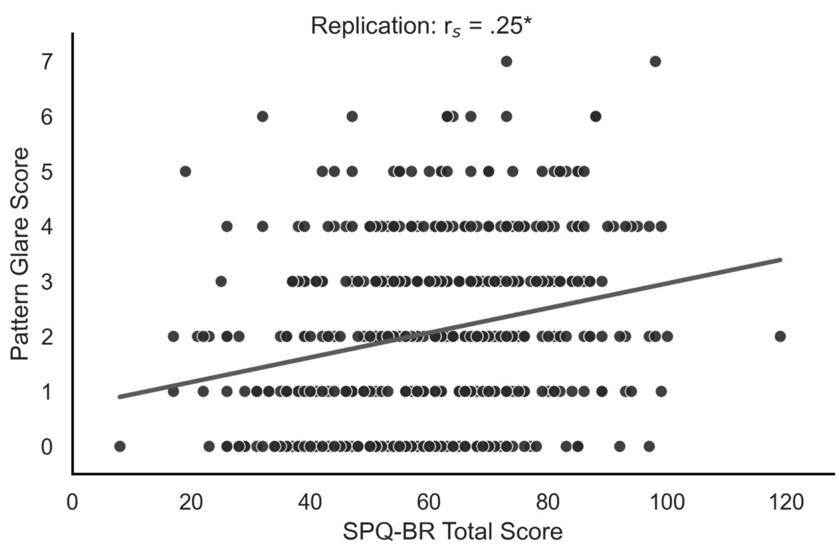


Figure 5. *Replication sample findings showed that high schizotypy is related to a greater Pattern Glare score, similar to the initial sample. *p < .001*

Table 2

Negative Binomial Regression of SPQ-BR Factors and Pattern Glare score for the Replication Sample

Parameter
(Intercept)
IP
CP
DIS

Note. Exp(B) = exponentiated values of B or incidence rate ratio; CI = confidence intervals of Exp(B); IP = interpersonal;

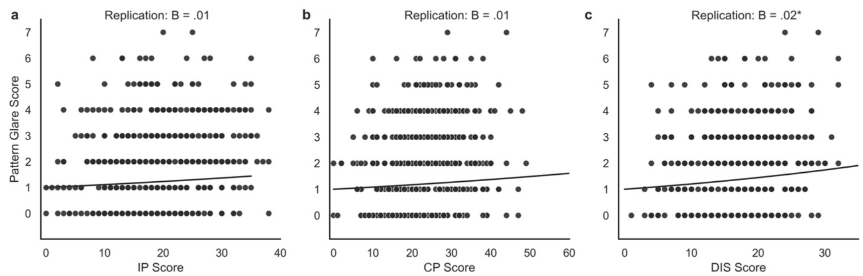


Figure 6. *Regression results for the replication sample. Again, the disorganization factor best predicts Pattern Glare score. Regression results of (a) interpersonal (IP) factor score. (b) cognitive-perceptual (CP) factor score, and (c) disorganized (DIS) factor score, and Pattern Glare score. In all graphs, the x-axis was limited to possible scores. *p <.01*

Discussion

A discrepancy exists between the objective and subjective responses to sensory stimuli in people with SSD: measures of sensory processing indicate *hyporeactivity* whereas their subjective reports of sensory flooding are consistent with *hyperexcitability* . Access to SSD populations can be challenging. We approached this issue by testing*non-clinical* individuals with varying degrees of schizotypy traits to test whether those with high schizotypy exhibited patterns of behavior consistent with *hyperexcitability* (higher reports of perceived visual illusions) or *hyporeactivity* (fewer reported illusions) in an online presentation of the PGT. Data from two samples, totaling 913 participants, found that individuals with higher schizotypy traits reported *more* illusions than those with fewer traits.*The disorganization factor robustly predicted Pattern Glare scores, whereas the interpersonal and cognitive-perceptual factors did not.* The findings are consistent with a*hyperexcitability* account.

Our findings suggest that the *non-clinical* population experiencing abnormal disorganized thinking is associated with a greater Pattern Glare score. Consistent with our findings, former research has found a link between disorganized schizotypy and attentional deficits (Chen et al., 1997; Cicero & Kerns, 2010; Kemp et al., 2021), which has been described as a symptom of perceptual abnormalities and sensory flooding (Bunney et al., 1999; McGhie & Chapman, 1961). Disorganized schizotypy has been associated with greater affective deficits, affective ambivalence, and impairments in communication (Cicero & Kerns, 2010; Kemp et al., 2018; Kerns, 2006; Kerns & Becker, 2008).

Implications: ***Neural Mechanisms of*** Hyporeactivity versus Hyperexcitability ***in SSD***

Our goal was to gain insight regarding conflicting characterizations of sensory percepts in SSD. On one hand, there is the subjective experience of *sensory flooding* (McGhie & Chapman, 1961) and the increased incidence of visual illusions reported here, both of which are associated with hyperexcitable *sensory processing* , and competing findings identifying hyporeactive responses. Importantly, the hyporeactivity/hyperexcitability conversation is not a straw-man argument. There is strong evidence associating hyporeactivity with SSD and disease progression (Javitt et al., 2018; Koshiyama et al., 2020). Hyporeactive *neural* responses in SSD are cataloged across a variety of measures, including preconscious deviance detection (mismatch negativity: MMN) in visual (Farkas et al., 2015; Urban et al., 2008) and auditory domains (Erickson et al., 2016; Haigh et al., 2016a; Joshi et al., 2018; Koshiyama et al., 2020; Umbricht & Krljes, 2005), and reduced N1 responses to visual (Antonova et al., 2021; Hoptman et al., 2018; Neuhaus et al., 2011) and auditory stimuli (Force et al., 2008; Mathalon et al., 2019; Osokina & Ivnyev, 2018; Perez et al., 2012). Hyporeactive BOLD responses in fMRI designs are observed in early visual, auditory, and somatosensory cortices (Gaebler et al., 2015; Haenschel et al., 2007; Haigh et al., 2016b; Hoptman et al., 2010; Martínez et al., 2018). Hyporeactivity is observed for complex sensory processing, including early face processing (Earls et al., 2016; Herrmann et al., 2004), behavioral face processing (Walther et al., 2009) and self-viewing (Zhou et al., 2020). In those with *high* *schizotypy* similar, weaker patterns appear (Broyd et al., 2016; Donaldson et al., 2021). Reduced amplitudes in the auditory MMN (Broyd et al., 2016), auditory and visual N1 (Favrod et al., 2017; Oestreich et al., 2015, 2016), are reported. Across SSD, including high schizotypy, a range of findings point to *hyporeactive* neural responses to sensory stimuli.

On the other hand, there is strong evidence for*hyperexcitability* . In the SSD population, there are reports of sensory flooding (Bunney et al., 1999; McGhie & Chapman, 1961) that are thought to reflect deficits in sensory gating (Freedman et al., 2020; Hetrick et al., 2012; Patterson et al., 2008; Potter et al., 2006) which have been observed in SSD (Brockhaus-Dumke et al., 2008; Cadenhead et al., 2000; Hazlett et al., 2015), including high schizotypy (Croft et al., 2001; Park et al., 2015; Wang et al., 2004), which include the current findings. The PGT is valuable as a behavioral measure of hyperexcitability.

It is important to note that neurological data would be required to make statements of hyperexcitability and how they relate to illusions seen in the PGT in high schizotypy. Although more research is needed, the current findings support that a feasible way to get a handle on SSD is to examine the neurotypical population who naturally vary on symptomatology. It may be the case that both *hyperexcitability and hyporeactivity* may be at play contributing to the impairments documented in SSD. Because of the challenge of accessing schizophrenia populations, the *non-clinical* population will continue to provide meaningful insight to clarify this question.

Limitations

Although a strength of the study is the large sample, we relied on an online format. This left uncontrolled a host of viewing parameters (e.g., image resolution, lighting, person-to-screen distances, screen dimensions) we would prefer to control. These sources of noise are likely equivalent across participants, and we see significant effects. The added noise may weaken effects compared to in person testing. This is worth revisiting with in person testing going forward. Online data collection prevented us from linking visual illusion findings in SSD with neural mechanisms (e.g., Thakkar et al., 2019). The number of illusions seen in the PGT has been associated with cortical hyperexcitability in *visual* cortex (Braithwaite et al., 2015; Fong et al., 2020), though we did not measure this in the current study, and cannot confirm this in our samples. *It is possible that cortical hyperexcitability/hyporeactivity fluctuates across the cortex.*To capture the underlying mechanism accounting for the relationship between high schizotypy and illusory percepts we are now collecting neural responses during task performance. The absence of neural measures leaves open an alternative hypothesis that there is a signal detection difference that shifts response criterion in those with higher schizotypy scores. In other words, those with high schizotypy might be*more* inclined to report that an illusion was perceived than those with lower scores (Sahakyan & Kwapil, 2019), and thus we could be capturing a response bias rather than a difference in perceptual experiences.

Another limitation worth noting is how the "other" response option was accounted for in the PGT. A small portion (< 1.5%) of participants selected the malfunctioning survey option "other," which did not allow them to describe their experience. These responses were counted as one illusion experienced. Since there were so few of the "other" responses, we believe this limitation is not influencing the results from our rather large sample (913 participants in total).

Lastly, we tested a *non-clinical* undergraduate population. This may explain why the cognitive-perceptual factor did not predict illusory percepts. Specifically, this factor assesses unusual patterns of thought (ideas of reference/suspiciousness, magical thinking, unusual perceptions) associated with paranormal belief (Betsch et al., 2020) and identifying meaning in meaningless stimuli (Riekki et al., 2013; Simmonds-Moore, 2014). This pattern of thinking would hamper performance in the university setting and it may bias our sample away from patterns that could exist in the broader population.

Conclusion

Individuals with more schizotypal traits experience a greater number of illusions when presented with the PGT compared to individuals scoring lower on the SPQ-BR. Interestingly, experiencing illusions is predicted by higher scores on the *disorganization factor* of the SPQ-BR,

which was consistent across two large data sets. Our results suggest the presence of behavioral hyperexcitability within high schizotypy individuals; albeit our lack of neurological data limits the extent to which we can infer the association between cortical hyperexcitability and illusions seen in the PGT. However, overall, this study reveals the need to continue studying the role cortical hyperexcitability may be playing on perception in individuals high in schizotypy traits.

References

Antonova, I., van Swam, C., Hubl, D., Griskova-Bulanova, I., Dierks, T., & Koenig, T. (2021). Altered visuospatial processing in schizophrenia: An event-related potential microstate analysis comparing patients with and without hallucinations with healthy controls. *Neuroscience* , *479* , 140–156. https://doi.org/10.1016/j.neuroscience.2021.10.014

Atagun, M. I., Drukker, M., Hall, M. H., Altun, I. K., Tatli, S. Z., Guloksuz, S., van Os, J., & van Amelsvoort, T. (2020). Meta-analysis of auditory P50 sensory gating in schizophrenia and bipolar disorder. *Psychiatry Research: Neuroimaging* , *300* , 111078. https://doi.org/10.1016/j.pscychresns.2020.111078

Bargary, G., Furlan, M., Raynham, P. J., Barbur, J. L., & Smith, A. T. (2015). Cortical hyperexcitability and sensitivity to discomfort glare. *Neuropsychologia* , *69* , 194–200. https://doi.org/10.1016/j.neuropsychologia.2015.02.006

Beasley, I. G., & Davies, L. N. (2012). Susceptibility to pattern glare following stroke. *Journal of Neurology* , *259* (9), 1832–1839. https://doi.org/10.1007/s00415-012-6418-5

Betsch, T., Aßmann, L., & Glöckner, A. (2020). Paranormal beliefs and individual differences: Story seeking without reasoned review. *Heliyon* , *6* (6), e04259. https://doi.org/10.1016/j.heliyon.2020.e04259

Braithwaite, J. J., Broglia, E., Brincat, O., Stapley, L., Wilkins, A. J., & Takahashi, C. (2013). Signs of increased cortical hyperexcitability selectively associated with spontaneous anomalous bodily experiences in a nonclinical population. *Cognitive Neuropsychiatry* , *18* (6), 549–573. https://doi.org/10.1080/13546805.2013.768176

Braithwaite, J. J., Mevorach, C., & Takahashi, C. (2015). Stimulating the aberrant brain: Evidence for increased cortical hyperexcitability from a transcranial direct current stimulation (tDCS) study of individuals predisposed to anomalous perceptions. *Cortex* , *69* , 1–13. https://doi.org/10.1016/j.cortex.2015.03.023

Brockhaus-Dumke, A., Schultze-Lutter, F., Mueller, R., Tendolkar, I., Bechdolf, A., Pukrop, R., Klosterkoetter, J., & Ruhrmann, S. (2008). Sensory gating in schizophrenia: P50 and N100 gating in antipsychotic-free subjects at risk, first-episode, and chronic patients. *Biological Psychiatry* , *64* (5), 376–384. https://doi.org/10.1016/j.biopsych.2008.02.006

Broyd, S. J., Michie, P. T., Bruggemann, J., van Hell, H. H., Greenwood, L., Croft, R. J., Todd, J., Lenroot, R., & Solowij, N. (2016). Schizotypy and auditory mismatch negativity in a non-clinical sample of young adults. *Psychiatry Research: Neuroimaging* , *254* , 83–91. https://doi.org/10.1016/j.pscychresns.2016.06.011

Bunney, W. E., Hetrick, W. P., Bunney, B. G., Patterson, J. V., Jin, Y., Potkin, S. G., & Sandman, C. A. (1999). Structured Interview for Assessing Perceptual Anomalies (SIAPA). *Schizophrenia Bulletin* , *25* (3), 577–592. https://doi.org/10.1093/oxfordjournals.schbul.a033402

Cadenhead, K. S., Light, G. A., Geyer, M. A., & Braff, D. L. (2000). Sensory gating deficits assessed by the P50 event-related potential in subjects with schizotypal personality disorder. *American Journal of Psychiatry* , *157* (1), 55–59. https://doi.org/10.1176/ajp.157.1.55

Campbell, F. W., & Robson, J. G. (1968). Application of fourier analysis to the visibility of gratings. *The Journal of Physiology* , *197* (3), 551–566. https://doi.org/10.1113/jphysiol.1968.sp008574

Chen, W. J., Hsiao, C. K., & Lin, C. C. H. (1997). Schizotypy in community samples: The three-factor structure and correlation with sustained attention. *Journal of Abnormal Psychology* ,*106* (4), 649–654. https://doi.org/10.1037/0021-843X.106.4.649

Cicero, D. C., & Kerns, J. G. (2010). Can disorganized and positive schizotypy be discriminated from dissociation?: Schizotypy facets and dissociation. *Journal of Personality* , https://doi.org/10.1111/j.1467-6494.2010.00649.x

Cohen, A. S., Matthews, R. A., Najolia, G. M., & Brown, L. A. (2010). Toward a more psychometrically sound brief measure of schizotypal traits: Introducing the SPQ-Brief Revised. *Journal of Personality Disorders* , *24* (4), 516–537. https://doi.org/10.1521/pedi.2010.24.4.516

Coutts, L. V., Cooper, C. E., Elwell, C. E., & Wilkins, A. J. (2012). Time course of the haemodynamic response to visual stimulation in migraine, measured using near-infrared spectroscopy. *Cephalalgia* ,*32* (8), 621–629. https://doi.org/10.1177/0333102412444474

Croft, R. J., Lee, A., Bertolot, J., & Gruzelier, J. H. (2001). Associations of P50 suppression and desensitization with perceptual and cognitive features of “unreality” in schizotypy. *Biological Psychiatry* , *50* (6), 441–446. https://doi.org/10.1016/S0006-3223(01)01082-4

Donaldson, K. R., Larsen, E. M., Jonas, K., Tramazzo, S., Perlman, G., Foti, D., Mohanty, A., & Kotov, R. (2021). Mismatch negativity amplitude in first-degree relatives of individuals with psychotic disorders: Links with cognition and schizotypy. *Schizophrenia Research* , *238* , 161–169. https://doi.org/10.1016/j.schres.2021.10.006

Earls, H. A., Curran, T., & Mittal, V. (2016). Deficits in early stages of face processing in schizophrenia: A systematic review of the P100 component. *Schizophrenia Bulletin* , *42* (2), 519–527. https://doi.org/10.1093/schbul/sbv096

Erickson, M. A., Ruffle, A., & Gold, J. M. (2016). A meta-analysis of mismatch negativity in schizophrenia: From clinical risk to disease specificity and progression. *Biological Psychiatry* ,*79* (12), 980–987. https://doi.org/10.1016/j.biopsych.2015.08.025

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* (suppl 2), S417–S426. https://doi.org/10.1093/schbul/sbu190

Evans, B. J. W., & Stevenson, S. J. (2008). The Pattern Glare Test: A review and determination of normative values. *Ophthalmic and Physiological Optics* , *28* (4), 295–309. https://doi.org/10.1111/j.1475-1313.2008.00578.x

Farkas, K., Stefanics, G., Marosi, C., & Csukly, G. (2015). Elementary sensory deficits in schizophrenia indexed by impaired visual mismatch negativity. *Schizophrenia Research* , *166* (1–3), 164–170. https://doi.org/10.1016/j.schres.2015.05.011

Favrod, O., Sierro, G., Roinishvili, M., Chkonia, E., Mohr, C., Herzog, M. H., & Cappe, C. (2017). Electrophysiological correlates of visual backward masking in high schizotypic personality traits participants. *Psychiatry Research* , *254* , 251–257. https://doi.org/10.1016/j.psychres.2017.04.051

Fong, C. Y., Law, W. H. C., Braithwaite, J. J., & Mazaheri, A. (2020). Differences in early and late pattern-onset visual-evoked potentials between self- reported migraineurs and controls. *NeuroImage: Clinical* , *25* , 102122. https://doi.org/10.1016/j.nicl.2019.102122

Fong, C. Y., Takahashi, C., & Braithwaite, J. J. (2019). Evidence for distinct clusters of diverse anomalous experiences and their selective association with signs of elevated cortical hyperexcitability. *Consciousness and Cognition* , *71* , 1–17. https://doi.org/10.1016/j.concog.2019.03.003

Force, R. B., Venables, N. C., & Sponheim, S. R. (2008). An auditory processing abnormality specific to liability for schizophrenia.*Schizophrenia Research* , *103* (1–3), 298–310. https://doi.org/10.1016/j.schres.2008.04.038

Freedman, R., Olsen-Dufour, A. M., & Olincy, A. (2020). P50 inhibitory sensory gating in schizophrenia: Analysis of recent studies.*Schizophrenia Research* , *218* , 93–98. https://doi.org/10.1016/j.schres.2020.02.003

Gaebler, A. J., Mathiak, K., Koten, J. W., König, A. A., Koush, Y., Weyer, D., Depner, C., Matentzoglu, S., Edgar, J. C., Willmes, K., & Zvyagintsev, M. (2015). Auditory mismatch impairments are characterized by core neural dysfunctions in schizophrenia. *Brain* ,*138* (5), 1410–1423. https://doi.org/10.1093/brain/awv049

González-Rodríguez, A., García-Pérez, Á., Godoy-Giménez, M., Carmona, I., Estévez, Á. F., Sayans-Jiménez, P., & Cañadas, F. (2021). Schizotypal personality traits and the social learning of fear.*Scientific Reports* , *11* (1), 23048. https://doi.org/10.1038/s41598-021-02336-6

Haenschel, C., Bittner, R. A., Haertling, F., Rotarska-Jagiela, A., Maurer, K., Singer, W., & Linden, D. E. J. (2007). Contribution of impaired early-stage visual processing to working memory dysfunction in adolescents with schizophrenia: A study with event-related potentials and functional magnetic resonance imaging. *Archives of General Psychiatry* , *64* (11), 1229. https://doi.org/10.1001/archpsyc.64.11.1229

Haigh, S. M., Coffman, B. A., Murphy, T. K., Butera, C. D., & Salisbury, D. F. (2016a). Abnormal auditory pattern perception in schizophrenia. *Schizophrenia Research* , *176* (2–3), 473–479. https://doi.org/10.1016/j.schres.2016.07.007

Haigh, S. M., Gupta, A., Barb, S. M., Glass, S. A. F., Minshew, N. J., Dinstein, I., Heeger, D. J., Eack, S. M., & Behrmann, M. (2016b). Differential sensory fMRI signatures in autism and schizophrenia: Analysis of amplitude and trial-to-trial variability.*Schizophrenia Research* , *175* (1–3), 12–19. https://doi.org/10.1016/j.schres.2016.03.036

Harle, D. E., Shepherd, A. J., & Evans, B. J. W. (2006). Visual stimuli are common triggers of migraine and are associated with Pattern Glare.*Headache: The Journal of Head and Face Pain* , *46* (9), 1431–1440. https://doi.org/10.1111/j.1526-4610.2006.00585.x

Hazlett, E. A., Rothstein, E. G., Ferreira, R., Silverman, J. M., Siever, L. J., & Olincy, A. (2015). Sensory gating disturbances in the spectrum: Similarities and differences in schizotypal personality disorder and schizophrenia. *Schizophrenia Research* ,*161* (2–3), 283–290. https://doi.org/10.1016/j.schres.2014.11.020

Herrmann, M. J., Ellgring, H., & Fallgatter, A. J. (2004). Early-stage face processing dysfunction in patients with schizophrenia.*American Journal of Psychiatry* , *161* (5), 915–917. https://doi.org/10.1176/appi.ajp.161.5.915

Hetrick, W. P., Erickson, M. A., & Smith, D. A. (2012). Phenomenological dimensions of sensory gating. *Schizophrenia Bulletin* , *38* (1), 178–191. https://doi.org/10.1093/schbul/sbq054

Hoptman, M. J., Parker, E. M., Nair-Collins, S., Dias, E. C., Ross, M. E., DiCostanzo, J. N., Sehatpour, P., & Javitt, D. C. (2018). Sensory and cross-network contributions to response inhibition in patients with schizophrenia. *NeuroImage: Clinical* , *18* , 31–39. https://doi.org/10.1016/j.nicl.2018.01.001

Hoptman, M. J., Zuo, X.-N., Butler, P. D., Javitt, D. C., D'Angelo, D., Mauro, C. J., & Milham, M. P. (2010). Amplitude of low-frequency oscillations in schizophrenia: A resting state fMRI study.*Schizophrenia Research* , *117* (1), 13–20. https://doi.org/10.1016/j.schres.2009.09.030

Huang, J., Cooper, T. G., Satana, B., Kaufman, D. I., & Cao, Y. (2003). Visual distortion provoked by a stimulus in migraine associated with hyperneuronal Activity. *Headache: The Journal of Head and Face Pain* , *43* (6), 664–671. https://doi.org/10.1046/j.1526-4610.2003.03110.x

Javitt, D. C., & Freedman, R. (2015). Sensory processing dysfunction in the personal experience and neuronal machinery of schizophrenia. *American Journal of Psychiatry* , *172* (1), 17–31. https://doi.org/10.1176/appi.ajp.2014.13121691

Javitt, D. C., Lee, M., Kantrowitz, J. T., & Martinez, A. (2018). Mismatch negativity as a biomarker of theta band oscillatory dysfunction in schizophrenia. *Schizophrenia Research* , *191* , 51–60. https://doi.org/10.1016/j.schres.2017.06.023

Joshi, Y. B., Breitenstein, B., Tarasenko, M., Thomas, M. L., Chang, W.-L., Sprock, J., Sharp, R. F., & Light, G. A. (2018). Mismatch negativity impairment is associated with deficits in identifying real-world environmental sounds in schizophrenia. *Schizophrenia Research* , *191* , 5–9. https://doi.org/10.1016/j.schres.2017.05.020

Kelemen, O., Kiss, I., Benedek, G., & Kéri, S. (2013). Perceptual and cognitive effects of antipsychotics in first-episode schizophrenia: The potential impact of GABA concentration in the visual cortex. *Progress in Neuro-Psychopharmacology and Biological Psychiatry* , *47* , 13–19. https://doi.org/10.1016/j.pnpbp.2013.07.024

Kemp, K. C., Bathery, A. J., Barrantes-Vidal, N., & Kwapil, T. R. (2021). Positive, negative, and disorganized schizotypy predict differential patterns of interview-rated schizophrenia-spectrum symptoms and impairment. *Assessment* , *28* (1), 141–152. https://doi.org/10.1177/1073191119900008

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

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

Koshiyama, D., Kirihara, K., Tada, M., Nagai, T., Fujioka, M., Usui, K., Araki, T., & Kasai, K. (2020). Reduced auditory mismatch negativity reflects impaired deviance detection in schizophrenia. *Schizophrenia Bulletin* , *46* (4), 937–946. https://doi.org/10.1093/schbul/sbaa006

Kwapil, T. R., & Barrantes-Vidal, N. (2015). Schizotypy: Looking back and moving forward. *Schizophrenia Bulletin* , *41* (suppl 2), S366–S373. https://doi.org/10.1093/schbul/sbu186

Luo, Y., Zhang, J., Wang, C., Zhao, X., Chang, Q., Wang, H., & Wang, C. (2019). Discriminating schizophrenia disease progression using a P50 sensory gating task with dense-array EEG, clinical assessments, and cognitive tests. *Expert Review of Neurotherapeutics* , *19* (5), 459–470. https://doi.org/10.1080/14737175.2019.1601558

Martínez, A., Gaspar, P. A., Hillyard, S. A., Andersen, S. K., Lopez-Calderon, J., Corcoran, C. M., & Javitt, D. C. (2018). Impaired motion processing in schizophrenia and the attenuated psychosis syndrome: Etiological and clinical implications. *American Journal of Psychiatry* , *175* (12), 1243–1254. https://doi.org/10.1176/appi.ajp.2018.18010072

Mathalon, D. H., Roach, B. J., Ferri, J. M., Loewy, R. L., Stuart, B. K., Perez, V. B., Trujillo, T. H., & Ford, J. M. (2019). Deficient auditory predictive coding during vocalization in the psychosis risk syndrome and in early illness schizophrenia: The final expanded sample. *Psychological Medicine* , *49* (11), 1897–1904. https://doi.org/10.1017/S0033291718002659

McGhie, A., & Chapman, J. (1961). Disorders of attention and perception in early schizophrenia. *British Journal of Medical Psychology* , *34* (2), 103–116. https://doi.org/10.1111/j.2044-8341.1961.tb00936.x

Micoulaud-Franchi, J.-A., Aramaki, M., Merer, A., Cermolacce, M., Ystad, S., Kronland-Martinet, R., Naudin, J., & Vion-Dury, J. (2012). Toward an exploration of feeling of strangeness in schizophrenia: Perspectives on acousmatic and everyday listening. *Journal of Abnormal Psychology* , *121* (3), 628–640. https://doi.org/10.1037/a0026411

Moussa-Tooks, A. B., Bailey, A. J., Bolbecker, A. R., Viken, R. J., O'Donnell, B. F., & Hetrick, W. P. (2021). Bifactor structure of the Schizotypal Personality Questionnaire across the schizotypy spectrum. *Journal of Personality Disorders* , *35* (4), 513–537. https://doi.org/10.1521/pedi_2020_34_466

Myles, J. B., Rossell, S. L., Phillipou, A., Thomas, E., & Gurvich, C. (2017). Insights to the schizophrenia continuum: A systematic review of saccadic eye movements in schizotypy and biological relatives of schizophrenia patients. *Neuroscience & Biobehavioral Reviews* ,*72* , 278–300. https://doi.org/10.1016/j.neubiorev.2016.10.034

Nelson, M. T., Seal, M. L., Pantelis, C., & Phillips, L. J. (2013). Evidence of a dimensional relationship between schizotypy and schizophrenia: A systematic review. *Neuroscience & Biobehavioral Reviews* , *37* (3), 317–327. https://doi.org/10.1016/j.neubiorev.2013.01.004

Neuhaus, A. H., Karl, C., Hahn, E., Trempler, N. R., Opgen-Rhein, C., Urbanek, C., Hahn, C., Ta, T. M. T., & Dettling, M. (2011). Dissection of early bottom-up and top-down deficits during visual attention in schizophrenia. *Clinical Neurophysiology* , *122* (1), 90–98. https://doi.org/10.1016/j.clinph.2010.06.011

Oestreich, L. K. L., Mifsud, N. G., Ford, J. M., Roach, B. J., Mathalon, D. H., & Whitford, T. J. (2015). Subnormal sensory attenuation to self-generated speech in schizotypy: Electrophysiological evidence for a 'continuum of psychosis.' *International Journal of Psychophysiology* , *97* (2), 131–138. https://doi.org/10.1016/j.ijpsycho.2015.05.014

Oestreich, L. K. L., Mifsud, N. G., Ford, J. M., Roach, B. J., Mathalon, D. H., & Whitford, T. J. (2016). Cortical suppression to delayed self-initiated auditory stimuli in schizotypy: Neurophysiological evidence for a continuum of psychosis. *Clinical EEG and Neuroscience* , *47* (1), 3–10. https://doi.org/10.1177/1550059415581708

Osokina, O. I., & Ivnyev, B. B. (2018). Cerebral evoked potentials in patients at an early stage of schizophrenia. *Neurophysiology* ,*50* (4), 292–301. https://doi.org/10.1007/s11062-018-9751-1

Park, H. R. P., Lim, V. K., Kirk, I. J., & Waldie, K. E. (2015). P50 sensory gating deficits in schizotypy. *Personality and Individual Differences* , *82* , 142–147. https://doi.org/10.1016/j.paid.2015.03.025

Patterson, J. V., Hetrick, W. P., Boutros, N. N., Jin, Y., Sandman, C., Stern, H., Potkin, S., & Bunney, W. E. (2008). P50 sensory gating ratios in schizophrenics and controls: A review and data analysis. *Psychiatry Research* , *158* (2), 226–247. https://doi.org/10.1016/j.psychres.2007.02.009

Perez, V. B., Ford, J. M., Roach, B. J., Loewy, R. L., Stuart, B. K., Vinogradov, S., & Mathalon, D. H. (2012). Auditory cortex responsiveness during talking and listening: Early illness schizophrenia and patients at clinical high-risk for psychosis. *Schizophrenia Bulletin* , *38* (6), 1216–1224. https://doi.org/10.1093/schbul/sbr124

Potter, D., Summerfelt, A., Gold, J., & Buchanan, R. W. (2006). Review of clinical correlates of P50 sensory gating abnormalities in patients with schizophrenia. *Schizophrenia Bulletin* , *32* (4), 692–700. https://doi.org/10.1093/schbul/sbj050

Qi, X., Fan, H., Yang, X., Chen, Y., Deng, W., Guo, W., Wang, Q., Chen, E., Li, T., & Ma, X. (2019). High level of pattern glare in major depressive disorder. *BMC Psychiatry* , *19* (1), 415. https://doi.org/10.1186/s12888-019-2399-6

Ramsay, I. S., Schallmo, M.-P., Biagianti, B., Fisher, M., Vinogradov, S., & Sponheim, S. R. (2020). Deficits in auditory and visual sensory discrimination reflect a genetic liability for psychosis and predict disruptions in global cognitive functioning. *Frontiers in Psychiatry* , *11* , 638. https://doi.org/10.3389/fpsyt.2020.00638

Riekki, T., Lindeman, M., Aleneff, M., Halme, A., & Nuortimo, A. (2013). Paranormal and religious believers are more prone to illusory face perception than skeptics and non-believers: Illusory faces and paranormal beliefs. *Applied Cognitive Psychology* , *27* (2), 150–155. https://doi.org/10.1002/acp.2874

Sahakyan, L., & Kwapil, T. R. (2019). Hits and false alarms in recognition memory show differential impairment in positive and negative schizotypy. *Journal of Abnormal Psychology* , *128* (6), 633–643. https://doi.org/10.1037/abn0000441

Simmonds-Moore, C. (2014). Exploring the perceptual biases associated with believing and disbelieving in paranormal phenomena. *Consciousness and Cognition* , *28* , 30–46. https://doi.org/10.1016/j.concog.2014.06.004

Spencer, K. M., & McCarley, R. W. (2005). Visual hallucinations, attention, and neural circuitry: Perspectives from schizophrenia research. *Behavioral and Brain Sciences* , *28* (6), 774–774. https://doi.org/10.1017/S0140525X05390133

Teeple, R. C., Caplan, J. P., & Stern, T. A. (2009). Visual hallucinations: Differential diagnosis and treatment. *The Primary Care Companion to The Journal of Clinical Psychiatry* , *11* (1), 26–32. https://doi.org/10.4088/PCC.08r00673

Thakkar, K. N., Silverstein, S. M., & Brascamp, J. W. (2019). A review of visual aftereffects in schizophrenia. *Neuroscience & Biobehavioral Reviews* , *101* , 68–77. https://doi.org/10.1016/j.neubiorev.2019.03.021

Todd, J., Michie, P. T., & Jablensky, A. V. (2003). Association between reduced duration mismatch negativity (MMN) and raised temporal discrimination thresholds in schizophrenia. *Clinical Neurophysiology* , *114* (11), 2061–2070. https://doi.org/10.1016/S1388-2457(03)00246-3

Umbricht, D., & Krljes, S. (2005). Mismatch negativity in schizophrenia: A meta-analysis. *Schizophrenia Research* ,*76* (1), 1–23. https://doi.org/10.1016/j.schres.2004.12.002

Urban, A., Kremlacek, J., Masopust, J., & Libiger, J. (2008). Visual mismatch negativity among patients with schizophrenia. *Schizophrenia Research* , *102* (1–3), 320–328. https://doi.org/10.1016/j.schres.2008.03.014

Walther, S., Federspiel, A., Horn, H., Bianchi, P., Wiest, R., Wirth, M., Strik, W., & Müller, T. J. (2009). Encoding deficit during face processing within the right fusiform face area in schizophrenia. *Psychiatry Research: Neuroimaging* , *172* (3), 184–191. https://doi.org/10.1016/j.pscychresns.2008.07.009

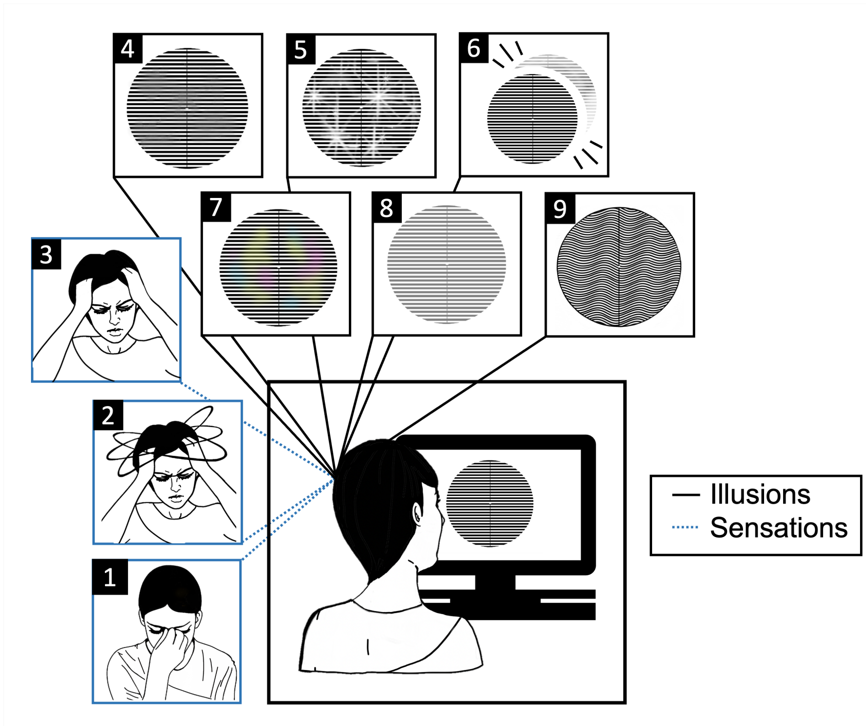
Wang, J., Miyazato, H., Hokama, H., Hiramatsu, K.-I., & Kondo, T. (2004). Correlation between P50 suppression and psychometric schizotypy among non-clinical Japanese subjects. *International Journal of Psychophysiology* , *52* (2), 147–157. https://doi.org/10.1016/j.ijpsycho.2003.06.001

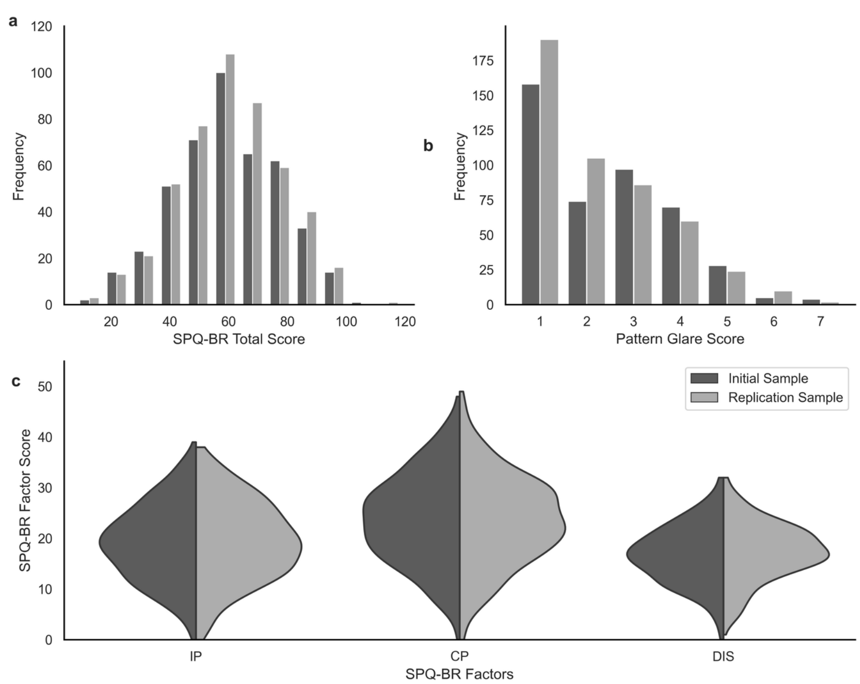
Ward, J., Hoadley, C., Hughes, J. E. A., Smith, P., Allison, C., Baron-Cohen, S., & Simner, J. (2017). Atypical sensory sensitivity as a shared feature between synaesthesia and autism. *Scientific Reports* , *7* (1), 41155. https://doi.org/10.1038/srep41155

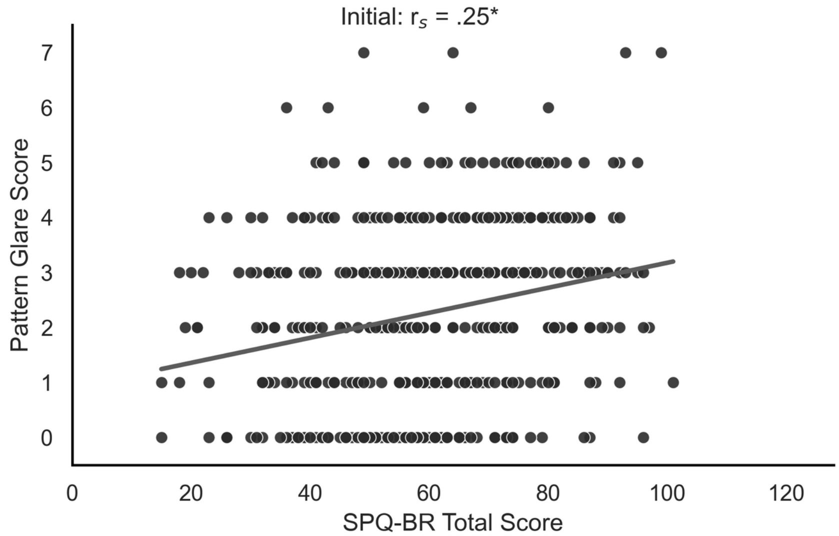
Wilkins, A. J., & Evans, B. J. W. (2001). Pattern glare test instructions. *IOO Sales Ltd, London* .

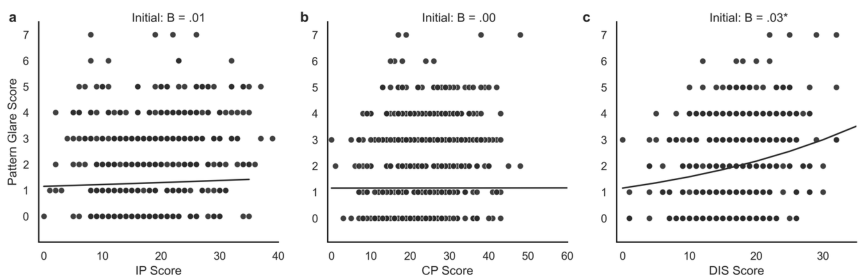
Wilkins, A., Nimmo-Smith, I., Tait, A., McManus, C., Sala, S. D., Tilley, A., Arnold, K., Barrie, M., & Scott, S. (1984). A neurological basis for visual discomfort. *Brain* , *107* (4), 989–1017. https://doi.org/10.1093/brain/107.4.989

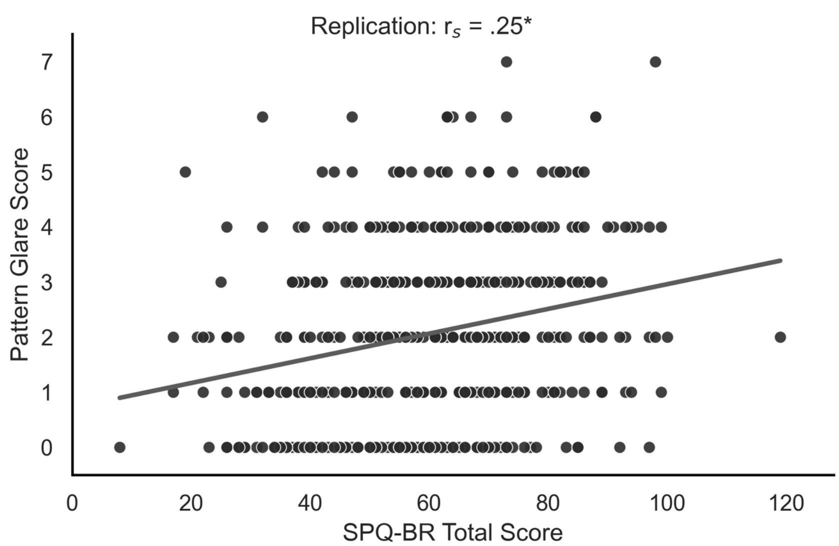
Zhou, S., Xu, Y., Wang, N., Zhang, S., Geng, H., & Jia, H. (2020). Deficits of subliminal self-face processing in schizophrenia. *Consciousness and Cognition* , *79* , 102896. https://doi.org/10.1016/j.concog.2020.102896

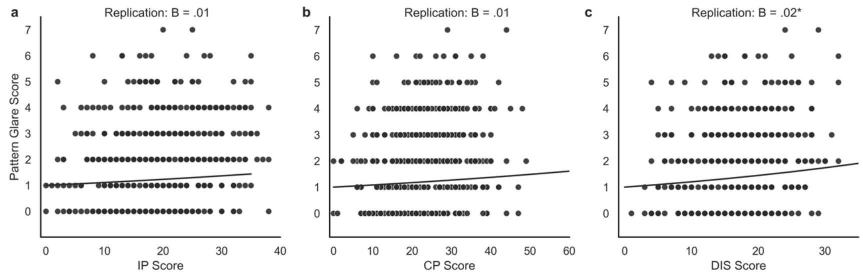

4
5
6
7
8
9
3
2
1
Illusions
Sensations


a
Frequency
SPQ-BR Total Score
b
Frequency
Pattern Glare Score
c
SPQ-BR Factor Score
Initial Sample
Replication Sample
IP
CP
DIS
SPQ-BR Factors


Initial: r_s = .25*
Pattern Glare Score
SPQ-BR Total Score


a
Initial: B = .01
Pattern Glare Score
IP Score
b
Initial: B = .00
CP Score
c
Initial: B = .03*
DIS Score


Replication: r_s = .25*
Pattern Glare Score
SPQ-BR Total Score



Hosted file

`Table1.docx` available at https://authorea.com/users/521694/articles/594498-people-with-high-schizotypy-experience-more-illusions-in-the-pattern-glare-test-consistent-with-the-hyperexcitability-hypothesis

Hosted file

`Table2.docx` available at https://authorea.com/users/521694/articles/594498-people-with-high-schizotypy-experience-more-illusions-in-the-pattern-glare-test-consistent-with-the-hyperexcitability-hypothesis