

COGNITIVE BIASES AND SOCIAL COGNITION AMONG PEOPLE WITH
PSYCHOTIC-LIKE EXPERIENCES: DO JUMPING TO CONCLUSIONS BIAS AND
BIAS AGAINST DISCONFIRMATORY EVIDENCE PLAY A ROLE IN SOCIAL
JUDGEMENTS?



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PLAGIARISM

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ABSTRACT

Cognitive biases such as Jumping to Conclusions (*JTC*) and Bias Against Disconfirmatory Evidence (*BADE*) have been implicated in the delusion formation and maintenance. In line with the continuum approaches to psychosis, such biases have been observed not just in clinical populations but also in otherwise healthy individuals with psychotic-like experiences. Current study aimed to assess *JTC* and *BADE* biases in a community sample with a novel paradigm. The results of the current study showed that a tendency to arrive hasty decisions and belief inflexibility in the face of new information might be present in people with psychosis proneness in their daily interactions.

Key words: *psychosis, schizophrenia, psychosis continuum, delusions, psychotic-like experiences, cognitive biases, social cognition*

ÖZET

Sonuca Atlama Yanlılığı (SAY) ve Yanlışlayan Bilgiye Önyargı (YBÖ) gibi bilişsel yanlılıkların, delüzyonların oluşma ve devam ettirilme süreçlerine katkıda bulunduğu düşünülmektedir. Ek olarak, psikotik rahatsızlıkların kategorik olarak ayrışmadığını ve bir süreklilik arz ettiğini destekleyen nitelikteki güncel bulgular, bu bilişsel yanlılıkların yalnızca psikotik tanılı kişilerde değil, psikoz-benzeri deneyimler yaşamış sağlıklı kişilerde görüldüğüne dair veriler sunmaktadır. Bu çalışma, SAY ve YBÖ bilişsel yanlılıklarını psikoz-benzeri deneyimler yaşamış kişilerde yeni geliştirilmiş bir paradigma aracılığıyla ölçmeyi hedeflemiştir. Araştırmanın sonuçları, psikoza eğilimli kişilerin gündelik hayattaki etkileşimlerinde sonuca atlama yanlılığı sergileyebildiklerine ve yeni bilgi karşısında inançlarını güncellemeye dair güçlük yaşayabildiklerine dair çıktılar sunmaktadır.

Anahtar kelimeler: *Psikoz, şizofreni, psikoz-benzeri deneyimler, delüzyon, bilişsel yanlılıklar, sonuca atlama yanlılığı, yanlışlayan bilgiye önyargı, sosyal biliş*

To my family...



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1. GENERAL INTRODUCTION

“Wenn wir im Leben vom Tod umgeben sind, so auch in der Gesundheit des Verstandes vom Wahnsinn.” (L. Wittgenstein, 1944)

Although anyone might show the tendency to not to change their beliefs easily, extreme form of this, namely, fixating onto wrong beliefs despite the existence of contradictory evidence canonically known as delusional thinking and delusions constitute one of the hallmarks of schizophrenia and other primary psychosis disorders (American Psychiatric Association, 2013; Azis et al., 2021).

Cognitive research on delusions has been increasingly focusing on the role of cognitive biases such as Jumping to Conclusions (*JTC*) (P. A. Garety et al., 1991); Bias Against Disconfirmatoy Evidence (*BADE*) (Moritz & Woodward, 2006; Woodward et al., 2006); and Liberal Acceptance Bias (*LA*) (Moritz, Pfuhl, et al., 2017) in the formation and maintenance of delusions.

Moreover, accumulating evidence demonstrates that aforementioned cognitive biases also present among otherwise healthy individuals with so-called psychotic-like experiences (*PLEs*) who does not fully meet the diagnostic criteria of psychosis disorders (Gawęda et al., 2020; Kusztrits et al., 2020; Scheunemann et al., 2020; Yung et al., 2009). These findings further support the continuum approaches to psychosis, which, in contrast to categorical approaches, claim that psychotic symptoms such as delusions rather expand on a spectrum, can be seen among general population and only differ from clinical presentations in quantity, rather than quality (Eisenacher & Zink, 2017; Kusztrits et al., 2020; Reininghaus, Böhnke, et al., 2019).

Apart from cognitive (Elvevåg & Goldberg, 2000; Keefe & Harvey, 2012; Schaefer et al., 2013); neuropsychological (Heaton et al., 2001; Kalkstein et al., 2010; Palmer et al., 2009) and communicative (Colle et al., 2013) impairments; social cognition is another front where patients with schizophrenia and neighboring psychotic disorders have prominent difficulties (Grant et al., 2017; M. F. Green et al., 2019; Pinkham, 2014).

The term social cognition describes cognitive processes that underlies social interactions (M. F. Green et al., 2005). Although employed terminology, definitions and components of social cognition might slightly differ, dominantly accepted and studied four

components of social cognition involves emotion processing, theory of mind (*ToM*), social perception and attributional style (Mediavilla et al., 2021). In schizophrenia and related psychosis disorders social cognition impairments are well documented, have prognostic value and are important correlates and predictors of functional outcome (Vaskinn et al., 2018).

Nevertheless, despite the social nature of delusions, cognitive biases which presumably contribute to the formation and maintenance of delusions have not been sufficiently investigated via paradigms that require social or inter-personal reasoning that taps into socio-cognitive abilities. Considering the importance of social cognition and havoc that impairments in social cognition might lead to, it is important to decipher whether these cognitive biases also hold true during a task where participants need to employ their socio-cognitive abilities.

Therefore the aim of this study is to investigate whether people with psychotic-like experiences demonstrate cognitive biases in a novel paradigm that requires social judgments.

1.1. Schizophrenia and Other Primary Psychosis Disorders

Primary psychosis disorders are among most debilitating mental disorders which not just lead to severe social and cognitive impairments for the affected individual (Fett et al., 2011) but they also further constitute a heavy burden on the caregivers (Lasebikan & Ayinde, 2013) as well as on society, economy and public health (Rössler et al., 2005). According to the latest numbers, schizophrenia and related psychosis disorders are among leading fifteen causes of disability worldwide (Vos et al., 2017).

The term “psychosis”, coined by Ernst von Feuchtersleben in 1845 (Giulio, 2020), refers to a mental state characterized by distorted contact with reality. Psychosis as a term might lead to confusion for lay people because it is employed to refer to not just individual experiences with manifold levels of severity, duration and clinical significance; but also to a diagnostic category containing a variety of mental disorders such as schizophrenia, schizophreniform disorder, brief psychotic disorder and other psychotic disorders (American Psychiatric Association, 2013; Badcock & Georgie, 2020) for which hereafter an umbrella term “primary psychosis disorders” will be used.

Although psychotic (i.e., positive) symptoms such as delusions and hallucinations might be observed in the clinical presentation of a range of other mental and neurocognitive disorders (Badcock & Georgie, 2020) and might be experienced by individuals in the general, nonclinical population without any psychiatric diagnosis (Johns & Van Os, 2001); delusions and hallucinations constitute *a sine qua non* diagnosis criteria for primary psychosis disorders (American Psychiatric Association, 2013; Azis et al., 2021; Biedermann & Fleischhacker, 2016). Moreover, psychotic state accompanying primary psychosis disorders do not result merely from any medication or substance and is not secondary to another medical condition or mental disturbance (Maj et al., 2021).

Associability, aggression, autism, attention deficits, autoeroticism and auditory hallucinations are some of the countless number of signs and symptoms of primary psychosis disorders that just start with the letter A (McNally, 2016). However, from a descriptive psychopathology perspective, symptoms of schizophrenia, as one of the most studied and prototypic disorder of psychosis (Badcock & Georgie, 2020; Ritsner, 2011), clinically separated into three dimensions as positive, negative and disorganized symptoms (Westhoff et al., 2021). While delusions and hallucinations are at the forefront of positive symptoms; social withdrawal, flattened affect and poverty of speech can be counted among the negative

symptoms (McCutcheon et al., 2020) and formal thought disorder with inadequate affect are core symptoms of the third dimension called disorganization (Rognlien & Sahl, 2021). In addition to cognitive deficits (Adhikari et al., 2019), patients also suffer from impairments in social functioning and relatedly, poor quality of life (Velthorst et al., 2017). Further to that, schizophrenia and related psychosis disorders are furthermore associated with an average of 15-year-shorter life expectancy (Hjorthøj et al., 2017) and both physical as well as mental comorbidities (Maj et al., 2021).

Just as their clinical manifestations, etiology of primary psychosis disorders is also very complex, supposedly multifactorial and still a matter of much discussion whereby according to accumulating findings genetic, neurological, neurochemical and environmental factors all play a role together (Guerrin et al., 2021). In one of the following sections, detailed explanation of different approaches to etiology of psychosis will be touched upon.

The onset of primary psychosis disorders, which is posterior to a prodromal phase characterized by unspecific symptoms such as delusional mood and undirected fears (Haller et al., 2014) usually peaks in late adolescence or early adulthood (McCutcheon et al., 2020). On average, males are diagnosed at a slightly earlier age than females (Maj et al., 2021) or to put it differently, males usually tend to have an early onset than females (Robin M. Murray et al., 2008). Addedly, according to a systematic review, incidence of schizophrenia and related psychotic disorders are higher among males than females (J. J. McGrath et al., 2008). Regarding the epidemiology, life time prevalence of schizophrenia was thought to be around 1% worldwide with a little degree of variation among regions, partially related to diagnosis conventions and existence of risk and protective factors (Brüne, 2016); however this notion that incidence and prevalence of schizophrenia varies very little worldwide has been challenged with findings showing that factors such as urbanity, sex and migrant status contribute significantly to the prominent variation in incidence (J. J. McGrath, 2006).

1.1.1. Diagnostic Criteria and Symptoms

Classification, explanation and treatment are three core elements of psychopathology research (Nielsen, 2020). Current issues in the classification of the psychiatric disorders aside (Horwitz, 2019), contemporarily there are two dominantly used classification systems which provide a shared framework for research, a common language among mental health professionals and diagnostic codes for public health services and insurance companies (Biondi et al., 2018); namely, the *Diagnostic and Statistical Manual of Mental Disorders* DSM-5 (American Psychiatric Association, 2013) and the *International Classification of Diseases* ICD -11 (WHO, 2018, <https://icd.who.int/browse11/l-m/en>).

Although the predominantly used diagnostic manuals that embarks on a categorical approach in the classification of mental disorders have been criticized heavily (for a detailed discussion on the matter, see: Horwitz, 2019, 2021); they maintain dominating the psychopathology research and especially the clinical practice (Ravichandran et al., 2021).

DSM and ICD differ from each other in their aim, intention, functionality and diagnostic criteria. While ICD is more trimmed, refers to mental disorders in a less detailed fashion and therefore addresses not only to mental health professionals but also to other specialists and lay people; DSM, on the other hand, concentrates on issues in research and nosology and therefore primarily bespeaks to mental health professionals. Descriptions of the disorders, diagnostic criteria and comments are more detailed in the DSM (Biedermann & Fleischhacker, 2016).

One shared aspect of both DSM and ICD is that diagnostic categories are in both of these manuals defined based on symptom and syndrome clusters that co-vary in time (Biondi et al., 2018) and importantly, both of them employ a categorical, as opposed to dimensional, approach to classification of the disorders, and accordingly, each disorder is being treated as a discrete and separate entity with a clear “cut point” from others (Krueger et al., 2018; Phalen et al., 2022). Elaborate definitions as well as advantages and disadvantages of both approaches to classification of disorders will be addressed in more detail in the next chapters.

With respect to primary psychosis disorders, in the latest version of DSM, i.e., DSM-5, primary psychosis disorders involve schizophrenia, schizophreniform disorder, brief psychotic disorder, schizoaffective disorder, delusional disorder, “other specified schizophrenia spectrum and other psychotic disorder” as well as “unspecified schizophrenia

spectrum and other psychotic disorder”, whereas in the latest version of ICD, i.e. ICD-11, schizophrenia, acute and transient psychotic disorder, schizoaffective disorder, delusional disorder, and “other primary psychotic disorder” constitute primary psychosis disorders (American Psychiatric Association, 2013; Maj et al., 2021).

Despite different aim, functionality and nomenclature of the two manuals, as a result of harmonization attempts in the field the differences with regards to sections reviewing primary psychosis disorders are fairly less (Tandon et al., 2013). For example in both manuals, prodromal syndromes are not taken into consideration as a diagnostic criteria and the importance of cognitive impairments is examined carefully in both DSM-5 and ICD-11. However, the inclusion of impaired functional outcome as a necessary criteria for a diagnosis of schizophrenia in DSM-5, but not in ICD-11 (American Psychiatric Association, 2013; Biedermann & Fleischhacker, 2016), is an example for difference between the two manuals.

Because of the dominant focus on schizophrenia in research and in clinical practice (Maj et al., 2021), the diagnostic criteria of schizophrenia will be addressed here.

Given the heterogeneous nature of clinical presentations of schizophrenia, course of illness, prognosis as well as absence of any pathognomonic symptoms or biological markers (Palomar-Ciria et al., 2019) and existence of various etiologic and physiological hypotheses (Mailman & Paoli, 2017); a diagnosis of schizophrenia is of clinical nature and thus made based on clinical features, subjective reports, patient’s as well as family history along with mental status examination which eventually followed by ticking off symptoms from diagnostic manuals (Chan, 2017).

For a diagnosis of schizophrenia, the DSM-5 requires the existence of at least two out of five core symptoms (i.e., delusions, hallucinations, disorganized speech/thinking, grossly disorganized/catatonic behavior, negative symptoms); one of these two symptoms must be delusions, hallucinations or disorganized speech which must be present for a minimum of one month. A diagnosis also requires “continuous signs of disturbance” (American Psychiatric Association, 2013; Ayano, 2016; Chan, 2017) that present for a minimum of six-month-long period. Along with above mentioned core symptoms in the DSM-5, the ICD-11 also includes “experiences of influence, passivity or control” (classified under delusions in the DSM-5) and “psychomotor disturbances” (classified under “grossly disorganized or catatonic behavior” in the DSM-5) (Maj et al., 2021). For a diagnosis of schizophrenia, the ICD-11 requires at least two symptoms having been present “most of the time” for at least a one-month-long period

and one of them must be a core symptom. In the ICD-11, negative symptoms, disorganized/catatonic behavior and psychomotor disorders are treated as additional symptoms (American Psychiatric Association, 2013; Biedermann & Fleischhacker, 2016; Chan, 2017; Maj et al., 2021). Additionally, in the DSM-5 social/occupational dysfunction is a fundamental component of a diagnosis of schizophrenia while this is not the case in the ICD-11 (Biedermann & Fleischhacker, 2016).



1.1.1.1. Positive Symptoms

Since the cardinal developments in the history of psychosis disorders tracing back to late 19th-early 20th century, namely, since the first conceptualization of the schizophrenia spectrum disorders under the name of *Dementia Praecox* by Emil Kraepelin, followed by Eugen Bleuler's invention of the term *Schizophrenias* and later the description of the so-called *First-rank-symptoms* of the disorder by Kurt Schneider (Badcock & Georgie, 2020; Kashyap et al., 2021; Lawrie et al., 2016); outcomes of the pursuit for a systematic characterization of the symptomatology of psychotic disorders remains elusive to this day. Furthermore, despite the vigorous efforts, developing a reliable clinical typology remains as a very challenging task (Biondi et al., 2018; Picardi et al., 2012).

Symptom dimensions represent symptom clusters that usually emerge together and may illuminate a wide range of phenotypic variation between individuals with the same diagnosis (Rietkerk et al., 2008). Many researchers have tried to capture the defining symptom structure of primary psychosis disorders via factor or cluster analysis of symptoms (Lawrie et al., 2016), hence yielding symptom dimensions of the disorder.

Although distinguishing symptom dimensions from another might be difficult at times (for example, it might be challenging to differentiate negative symptoms from depressive symptoms); a good understanding of the symptom structure is of great clinical as well as scientific importance; while different symptom dimensions might necessitate distinct interventions (Rooijen et al., 2017), hence clinical decisions might be enhanced on the basis of a dimensional presentation of symptoms (Phalen et al., 2022). Furthermore, a good understanding of the symptom structure may also improve differential research aimed at defining distinctive entities with their unique pathogenesis, course of illness as well as outcome (Azis et al., 2021; Picardi et al., 2012; Tandon et al., 2009).

Despite the existence of various dimensional models and absence of a consensus (Kashyap et al., 2021; Lawrie et al., 2016; Picardi et al., 2012; Rietkerk et al., 2008; Rooijen et al., 2017), non-homogenous nature of symptomatology of primary psychosis disorders can be well captured with a multidimensional structure that includes positive, negative and disorganized symptom dimensions (Gross et al., 2014; Kashyap et al., 2021; Kemp et al., 2020; Nelson et al., 2013; Phalen et al., 2022; Rietkerk et al., 2008; Rooijen et al., 2017). In addition, this model has been proven to be consistent across different cultures (Kemp et al., 2020).

According to this model, negative dimension encompasses five symptoms, also known as “*the 5A*”; affective blunting, alogia, asociality, anhedonia and avolition (Maj et al., 2021). Negative symptoms are important indicators of functional outcome as well as quality of life and are in close relation with various other detrimental clinical outcomes (Kharawala et al., 2022; Strauss, 2021). They further contribute heavily to the burden that primary psychosis disorders impose on the affected individual, their caregiver and the society (Galderisi et al., 2018). Furthermore, negative symptoms are usually persistent over time and sadly, show resistance to psychopharmacologic treatments (Krause et al., 2018).

Disorganized dimension includes following symptoms: formal thought disorder (thought and speech disorganization), bizarre behavior and inappropriate affect (Kemp et al., 2020; Nelson et al., 2013; Rietkerk et al., 2008). According to some findings, thought disorder is of highest importance in terms of its contribution to everyday functioning (Rocca et al., 2018). Despite their responsiveness to antipsychotic medications, especially during the acute phases of psychotic disorders, there is not a particular psychopharmacological treatment for disorganized symptoms (Maj et al., 2021).

Positive symptom dimension is loaded by delusions of all forms (such as delusions of persecution, delusions of influence etc.) as well as hallucinations in any sensory modality (i.e., auditory, visual, olfactory etc.) (Arango & Carpenter, 2011; Kemp et al., 2020). Delusions and hallucinations are defining common features of primary psychosis disorders (Schultze-Lutter et al., 2019). Positive dimension arguably encapsulates the most critical symptoms while they constitute the *primary* criterion for a diagnosis of a psychotic disorder and further, they constitute the *sole* criterion for defining the individuals at clinical high risk (CHR) status for psychosis (Azis et al., 2021).

Along with other sources of information such as clinical observation, information yielded from patient’s family and self-reports, positive symptoms are, among other assessment tools such as SSPI or SAPS, most widely assessed by positive scale of the Positive and Negative Syndrome Scale (PANSS) (Maj et al., 2021).

With regards to treatment options aimed at improving positive symptoms; although different psychopharmacologic interventions might show different efficacy levels on positive symptoms (Huhn et al., 2019), antipsychotic medications are strongly recommended, especially for the patients in acute stages (Maj et al., 2021).

Importantly, along with psychopharmacologic interventions, Cognitive-Behavioral Therapy (CBT) as a psychotherapeutic intervention have been found to be effective in improvement of positive symptoms among moderately ill patients (Bighelli et al., 2018). Furthermore, it has been shown that certain cognitive biases contribute to the formation and maintenance of positive symptoms in general and delusions in particular (Bell et al., 2006; McLean et al., 2017; Moritz, Pfuhl, et al., 2017). Consequently, in addition to psychopharmacological treatments and psychotherapeutic interventions like CBT, interventions targeting these biases such as Metacognitive Training (MCT), have been shown to reduce positive symptoms (Eichner & Berna, 2016; Liu et al., 2018).



1.1.1.1.1. Delusions

“...To be mad was to be deluded.” (Jaspers, 1963 p.78)

Since time immemorial every society has labeled some of its members who act seemingly irrational as “*mad*” (Horwitz, 2019). Likewise, discussions questioning the nature of mental disorders, their causes and the classification of the disorders trace back to pre-Hippocratic times (for an elaborate reading on the history of mental disorders and history of psychiatry, see: Ahonen, 2014; Coleborne, 2020; Eghigian, 2017; Ellis et al., 2021; Wallace & Gach, 2008). Further, as reflected in the above quote by Jaspers, “*madness*” has been historically tightly associated with delusions (Carota & Bogousslavsky, 2019). At the present time having been considered as one of the defining symptoms of psychotic disorders in psychiatric diagnostic manuals (American Psychiatric Association, 2013); delusions lead to severe distress; impair social functioning heavily; and have been linked with lower levels of wellbeing (Baker et al., 2019; Broyd et al., 2017).

Despite the existence of multiple definitions of delusions, cardinal psychiatric diagnostic manuals and psychiatry textbooks follow Karl Jasper’s criteria in defining delusions (Feyaerts, Henriksen, et al., 2021). Accordingly, delusions are canonically known as “firmly held incorrigible beliefs in the face of contrary evidences” (American Psychiatric Association, 2013). (For a comprehensive historical overview of definitions of delusions as well as other symptoms by scholars from different school of thoughts from all over the world since 19th century, see: Berrios, 1991). Therefore, in accordance with this definition, for a belief to be regarded as a delusion, the following criteria must be met: a) its content must be bizarre, false or impossible; b) it must be incorrigible by counter evidences or rational arguments; c) it must be held with firm conviction (Feyaerts, Henriksen, et al., 2021).

Delusions can be sorted into different groups in terms of their content (i.e. themes): for instance, delusions of persecution (“*My water is being intoxicated by FBI*”), delusions of control (“*My mind is being controlled by my neighbor*”), *Capgras* delusions (“*My husband has been replaced by an identical looking imposter*”) or delusions of grandiosity (“*I am the Jesus*”) can be counted as different examples of various delusional themes (Bell et al., 2006; Carota & Bogousslavsky, 2019; Heilskov et al., 2020). However, despite the existence of multiple delusional themes, it should be noted that majority of delusional ideations pertain to social world and especially to allegedly malicious intentions of other people (Bell et al., 2021;

Wellstein et al., 2020). Notwithstanding this apparent social nature of delusions, most of the accounts do not consider social and relational elements as a focus in explaining delusions (Bell et al., 2021; Ward & Garety, 2019).

Another debate pertaining to the nature of delusions examines whether delusions are pathological beliefs *per se* (i.e., are they beliefs in essence at all?) or they are different kind of mental phenomena, for example in the form of “*imaginations*”, “*experiences*” or “*linguistic acts*” (Bebbington & Freeman, 2017; Bell et al., 2021; Connors & Halligan, 2015, 2017, 2020; Sanati & Kyratsous, 2015; Williams, 2018). However, there is no empirical finding to support the belief-negative accounts (*for the origin of the terms "belief-negative" and "belief-positive", see: Bell et al., 2006*) which claim that delusions are qualitatively different than beliefs (Connors & Halligan, 2017). Moreover, belief-positive accounts of delusions challenged the belief-negative accounts with the empirical findings that demonstrate delusions are qualitatively no different than beliefs and additionally, cognitive processes and cognitive biases contribute to delusion formation and maintenance both in clinical as well as non-clinical subjects with delusion-like experiences (Bell et al., 2006; Connors & Halligan, 2020; Feyaerts, Henriksen, et al., 2021). As a fruitful result of these empirical findings, cognitive-behavioral interventions aiming delusion reduction have been developed and shown to be effective (Ward & Garety, 2019).

Despite the increased attention to delusion research over the past decades and notwithstanding the abundant competing accounts to delusions, the process of delusion formation and maintenance is still an incomplete puzzle to understand with possibly various cognitive, biological and environmental elements involved (Zamperoni et al., 2021). Different cognitive theories of and cognitive biases involved in delusion formation and maintenance will be explained in an elaborate manner in the following chapters however, as this study aims to do, future research should focus on the role of social processes and context in delusion formation and maintenance (Ward & Garety, 2019).

1.2. General Etiology of Psychosis

Despite years of research, neither the precise pathophysiological mechanism, nor any specific biological markers have been uncovered that may explain the pathophysiology and etiology of primary psychosis disorders (Onaolapo & Onaolapo, 2018; Winship et al., 2019; Zamanpoor, 2020). Nonetheless, just as all mental disorders, primary psychosis disorders have complex and multifactorial etiologies that involve interdependent and interacting elements contributing to underlying environmental, genetic and neurochemical mechanisms (Guloksuz & van Os, 2021; Hollander et al., 2020).

Below, some prominent neurochemical, genetic, environmental explanations and neurological findings concerning the etiology and the pathophysiology of psychosis will be briefly discussed and then, cognitive models of psychosis will be elaborated (for a detailed understanding readers are directed to Badcock & Paulik, 2020, p.37; Cunningham & Peters, 2014; Jaaro-Peled & Sawa, 2020; Onaolapo & Onaolapo, 2018; Stilo & Murray, 2019; Winship et al., 2019; Zamanpoor, 2020).

1.2.1. Neurochemical Explanations

Deviations in a variety of neurotransmitter systems such as dopamine (DA), glutamate and serotonin (5-HT) have been implicated in the pathophysiology of psychosis disorders (Onaolapo & Onaolapo, 2018). In this section, I will focus only on two prominent hypotheses that stipulate irregularities of the dopamine and glutamate transmitter systems.

The dopamine (DA) hypothesis is one of the most prominent neurochemical explanations (Badcock & Paulik, 2020, p.41). The DA hypothesis was first put forward after the introduction of the first antipsychotic drug chlorpromazine and its remedial effects was proven effective on psychotic symptoms in the 1950s (Stępnicki et al., 2018; Yang & Tsai, 2017). DA hypothesis relies on the indirect findings that amphetamine, as an agent that increases DA levels in the brain, induces psychotic symptoms and certain agents that decreases DA levels in the brain, reduce psychotic symptoms (Onaolapo & Onaolapo, 2018). DA hypothesis and its succeeding variations have created the ground for the development of over 60 antipsychotics to date (Cunningham & Peters, 2014). However, psychopharmacological treatments working as dopamine receptor antagonists show very little effect on neurocognitive deficits and negative symptoms (Winship et al., 2019; Yang & Tsai, 2017). Further, almost 30% patients exhibit only partial responsiveness to dopaminergic antipsychotics (Badcock & Georgie, 2020). Therefore, despite the important role of DA in the pathophysiology of psychosis, it does not fully explain the symptomatology. Hence, contributions of alterations in other neurotransmitter systems should also be addressed (Stępnicki et al., 2018) which brings us to the glutamate hypothesis.

As the most abundant transmitter in the mammalian brain, glutamate is the main excitatory transmitter (Yang & Tsai, 2017) and its pathways link the brain regions such as the cortex, the limbic system and the thalamus (Stępnicki et al., 2018). Irregularities in the glutamate system, to be more precise the hypo-functioning of the main glutamate receptor *N-methyl-D-aspartate* (NMDA), have been proposed to play a role in the pathophysiology of psychosis after a line of pharmacological studies demonstrated that drugs like *Dizocilpine* (MK-801) and Ketamine, which works as NMDA antagonists, induce psychosis-like positive and negative symptoms as well as cognitive deficits in healthy individuals and aggravates the symptoms of schizophrenia patients (Hu et al., 2015; Winship et al., 2019; Zamanpoor, 2020). Furthermore, considering the wide distribution of glutamate receptors in the brain, this model addresses to a more global cortical and subcortical mutilation compared to DA model, which

might help to account for the findings of abnormal perception and behavior observed in psychosis (Badcock & Georgie, 2020). Indeed, consistent administration of NDMA antagonists in rodents have been linked to behavioral and structural brain changes that bear resemblance to psychosis disorders in human subjects (Onaolapo & Onaolapo, 2018).

It should be noted that complex symptomatology of psychosis disorders including positive, negative, disorganized symptoms as well as neurocognitive deficits can only be insufficiently explained by a single-compound models (Badcock & Georgie, 2020; Onaolapo & Onaolapo, 2018). Further, studies investigating the role of neurotransmitters have had limited sample sizes and yielded inconsistent results between participants (Cunningham & Peters, 2014). Although neurotransmitter models of psychosis constitute the foundation of psychopharmacological treatments, specific causal pathways are still unknown and the non-homogenous symptom profile of psychosis can be best explained by integrated models (Badcock & Georgie, 2020; Cunningham & Peters, 2014).

1.2.2. Brain Structural and Functional Findings

It is well established that there are structural and functional alterations in the brain before, during and after the onset of psychosis disorders (Y. Chung & Cannon, 2015; Takahashi & Suzuki, 2018). Whether these alterations are neurodevelopmental or neurodegenerative in nature remains as an unsettled discussion (R M Murray et al., 2022; Stone et al., 2022). However, accumulating evidence supports the notion that psychosis disorders arise as neurodevelopmental disorders that follow a neurodegenerative trajectory (Reckziegel et al., 2022). Mild neurocognitive, social and motor disturbances in the early childhood during the prodromal stage hints to neurodevelopmental components and further anatomical alterations after the onset hints to neurodegenerative components (R M Murray et al., 2022; Reckziegel et al., 2022).

The gestation, that is, the pregnancy and the adolescence have been considered as two critical periods for the pathogenesis psychosis (Jaaro-Peled & Sawa, 2020; R M Murray et al., 2022). The gestation is a period of extreme neural vulnerability to *in utero* insults (Freedman et al., 2021), which is central to the *two-hit hypothesis* of schizophrenia (C. Davies et al., 2020). Findings reporting abnormal cerebral asymmetry and atypical surface morphology in schizophrenia have been regarded as *in utero* brain alterations, because cortical folding and lateralization mainly take shape during the gestation and these early alterations in the brain, in turn, have been partially linked to neurocognitive deficits and negative symptoms (Takahashi & Suzuki, 2018).

Adolescence is the second critical period where the conversion to psychosis occurs (Jaaro-Peled & Sawa, 2020; R M Murray et al., 2022). Excessive synaptic pruning during the adolescence has been proposed as a candidate mechanism leading to exacerbation, compatible with findings showing reduced cortical density (Jaaro-Peled & Sawa, 2020; Keshavan et al., 2020). Indeed, the largest-to-date meta-analysis demonstrated decreased cortical thickness among individuals at clinical high risk (CHR) state as well as similar alternations between CHR individuals who later developed psychosis to those previously demonstrated in clinical samples (Jalbrzikowski et al., 2021).

The most severe brain alterations occur right after the onset, that is, during the early stages of the disorder (Reckziegel et al., 2022). Decrease in gray matter volume in both hemispheres have been among the most replicated findings (Zhang et al., 2020) and linked with delusions and hallucinations (Song et al., 2015) and impaired social functioning (Romain

et al., 2019). Additionally, numerous studies have demonstrated that schizophrenia patients have a smaller hippocampus, amygdala, thalamus and accumbens compared to nonclinical individuals (Keshavan et al., 2020; Reckziegel et al., 2022). Recent findings further show that schizophrenia patients exhibit altered global structural connectivity and these alterations have been linked with impaired neurocognitive abilities (Holleran et al., 2020). For a summary of the consistently replicated findings with regards to alterations in the brain structure, function, connectivity and chemistry, see: (Keshavan et al., 2020; Romain et al., 2019).

Lastly, although neuroimaging studies have thus far made significant contributions, only a handful of findings are consistent and there are many shortcomings in the literature (Hager & Keshavan, 2015; Keshavan et al., 2020). Firstly, the majority of the studies have investigated clinical samples with manifest disorders or have had insufficient sample size (Zhang et al., 2020). Therefore, researchers should pay more attention on longitudinal studies in order to shed light on the timing and course of the morphological changes (Takahashi & Suzuki, 2018). Moreover, confounding effects of medications as well as other environmental and social hazards need further investigations (R M Murray et al., 2022).

1.2.3. Genetics, Environment and Their Interaction

According to the *two hit hypothesis*, the development of schizophrenia might be induced by genetic vulnerabilities (*first hit*) which predispose individuals to be more susceptible to later environmental insults (*second hit*) (Davis et al., 2016; Guerrin et al., 2021; Westhoff et al., 2021).

Indeed, findings from twin studies demonstrate that schizophrenia and related psychosis disorders are highly heritable with a concordance rate among twins up to 80% for schizophrenia and 73% for the wider phenotype (Hilker et al., 2018). Furthermore, family history has been considered as one of the most important risk factors and the lifetime risk of psychosis disorders have been linked with the number of relatives diagnosed with a psychotic disorder (Janoutová et al., 2016). However, despite findings demonstrating the heritability of the psychosis disorders; genetics research addresses to an inheritance involving multiple genes with small effect sizes or as an alternative explanation, multiple but rare genetic variants with large effect sizes (Corlett et al., 2010). Consequently, only a handful of phenotypic variance can be explained by genetic findings alone (Arango et al., 2021; Hollander et al., 2020). Furthermore, the contribution of the *shared environmental* elements between genetically close individuals must not be neglected (Badcock & Paulik, 2020, p.39).

Neither genetic nor environmental factors work in isolation and an interplay between multiple factors might best account for the complex etiology of the psychosis and other mental disorders (Guerrin et al., 2021; Yay et al., 2022).

Environmental insults that have been linked with psychosis risk can be broadly grouped into *early* and *late* factors (Guerrin et al., 2021). Obstetric complications, *in utero* viral infections, hazardous prenatal environment such as maternal malnutrition, psychosocial stress and antibiotic medications during pregnancy or childhood adversities are counted among early environmental factors, whereas minority status, urbanity, severe life adversities, drug abuse as well as tobacco smoking are regarded as later environmental factors; all of which have been associated with psychosis risk (Arango et al., 2021; Guerrin et al., 2021; Stilo & Murray, 2019; Uher & Zwickler, 2017).

Furthermore, evidence suggests that the timing of the interactions between *hits* might lead to different symptom presentations depending on the neurodevelopmental windows they correspond to (Davis et al., 2016; Erzin & Gülöksüz, 2021). Hence, a third factor, the *timing*

of the environmental insults, their complex interactions with one another as well as with the genetic vulnerabilities should also be taken into account (Arango et al., 2021). Additionally, the effects of environmental insults further depend on their duration and magnitude (Erzin & Gülöksüz, 2021). Recently, *Exposome Paradigm* offers a promising approach in illuminating these dynamic, complex and multilayered interactions (see: Guloksuz et al., 2018).

As concluding remarks, it can be said that a new understanding of the complex etiologies of mental disorders in general and psychosis disorders in particular is being formed according to which the contributions of genetics sparsely distributed across a great number of genetic variants with small effect sizes that are dependent on interacting environmental factors and not entirely unique to a single phenotypic variance (Uher & Zwickler, 2017). This is why, much more nuanced studies with broader sample sizes, higher statistical power and higher quality of measurements as well as animal and longitudinal studies should be employed in order to tackle with the multilayered complexity of the etiology of psychosis disorders (Erzin & Gülöksüz, 2021; Guerrin et al., 2021; Uher & Zwickler, 2017).

1.3. Cognitive Theories of Delusions

Cognitive theories of delusions focus on the role of cognitive, social and emotional processes in the formation and maintenance of delusions (Badcock & Paulik, 2020, p.11). According to these doxastic, that is, *belief-positive* (Bell et al., 2006) approaches, delusions are pathological forms of beliefs (Bortolotti & Miyazono, 2015) and crucially, the appraisals, that is, interpretations and meanings attributed to the anomalous beliefs and experiences by the deluded individual are of critical importance in the conversion of beliefs to delusions (Badcock & Georgie, 2020, p.11; Broyd et al., 2017; Ward & Garety, 2019).

In line with the current conceptualizations of delusions as fixed false beliefs, it is the *persistent irrationality* that differentiates delusions from non-pathological beliefs (Sakakibara, 2016) and consequently, not all but majority of the cognitive theories of delusions focus on the role of impairments in the reasoning process or cognitive biases in the information processing and integration (Bell et al., 2021; Gold, 2017). Of note, by describing the causal cognitive mechanisms of delusions, cognitive theories facilitate the development and improvement of meta-cognitive (Fekete, Vass, Balajthy, Tana, Csaba Nagy, et al., 2022; Penney et al., 2022) and cognitive-behavioral interventions (Lincoln & Peters, 2019) that aim to ameliorate the rational assessment (of the reality) and the re-conceptualization of the delusional appraisals (Badcock & Georgie, 2020; Feyaerts, Kusters, et al., 2021).

The last decades have witnessed an upsurge in the number of cognitive theories that attempt to explain delusions (Ashinoff et al., 2021; Carota & Bogousslavsky, 2019; Connors & Halligan, 2015; Feyaerts, Kusters, et al., 2021). These theories can be sketchily grouped into three camp: a) single-factorial models that primarily focus on the aberrant perceptual experiences (H. D. Ellis & Young, 1990; Maher, 1988); b) two-factorial models that focus on the impairments in reasoning, perception and autonomic processes (Coltheart, 2013; Coltheart et al., 2011; M. Davies et al., 2001; P. A. Garety et al., 2001) and c) (meta)cognitive biases related to reduced acceptance threshold, biased data gathering and evidence integration (Balzan & Moritz, 2020; R. Dudley et al., 2016; McLean et al., 2017; Moritz, Pfuhl, et al., 2017; Veckenstedt et al., 2011; Woodward et al., 2006).

It should be noted here that while some cognitive theories attempt to tackle with particular mono-thematic delusions such as persecutory delusions or delusions of reference (Bentall et al., 1994; Hadyn D. Ellis & Lewis, 2001; Christopher Donald Frith, 2014); we are concerned with grouping the cognitive models those are applicable to all delusions regardless

of the content. However, interested readers are referred to (Bell et al., 2006; Connors & Halligan, 2015, 2020) for a comprehensive overview.

According to single-factorial models, delusions are the subjective explanations and therefore *rational* responses in the face of aberrant but *genuine* perceptual input experienced by the deluded individual (H. D. Ellis & Young, 1990; Maher, 1988). Although this account might be successful in explaining the content of a variety of mono-thematic delusions such as *Capgras* delusions, they are insufficient in explaining why a delusional explanation is not the choice of every individual with similar experiences and why deluded individual goes with the implausible interpretation instead of the plausible one to begin with (Broyd et al., 2017; Feyaerts, Henriksen, et al., 2021). Moreover, and crucially, delusions are not just bizarre but also notably fixed (Carota & Bogousslavsky, 2019; Feeney et al., 2017) and single-factorial models might be inadequate to explain the maintenance of the delusional ideation (Connors & Halligan, 2020).

These critiques to single-factorial theories inspired researchers to suggest a necessary second factor for the formation and maintenance of the delusions (Connors & Halligan, 2020; Feyaerts, Henriksen, et al., 2021). While different researchers have proposed various candidates as the second contributing factor, Langdon and Coltheart's two-factorial model (Coltheart et al., 2011; M. Davies et al., 2001; Langdon & Coltheart, 2000) has been claimed to be the most detailed and influential account among others (Connors & Halligan, 2020). According to this model, the first factor is a neuropsychological irregularity that leads to anomalous perceptual, emotional or autonomic process mainly responsible for the content i.e. theme of the delusion; whereas the second factor, which has been linked to a non-specific irregularity in the belief evaluation process, is primarily responsible for patients' failure to ignore the implausible, that is, delusional explanation and thus the maintenance of the delusion (Coltheart, 2013; Coltheart et al., 2011; M. Davies et al., 2001; Langdon & Coltheart, 2000). Despite being perhaps more elaborate than one-factorial theories, Langdon and Coltheart's two-factorial model has also been subjected to several critiques (for a detailed examination of the model, see: Connors & Halligan, 2020; Miyazono & McKay, 2019). However, one crucial limitation of this model that is further relevant for the current study is that, two-factorial model fails to explain the continuity of the delusion-like experiences among non-clinical population (Heilskov et al., 2020; Linscott & Van Os, 2013; Jim Van Os, 2003). Moreover, considering the high prevalence of delusions among clinical population

(Bronstein et al., 2019), it is improbable for these two irregularities to *co-occur* among all patients with delusions (Connors & Halligan, 2020; Miyazono & McKay, 2019).

The third and last camp of cognitive theories to delusions includes a variety of cognitive biases that have been linked to delusion formation and maintenance (Bronstein et al., 2019b). An inclination towards reaching a decision based on little information, known as Jumping to Conclusions bias (JTC) (Moritz & Woodward, 2005; Van Dael et al., 2006), which might stem from a lowered decision threshold, known as Liberal Acceptance account (Moritz et al., 2016; Moritz & Woodward, 2004); an inclination towards neglecting evidence that contradicts one's belief, known as the Bias Against Disconfirmatory Evidence (BADE) (Moritz & Woodward, 2006; Speechly et al., 2012; Woodward et al., 2006); an inclination towards embarking on the evidence that fits to one's belief (Speechley et al., 2010) are some of the cognitive biases that have been putatively contribute to delusion formation and maintenance, as demonstrated by recent studies and meta-analyses (Broyd et al., 2017; Dudley et al., 2016; Eifler et al., 2014; McLean et al., 2017; Speechley et al., 2012). Nevertheless, how these biases emerge, whether they are interrelated or play a direct causal role in the formation and maintenance of delusions should be further investigated (Bronstein et al., 2019; Moritz et al., 2010).

The cognitive biases that constitute the anchor of the present study and the paradigm will be elaborated in a detailed fashion in the following section.

1.3.1. Cognitive Biases in the Formation and Maintenance of Delusions

Since the late 1980s (Huq et al., 1988), cognitive researchers have been increasingly focusing on the role of cognitive biases in the formation and maintenance of delusions (Scheunemann et al., 2020). As opposed to impairments in neurocognitive abilities which lead to overall poor cognitive performance (Moritz et al., 2010, 2016); cognitive biases reflect the aberrances in the way of information perception, evaluation and retrieval (Balzan & Moritz, 2020; Gaweda & Prochwicz, 2015; Moritz et al., 2010). Therefore, cognitive biases can be better addressed as *thinking styles* rather than impairments (Balzan & Moritz, 2020). Moreover, cognitive biases are ubiquitous and can be observed commonly within clinical as well non-clinical population and hence, are not abnormalities *per se* (Pohl, 2016).

Approaching delusions from the lens of cognitive biases has several positive implications: a) their prevalence among not just within clinical but also within otherwise healthy general population helps with reducing the stigmatization which people with mental illnesses face with (Balzan & Moritz, 2020) and b) several studies and meta-analyses have shown that cognitive biases are amenable to change and thus –for that matter – delusions are likely amenable to improve as well (Fekete, Vass, Balajthy, Tana, Nagy, et al., 2022; Moritz et al., 2022; Penney et al., 2022). Consequently, this approach helps with weakening the illusion of poor outcome / poor recoverability (Guloksuz & van Os, 2021).

In the next sections, cognitive biases that constitute the hinge of the current study and the paradigm, respectively, Jumping to Conclusions (JTC), Bias Against Disconfirmatory Evidence (BADE) and Liberal Acceptance account (LA) will be explained in a detailed fashion.

1.3.1.1. Jumping to Conclusions Bias (JTC)

Following Hemsley and Garety's initial proposal (Hemsley & Garety, 1986) which asserts that deluded schizophrenia patients might exhibit deviances in their reasoning process compared to healthy controls, empirical research on the subject started with the pioneering study of Huq et al. (1988) where a probabilistic reasoning task was used, commonly known as *the Beads Task*.

The task consists of the following steps: participants are first presented with two different boxes or jars (say, X & Y boxes) containing different colored beads in different but complementary ratios (for example, X: %15 Blue, %85 Red and Y: %85 Red, %15 Blue). The boxes are then hidden from the participants' view. Later, participants are informed that the experimenter will draw beads one by one from only one box. Subsequently, depending on the employed variation of the task: either (a) the participants are expected to provide *likelihood* estimates of the source box at the each stage of the drawing procedure (*It was drawn from definitely or almost certainly or probably from X box or a decision has yet to be arrived*). This is known as the "probability estimates" variation. The "draws to decision" (DTD) (b) variation, on the other hand, refers to the stage at which participant has reached a decision with regards to the source box (P. A. Garety et al., 1991; Huq et al., 1988).

Especially when the draws to decision procedure was employed the results were in favor of the initial proposal of Hemsley and Garety, which asserts that deluded patients demonstrate deviances in logical inference in the form of arriving premature decisions based on little information (P. A. Garety et al., 1991; Huq et al., 1988). It was shown that healthy controls generally did not arrive to a decision after the first two or third beads and further asked for additional beads; while deluded patients, conversely, terminated their decision making process after fewer draws. Indeed, a range of studies has found that up to 70% of deluded patients arrive to a decision after only one bead (Moritz & Woodward, 2005; Watanabe et al., 2021). Thereupon, this hasty decision making pattern based on relatively little information was named as *Jumping to Conclusions* (hereafter: JTC) and JTC is one of the most replicated cognitive bias to date that supposedly contribute to delusion formation and/or maintenance (Ashinoff et al., 2021; Broyd et al., 2017; Reininghaus, Oorschot, et al., 2019).

Despite its frequent employment in the JTC literature, many researchers pointed out several methodological limitations regarding the reliability and interpretability of the initial beads task (Balzan et al., 2012; Fine et al., 2007; Moritz et al., 2017; Moritz & Woodward, 2004; Pytlik et al., 2020; Sulik et al., 2022). For instance, while impulsivity (Strube et al., 2022) and motivation (Moreno-Fernández et al., 2021; Moritz et al., 2006) have been rendered unlikely as reasons for hasty decision making, however intelligence (Tripoli et al., 2021) or miscomprehension of the task procedure (Balzan et al., 2012; Sulik et al., 2022) might be a potential confounding factor which may inflate JTC in the patient group.

Moreover, it was also suggested that it is illegitimate to conclude that deluded patients have inferior reasoning and it is in fact healthy subjects who are indecisive and *conservatively biased* in a condition with 85:15 ratio according to Bayesian inference (Ashinoff et al., 2021; Maher, 1999, 2006; Moritz, Balzan, et al., 2017; Pytlik, Soll, Hesse, Moritz, et al., 2020). Hence, it is also of importance to consider the probability of a correct decision, while such a reasoning style might be described as risky (Moritz et al., 2016) but is not always premature (Pytlik, Soll, Hesse, Moritz, et al., 2020).

Following such critiques, several modifications were made to the task with regards to the color ratios or the number of boxes; however, there is no explicit evidence that premature decision making changes with the number of boxes and the two-boxes version of the beads task remains the most commonly employed one (So et al., 2016).

Another limitation regarding the beads task concerns the ambiguity between decision making and confidence by asking them to decide *only when* they are completely sure (Moritz, Balzan, et al., 2017). Hence, premature decision making might reflect overconfidence or an inclination to risk taking. Yet, studies that investigate overconfidence and decision making separately indicates findings for a greater JTC in individuals with a higher liability to psychosis (Andreou et al., 2014; Moritz et al., 2019). In the same vein, another issue revolves around the cut-points or the precise operationalization of the premature decision making including presence or absence of JTC (defined by DTD after 1 or 2 beads), probability estimates, subjective confidence in decisions, and accuracy of decisions (Pytlik, Soll, Hesse, & Wagner, 2020; So et al., 2016). Therefore, tasks (such as: Moritz et al., 2006) that enable measurements of probability estimates and decision points separately which allows the detection of the point at which probability estimates translate into decisions are critical to

avoid confusion between measurements of different constructs (Fine et al., 2007; Pytlik, Soll, Hesse, Moritz, et al., 2020; Sulik et al., 2022).

Ultimately, such critiques led to newer experimental paradigms that were created to address or circumvent methodological caveats: such as, *the two schools task* (R. E. J. Dudley & John, 1997); a paradigm that was developed with the inspiration from the *Who Wants to Be a Millionaire* television game show (Moritz et al., 2006); *the fish task* (Woodward et al., 2009); *naming the paintings task* (Moritz et al., 2009); *the picture to decision task* (Rubio et al., 2011); *the box task* (Moritz et al., 2017), and very recently, an *advice-weighting task* (Scheunemann et al., 2020).

JTC have been investigated not only with a variety of paradigms with deluded schizophrenia patients but also among diverse clinical (Langdon et al., 2014; Moritz et al., 2012; So et al., 2016), at high risk (Catalan et al., 2020; Rausch et al., 2016) as well as non-clinical (Freeman et al., 2008; Robert M. Ross et al., 2016; Robert Malcolm Ross et al., 2015; Van Der Leer et al., 2015) populations (Tripoli et al., 2021).

The relatively rich JTC literature has eventually led to four meta-analyses to date (R. Dudley et al., 2016; McLean et al., 2017; Robert Malcolm Ross et al., 2015; So et al., 2016) and these taken together, meta-analytic data posits that JTC bias is strongly and specifically associated with delusions and delusion-proneness but not with a diagnosis of schizophrenia or another psychiatric disorder. However, according to Pytlik et al., (2020) majority of the studies included samples consisting of otherwise healthy delusion-prone individuals instead of psychotic patients and hence, generalizations based on such results are hard to make. It is also worth noting that, several individual studies did not find significant differences between deluded and non-deluded groups however these insignificant results were attributed to methodological issues of the beads task as well as small sample sizes (Broyd et al., 2017). To wrap up, relationship between JTC, delusional ideation and particularly positive symptoms might be less significant than previously thought (Pytlik, Soll, Hesse, Moritz, et al., 2020), however, meta-analytic data implies that JTC might play a role as a “trait representing liability to delusions” (Bell et al., 2006; R. Dudley et al., 2016; Peters & Garety, 2006).

With regards to relationship between JTC and neurocognition, some studies implicated specific linkages with neuropsychological impairments in verbal and working memory (Moritz et al., 2016; Watanabe et al., 2021) However, most recent studies demonstrate that JTC in psychosis is not a neurocognitive impairment *per se* and JTC among PLEs is not

linked to general intelligence (IQ) (Tripoli et al., 2021). Furthermore, it was previously shown that a reduction in JTC does not necessarily co-occur with an improvement in neurocognition (Moritz et al., 2015), which hints at the metacognitive nature of the JTC (Arnon-Ribenfeld et al., 2017; Buck et al., 2012; Moritz et al., 2015).

Notwithstanding the relatively rich literature, research on JTC still has some shortcomings to address. For example, the core cognitive operation underlying the JTC should be further investigated (Broyd et al., 2017). One potential explanation towards that aim, that is, the Liberal Acceptance account (Moritz et al., 2006), will be elaborated in the next section. Furthermore, whether there is any relationship with JTC and other biases, and if so, in which ways, is still unclear (Bronstein et al., 2019; Moritz et al., 2010). Another question that should be addressed is that whether JTC is differently associated with specific delusion subtypes (Díaz-Cutraro et al., 2021; Pytlik, Soll, Hesse, Moritz, et al., 2020). Since some metacognitive interventions have been potent in decreasing the JTC and improving the delusional ideation (Catalan et al., 2020; Fekete, Vass, Balajthy, Tana, Csaba Nagy, et al., 2022; Penney et al., 2022), illuminating the relationship between JTC and specific delusion subtypes might further tailor the therapeutic outcomes (Díaz-Cutraro et al., 2021). Moreover, more longitudinal research is needed in order to better understand the causal role of JTC in the pathogenesis and progression of psychosis (Rauschenberg et al., 2021). Additionally, in addition to schizophrenia and other primary psychotic disorders, JTC should be further investigated in other mental disorders where the psychotic features might be present at times (Balzan et al., 2022; So et al., 2016).

Lastly and most relevantly to the current study, a tendency to make hasty decisions might also be present in daily interpersonal interactions (Cavieres et al., 2022; Lincoln et al., 2011) and considering the social and interpersonal nature of delusions (Bell et al., 2021; Ward & Garety, 2019); future studies should primarily focus on the relationship between social cognitive functioning, JTC and delusional ideation.

1.3.1.2. Bias Against Disconfirmatory Evidence (BADE)

Although difficulties in belief revision and unwillingness to change one's opinion are human nature to some degree, they are more pronounced among individuals with delusions (Bronstein & Cannon, 2018; Veckenstedt et al., 2011). Moreover, as noted earlier, incorrigibility is one of the most crucial aspects of delusions (Bronstein & Cannon, 2017; Carota & Bogousslavsky, 2019; Feeney et al., 2017).

According to Freeman, Garety and colleagues (Freeman et al., 2002; P. A. Garety et al., 2001) there are two cognitive mechanisms underlying and further consolidating the incorrigibility and maintenance of delusions: (a) acquiring delusion-congruent (or, *delusion-confirmatory*) information and (b) disregarding delusion-incongruent (or, *delusion-disconfirmatory*) information.

The jumping to conclusions bias that alters data gathering (P. A. Garety et al., 1991; Henquet et al., 2022), the attributional bias that leads to attribution of the causes of negative events to external factors or other people (Aakre et al., 2009; Bentall et al., 2001; Kinderman & Bentall, 1997; Miyazono et al., 2006), and impairments in theory mind that leads to misreading or misunderstanding of intentions and mental states of others (Bora et al., 2009; Corcoran et al., 1995; Dorn et al., 2021) have been implicated as contributing factors in the acquisition of delusion-confirmatory information. Moreover, these biases implicated in the acquisition of the delusion-confirmatory information have been studied and evidenced with delusion-neutral materials and hence, are generalizable and not exclusive to delusional ideation (Woodward et al., 2006).

On the other hand, disregarding delusion-*disconfirmatory* information has been proposed to arise from fitting the incongruent information into delusional narrative (Broyd et al., 2017; Eisenacher & Zink, 2017; Woodward et al., 2006). However, whether disregarding disconfirmatory information is specific to delusional themes and emotionally-charged materials or whether it extends beyond the delusions; that is, whether deluded individuals have a generalized bias against disconfirmatory evidence (*BADE*) and are less likely to query false beliefs *in general* has not been satisfactorily studied (Eisenacher & Zink, 2017; Howe et al., 2018; Moritz & Woodward, 2006; Sanford et al., 2014) until the chief studies of Woodward, Moritz and colleagues (Moritz & Woodward, 2006; Woodward et al., 2006).

In pursuit of illuminating whether deluded patients demonstrate a generalized BADE, Woodward, Moritz and colleagues created a novel paradigm whereby deluded, non-deluded and healthy participants were presented with delusion-neutral scenarios depicted in three successive pictures which increasingly disclose the ambiguity of the scenario (Woodward et al., 2006). Four interpretations were accompanying the pictures at the each step of disambiguation: one true interpretation that initially seems implausible but gains plausibility increasingly and eventually turns out to be true; two lure interpretations that were designated to be seem plausible at first but lose plausibility with each successive picture and finally turn out to be false; and one absurd interpretation that was implausible and unrelated to the scenario at all stages. Participants were requested to rate the plausibility of *each* interpretation and if necessary, adjust their ratings with each successive sentence. This study yielded two significant results: Firstly, schizophrenia patients were less likely to reduce their plausibility ratings for lure interpretations compared to healthy participants and this pattern was even more pronounced among currently-deluded patients. This bias, then, was conceptualized as Bias Against Disconfirmatory Evidence (BADE). Secondly, compared to healthy controls, schizophrenia patients gave higher plausibility ratings to absurd interpretations regardless of their current delusional status. The importance of this second finding with regards to its association with Liberal Acceptance account of schizophrenia (Moritz, Pfuhl, et al., 2017) will be further elaborated in the next section.

Following this preliminary study, Moritz and Woodward (Moritz & Woodward, 2006) aimed to replicate the initial findings with a similar but less complex “closure” task whereby participants were presented with a series of pictures instead of detailed scenarios. According to the task, the picture of a common object (e.g., an elephant) was disambiguated step by step over a sequence of up to eight pictures (that is, the defining features of the said object were made more distinguishable). Participants were then expected to rate the likelihood of the interpretations of what each picture fragment could possibly depict. The findings of the study were consistent with the main BADE hypothesis: compared to healthy participants and other psychiatric controls, schizophrenia patients were less likely to downgrade their ratings for incorrect interpretations while all groups did not demonstrate a significant difference in upgrading of correct interpretations. This latter finding further implicated that this biased response pattern could not be due to a general response perseverance or inattentiveness.

In the progress of BADE research, the paradigm was then modified and in this modified version, instead of pictures, scenarios consisting of three successive sentences which

increasingly disclosing a situation were used (Veckenstedt et al., 2011; Woodward et al., 2008). This version of the BADE task has then become the most commonly used one (Bronstein & Cannon, 2018). The study of Veckenstedt and colleagues is of particular importance while they simultaneously looked at the BADE, JTC, decision threshold (the importance of which will be elaborated in the Liberal Acceptance account section) and their relationship with symptom profile (Veckenstedt et al., 2011). The study yielded evidence that schizophrenia patients, regardless of their delusion status, did not show impairments in integration of confirmatory evidence yet demonstrated a strong BADE compared to healthy controls and OCD patients.

Considering the potential role of BADE in incorrigibility of delusions, further research needed to investigate whether BADE has the quality of a trait rather than a state marker (McLean et al., 2017; Veckenstedt et al., 2011). Indeed, majority of the findings were obtained from studies with patients with an established schizophrenia diagnosis; thus, longitudinal studies, studies with CHR individuals, studies with individuals at early stages of psychosis and recently, in line with the continuum approach of psychosis, studies with PLEs should be given more focus (Eisenacher & Zink, 2017). With regards to this latter group, very recently, Scheunemann and colleagues (Scheunemann et al., 2020) created a new advice weighting paradigm to capture both JTC and BADE among high and low PLEs. However, contrary to expected, they found no impairments in belief revision among high PLEs. With that said, researchers attributed the controversial findings to the novelty of the task (i.e., internal validity), demographic differences among groups and the difficulty of determining a correct answer in such a task with social nature (Scheunemann et al., 2020).

Overall, meta-analytic evidence suggests that BADE is associated with delusional severity and the relationship between delusions and BADE could be a causal one, while it covaries with delusions overtime and is more pronounced during the acute phases of the psychosis (McLean et al., 2017). In the light of these findings, some researchers argue that since BADE could be observable over different stages of psychosis, it can be considered as a cognitive marker of the psychotic state (Eisenacher & Zink, 2017). This is of importance, while if this is the case, then the implementations of necessary therapeutic interventions that targets impaired evidence integration during the early stages of the illness could potentially reduce symptom severity and even lead to a better prognosis (Eisenacher & Zink, 2017; Kotowicz et al., 2020).

Finally, as addressed by some researchers, BADE and whether it is specifically related to delusions or explicit to schizophrenia diagnosis in general have not been investigated in depth as much as JTC (McLean et al., 2017), therefore more comparative studies investigating different groups with respect to diagnosis or comparing psychosis at different stages as well as longitudinal studies are necessary. Moreover, although the suggestion that JTC and BADE contribute to delusion formation and maintenance seems valid, exact relationship between JTC, BADE and other biases are far from being satisfactorily understood; with this aim in mind more focus should be given to the studies that investigates both biases synchronously (Kotowicz et al., 2020). Lastly, considering the social nature of delusions, novel paradigms that concurrently taps into socio-cognitive as well as evidence integration abilities of the deluded or delusion-prone individuals should be conceived, which, the current study aims to do.

1.3.1.3. Liberal Acceptance Bias and the Two-Stage Cognitive Theory of Positive Symptoms

While a plethora of research yielded consistent results with regards to the association between JTC, BADE and delusions (Watanabe et al., 2021), the exact mechanisms underlying JTC and BADE or their precise role in delusion formation and maintenance are far from being satisfactorily understood (Strube et al., 2022). However, recently presented two-stage cognitive theory of positive symptoms at the center of which liberal acceptance (LA) bias is located (Moritz, Pfuhl, et al., 2017) provides a candidate explanation.

1.3.1.3.1. Liberal Acceptance Bias (LA)

LA bias (or a lowered decision threshold) roughly refers to a tendency to attribute higher plausibility to weakly supported evidence and thereby acceptance of hypotheses that would be deemed improbable or rejected by others (Moritz, Pfuhl, et al., 2017). Some researchers argue that LA might underlie the JTC bias in special cases (Moritz et al., 2016, 2020; Panula et al., 2022, PREPRINT; Reininghaus et al., 2019).

The questions concerning the generalizability of the JTC bias across different tasks led researchers to dig deeper. Because despite the relatively consistent findings of a JTC bias among deluded patients when the classical beads task with two alternatives (*low ambiguity situation*) is employed, when participants presented with multiple alternatives (*high ambiguity situation*) studies have found a weaker JTC effect (Broyd et al., 2017).

With the aim of illuminating this inconsistency and underlying mechanisms of JTC, Moritz and Woodward (Moritz & Woodward, 2004) created a novel paradigm. In this paradigm, SZ patients and HCs were asked to rate the plausibility of *multiple* interpretations for the pictures that were taken from the Thematic Apperception Task (TAT). The findings of the study sowed the initial seeds of the idea for a lowered threshold among deluded patients. In this high-ambiguity task, SZ patients gave higher plausibility ratings for alternatives that were deemed as improbable by HCs. Furthermore, SZ patients did *not* show an inclination to hastily reject multiple alternatives by hanging onto one; while in fact it was the control group who was more selective by ruling out implausible options rather hastily.

To further consolidate the idea and gather more evidence, in a follow-up study Moritz and colleagues created another paradigm inspired from the *Who Wants to Be a Millionaire* TV game show (Moritz et al., 2006c). In this study, SZ patients and HCs were asked knowledge

questions accompanied by four response options. Participants were expected to provide likelihood estimates for each option. Additionally, whenever participants felt confident over the falsity or correctness of an option, they were asked to indicate this via a rejection or decision rating; which allowed for the separate assessments of probability ratings and decisions. Results showed that SZ patients did not differ in their probability estimates from HCs, yet they gave more incorrect answers. Moreover, SZ groups' minimum plausibility ratings for arriving a decision was significantly lower than HCs. Therefore, results were interpreted as a reflection of an enhanced readiness to convert probability ratings into decisions.

In the light of these findings it was proposed that SZ patients require less information to accept options, however—and importantly—this decision making pattern does not necessarily imply for a JTC bias. In classical JTC tasks with limited number of alternatives (usually, two) that are mutually exclusive and very distinct from each other in terms of probability (low ambiguity); a hasty decision in favor of the preponderant alternative would be expected. *However*, in the face of multiple alternatives that are close to each other in terms of probability (high ambiguity), due to reduced decision threshold a delayed decision making would be expected, since multiple options are considered as plausible (Moritz et al., 2007, 2016). Hence, what may seem like a hasty decision making at the face value would be better described as a readiness to accept alternatives that would normally be rejected by healthy controls (Moritz, Scheunemann, Lüdtke, et al., 2020).

Successive studies using different paradigms replicated the evidence of LA among people with psychosis (Moritz et al., 2016; Moritz, Scheunemann, & Peters, 2020; Moritz, Scheunemann, Lüdtke, et al., 2020; Veckenstedt et al., 2011) as well as FEPs (Panula et al., 2022, PREPRINT; Reininghaus et al., 2019). Moreover, LA was associated with anomalous experiences among individuals with at-risk mental state but was not correlated with the severity of delusions (Reininghaus, Oorschot, et al., 2019).

Lastly, although a limited but growing number of studies are suggestive of the LA as a potentially contributing factor in delusion formation, literature still has many questions to answer. For instance, studies hints at a waxing-and-waning nature of JTC bias (Moritz, Scheunemann, Lüdtke, et al., 2020) and decision threshold thus might be flexible under various conditions (Moritz et al., 2016). Therefore, while motivational alterations rendered as unlikely factors for a lowered decision threshold (Moritz, Scheunemann, & Peters, 2020), LA

and its interrelations with various moderators such as stress, emotional involvement, potential cost of false decisions or competency (subjective or objective) should be further investigated (Moritz, Pfuhl, et al., 2017). Moreover, although research to date have not found strong associations between the severity of delusions and LA, which tentatively implicates that LA might be a trait-like vulnerability factor (Moritz et al., 2017; Panula et al., 2022, PREPRINT; Reininghaus et al., 2019; Veckenstedt et al., 2011); longitudinal studies are necessary to properly examine whether it represents a trait-like vulnerability factor rather than a state-marker of acute psychotic episodes.

1.3.1.3.2. Two-Stage Cognitive Theory of Positive Symptoms

Liberal Acceptance, which is implicated in the JTC bias under certain conditions (see the section on LA), represents one foundational element of the recently proposed *two-stage cognitive theory of positive symptoms* (Moritz, Pfuhl, et al., 2017), which comprises the following stages: 1) belief formation and 2) belief maintenance.

In the belief formation stage, LA enhances the delusion formation by paving the way for fragile delusional ideations or “as if” feelings. To exemplify, everyone might generate strange ideas at times, such as: “that signal tone coming from the defective phone feels like a strange sign, like, they are wiretapping me”. However, while healthy individuals or non-deluded patients would not dwell on and reject such thoughts upon the retrieval of prior knowledge and/or in the light of new information, deluded patients attribute more plausibility to such absurd ideas. Indeed, deluded patients’ assign higher plausibility ratings for absurd hypotheses (McLean et al., 2017; Moritz & Woodward, 2006; Sanford et al., 2014; Veckenstedt et al., 2011) and display lowered decision thresholds (McLean et al., 2017; Moritz, Scheunemann, & Peters, 2020; Moritz, Scheunemann, Lüdtke, et al., 2020; Scheunemann et al., 2020; Veckenstedt et al., 2011).

Due to early termination of the decision process, additional information hinting at the correct hypothesis might go unnoticed. Hence, in comparison to non-deluded individuals, who gain more evidence and are thus more confident in their decisions, deluded individuals show less confidence in their decisions, even if they initially hold the correct hypothesis. This results with an *overconfidence in wrong judgments yet an underconfidence in correct judgments* (Balzan, 2016; Moritz et al., 2014; Moritz, Pfuhl, et al., 2017). However, this

pattern and its interrelation with different constructs such as competency should be further investigated. In line with this and very relevant to the current study, in SZ patients, overestimation of the competence have been repeatedly associated with poorer performance on socio-cognitive tasks (Durand et al., 2021; Perez et al., 2020).

In the second, that is, belief maintenance stage, these initial and rather fragile delusional ideations crystallize into firm beliefs. With the contributions of the confirmation bias and BADE, this crystallization occurs in two steps: a) consolidation of the belief and b) neglect of disconfirmatory hypotheses (Moritz, Pfuhl, et al., 2017; Moritz, Scheunemann, & Peters, 2020). Furthermore, the possible congruence between the current emotional state and delusional idea might augment this solidification (Bentall et al., 2014; Freeman et al., 2002; Freeman & Garety, 2014; Philippa A. Garety et al., 2005). Additionally, delusional idea is more likely to be endorsed if it provides a benefit and/or a meaning for the individual (Westermann et al., 2015).

To wrap up, as the founders of the theory acknowledges, two-stage cognitive theory of positive symptoms does not claim to bring a generalized explanation for all psychotic experiences and hence, does not argue against other cognitive theories of delusions. However, it might provide a parsimonious explanation for a subgroup of phenomena. Another important limitation concerns the causal relationships: that is, more longitudinal studies are needed for an investigation of the causal relationships between BADE, LA, overconfidence and possible mediators such as competency or stress. Lastly, although the name covers positive symptoms, accumulating evidence predominantly concerns the delusion formation and maintenance, yet the theory is less well established for hallucinations.

1.4. Social Cognition

Social cognition (SC) is an umbrella term referring to a set of cognitive operations that underlie social behavior and social interactions, including the perception and interpretation of and generating responses to the intentions, dispositions and behaviors of others and oneself (Green et al., 2019). Impairments in SC have been associated with impaired functional capacity as well as real-world functioning (Kharawala et al., 2022) and consequently, profoundly hamper daily interactions and quality of life (Okano et al., 2021). Moreover, meta-analytic evidence suggests that SC serves as a mediator between neurocognition (NC) and social functioning with SC accounts for much of the variation in functioning in comparison to NC, hence representing an important target for recovery (Galindo et al., 2021; Halverson et al., 2019; Javed & Charles, 2018; Kharawala et al., 2022; Okano et al., 2021; Schmidt et al., 2011).

Given its significance in functional and clinical outcomes, SC have been started to regarded as a cognitive domain on its own (Brunet-Gouet et al., 2021; Okano et al., 2021) and this motivated researchers to examine the subcomponents of SC. Although the classification of the subcomponents and the employed terminology might slightly differ (for a review, see: Lewandowski & Moustafa, 2019, p.73), four key subcomponents of SC are as follows; (a) emotion perception and processing: the ability to identify emotional cues from facial expressions and / or vocal prosody, (b) social perception and knowledge: the ability to understand social cues and act in accordance with social roles, societal norms and social context, (c) theory of mind (ToM): the ability to understand the beliefs, intentions and mental states of others and (d) attributional style / bias: the ability to explain the causes of social interactions (Galindo et al., 2021; M. F. Green et al., 2019; Kharawala et al., 2022; Pinkham, 2014; Pinkham et al., 2014).

Individuals with psychotic disorders display impairments on each of these subcomponents with the largest effect size for emotional processing, social perception and ToM (Galindo et al., 2021; Schulz et al., 2016, p.108; Vaskinn & Horan, 2020). Moreover, impairments in SC are already present upon the first episode of psychosis (M. F. Green et al., 2019) and accumulating evidence further implicates that such impairments might precede the onset of the illness and remains stable over time in pre-FEP, FEP, early and chronic phases of the psychotic disorder (Javed & Charles, 2018; Pinkham et al., 2014; Schulz et al., 2016, p.108). These findings suggests that SC impairments could represent a vulnerability factor

and thus an important target for early interventions (Javed & Charles, 2018; Pinkham et al., 2018). Additionally, research have addressed to deficits in SZ patients' self-assessment of subjective socio-cognitive abilities as well (Durand et al., 2021; J. M. Silberstein et al., 2018; Uchino et al., 2022).

Given the strong linkage between SC and functional outcomes, any attempt to enhance the daily lives of patients with psychotic disorders would be better if it adopts an understanding of their social cognitive difficulties (Galindo et al., 2021) and a better understanding of such difficulties would pave the way for better interventions and prevention strategies. Indeed, the last two decades have seen an upsurge in the development and improvement of the social cognition interventions with their effectiveness especially on emotion perception, ToM and social perception have been evidenced with recent meta-analytic findings (Nijman et al., 2020; Palumbo et al., 2022). However literature on SC interventions is limited and findings are inconsistent (Kharawala et al., 2022). Lastly, while interested readers can be directed to a recent book on SC in psychosis for a detailed review (Lewandowski & Moustafa, 2019), due to its relevance to the current study, I will now focus on the subcomponent of ToM.

1.4.1. Theory of Mind (ToM)

Theory of mind (ToM) (also known as mentalizing, mind-reading or mental state attribution) is broadly defined as the capability to represent the feelings, intentions and thoughts, i.e., mental states of others (Breil et al., 2021; Brüne, 2005; Frith & Frith, 2006). Moreover, studies and neuroimaging findings have demonstrated that ToM is possibly a multidimensional construct, consisting of two components: affective and cognitive ToM (Hynes et al., 2006; Raimo et al., 2022; Shamay-Tsoory & Aharon-Peretz, 2007). While cognitive ToM allows for an understanding of the thoughts, intentions and beliefs of others; affective ToM enables the empathetic evaluation of the others' emotions and feelings (Dorn et al., 2021; Raimo et al., 2022). An impact ToM is therefore of vital importance for successful navigation in daily interactions (Lizcano-Cortés et al., 2021). Indeed, studies have linked ToM difficulties among psychotic patients with problems in social functioning (Galindo et al., 2021).

It was Frith (Frith, 1992) who first associated ToM impairments with psychosis, postulating that impairments in ToM could be predisposing factors in delusion formation (Dorn et al., 2021; Lewandowski & Moustafa, 2019, p.12). Since then, studies and meta-analytic evidence have consistently demonstrated ToM impairments among people at ultra-high risk state for psychosis (UHRs), people with a first episode of psychosis as well as chronic psychotic patients (Galindo et al., 2021; Langdon et al., 2017; Lewandowski & Moustafa, 2019). With regards the symptom profile, ToM impairments were found to be more pronounced in the presence of disorganized and negative symptoms (Bora et al., 2009; Piovan et al., 2020; van Neerven et al., 2021). Moreover, it has been shown that ToM impairments are stable over time (Fernández-Modamio et al., 2018). And there is evidence that ToM impairments are present among unaffected first-degree relatives of the psychotic patients (Bora & Pantelis, 2013). Along with these findings, one recent meta-analysis on ToM and schizotypy (Bora, 2020) further found associations between ToM impairments with both negative and positive schizotypy, suggesting that ToM impairments might represent a vulnerability marker for psychosis.

With regards to the relationship between ToM and the presence as well as the severity of delusions, findings are inconsistent (Fernández-Modamio et al., 2018). While some studies found correlations between delusions and ToM impairments (Mehl et al., 2010; Park, 2018); others did not (Dorn et al., 2021). However this inconsistency could be due to employed task

variation or the evaluation of the task performance (i.e., simple dichotomous right or wrong answer format). It should indeed be noted that the reliability and validity of the most of the ToM tasks have been called into question (Hermans et al., 2019; Okano et al., 2021; Pinkham, 2014; Pinkham et al., 2014). With that said, according to the results of The Social Cognition Psychometric Evaluation (SCOPE) study, *Hinting Task* showed the strongest psychometric properties (Pinkham et al., 2018). In line with this, and relevant to the current study, ToM impairments among psychotic patients have been linked with problems in pragmatic aspects of language and this link have not associated with the deficits in general cognitive abilities, intelligence or executive functions (Champagne-Lavau et al., 2006, 2009; Piovan et al., 2020).

Additionally, despite the rich ToM literature, delusions and their possible associations with different ToM components have been investigated in only a few studies. According to the results of these studies, while delusions and positive symptoms were associated with impairments in cognitive ToM; negative symptoms have linked with impairments in affective ToM (Mehl et al., 2010; Montag et al., 2011; Shamay-Tsoory et al., 2007).

To conclude, accumulating literature and meta-analytic evidence demonstrate that irrespective of the nature of the employed tasks (i.e., verbal, visual or implicit, explicit) or the targeted constructs (i.e., first-order ToM, second-order ToM) patients with psychotic disorders display impairments in their ToM abilities (Bora & Pantelis, 2013; van Neerven et al., 2021). Considering the importance of ToM abilities with respect to social functioning and quality of life (Bora, 2017), ToM is an important target for interventions. Hence, impairments in different ToM components and their associations with specific symptoms should be further investigated.

1.5. Categorical versus Continuum Approaches to Psychosis

Dichotomic decisions are frequent in the care of patients—to treat or not to treat, to discharge from hospital settings or to hospitalize, to decide for a certain intervention or to not, and the like—requiring professionals to give diagnoses to those in need of care (Kendler, 2018). In assigning a diagnosis to patients, the predominantly employed psychiatric diagnostic manuals, DSM-5 (American Psychiatric Association, 2013) and ICD – 11 (WHO, 2018, <https://icd.who.int/browse11/l-m/en>) adopt a categorical approach in the classification of the mental disorders (Biondi et al., 2018; Cohen et al., 2021). According to this approach, defining the categories is based on the assumption that the signs and the symptoms of a particular disorder cluster together, correlate in a meaningful and reliable pattern and are distinguishable from those of other disorders (Badcock & Paulik, 2020, p.13; Biondi et al., 2018, p.4).

Advantages of categorical approach are multifold, such as: being clinically useful for defining the boundaries between pathology and non-pathology as well as by paving the way for a mutual language between professionals; being helpful for epidemiological studies and research for providing rigorous diagnostic standards, prevalence and incidence rates as well as etiological factors linked with the disorders (Badcock & Paulik, 2020, p.14; Biondi et al., 2018, p.4; Cardella & Gangemi, 2019).

Yet, despite their utility, the validity of categorical approach has been subject to much debate. Firstly, to cite from Cohen and colleagues (2021): *not all things fall naturally into categories*. Mental disorders are complex and heterogeneous phenomena. Empirical investigations targeting to define clear-cut boundaries between different disorders have thus far yielded unsatisfactory outcomes (Potuzak et al., 2012; Reininghaus, Böhnke, et al., 2019). At clinical presentation (i.e., phenotypic), neurobiological as well as genetic level, elements associated with a specific diagnosis might differ significantly across individuals with the same diagnosis and might overlap to an important extent with other diagnoses (Cohen et al., 2021). Thus, according to its opponents, categorical approach is inadequate to represent the high heterogeneity of the clinical presentation of a patient group with the same diagnosis; is rather ineligible for distinguishing the severity of the symptoms, is of less utility for subclinical cases and has challenges in classifying patients with atypical symptoms, hence includes very ambiguous “not otherwise specified” categories (Potuzak et al., 2012; Ravichandran et al., 2021; Reininghaus, Böhnke, et al., 2019).

The symptom overlap, hence unclear boundaries between the disorders under the same category as well as diversity of the clinical presentation of patients with the same diagnostic label are especially true for psychotic disorders (Cardella & Gangemi, 2019; Cohen et al., 2021; Reininghaus, Böhnke, et al., 2019). Psychotic disorders have no unique or inclusive symptoms, prognosis or determinants (Cohen et al., 2021). Moreover, the subtype of the diagnosis of a particular patient might change with the subsequent psychotic episodes due to significantly different clinical presentation (Badcock & Paulik, 2020, p.15). Yet, this observation is not new. Two forthcoming names of schizophrenia research from late 19th-early 20th century, Emil Kraepelin and Eugen Bleuler, noted that subclinical symptoms are present before the onset of the schizophrenia and categories are not suitable for the range of the observed cases and the spectrum of the experiences (Ravichandran et al., 2021; Toutountzidis et al., 2022).

Indeed, although the label “psychosis” has been traditionally employed as a diagnostic category (Eisenacher & Zink, 2017), accumulating evidence demonstrates that heterogeneity of psychoses, in terms of their clinical presentation, course and outcome, might be better captured with the continuum approach to psychosis (Cohen et al., 2021; Smigielski et al., 2021). Continuum approach suggests that psychosis symptomatology is distributed across the general population in less severe and distressing forms (Toutountzidis et al., 2022).

Evidence supporting the continuum approach have been primarily yielded via epidemiological studies demonstrating the presence of psychotic-like experiences (PLEs) (also referred as *subclinical psychotic symptoms*) in the general population (Feyaerts, Henriksen, et al., 2021; Jim Van Os & Reininghaus, 2016). PLEs are defined as milder, early or atypical manifestations of psychotic symptoms in the absence of a psychotic disorder (Isaksson et al., 2022; Kalman et al., 2019). Additionally, PLEs reflect the same pattern of dimensionality with the psychotic symptomatology, by being distributed on the positive, negative and disorganized dimensions (Fonseca-Pedrero et al., 2021; Reininghaus, Böhnke, et al., 2019; Toutountzidis et al., 2022).

A line of research indicates that the prevalence of PLEs is higher than the prevalence of psychotic disorders among the general population (Healy et al., 2019; Kalman et al., 2019; Tamminga et al., 2020, p.143). Rates are inconsistent however. According some studies, approximately 5% of adults reports PLEs, whereas the prevalence rate of PLEs is higher in children and adolescents with rates ranging between 8% – 17% (Healy et al., 2019). In

comparison, clinical psychosis remains infrequent with a median prevalence rate of 1– 3% in adults, with variations among different regions depending on the existence or absence of protective factors as well as diagnostic conventions (Brüne, 2016; Feyaerts, Henriksen, et al., 2021).

Secondly, delusion-like beliefs and hallucinations demonstrate a correlation in the general population, which is similar to the co-occurrence of delusions and hallucinations in manifest psychosis (Feyaerts, Henriksen, et al., 2021; Wigman et al., 2012).

Lastly, most of the risk factors associated with clinical psychotic disorders have been linked with the higher risk of experiencing PLEs in otherwise healthy individuals (Kalman et al., 2019). Moreover, PLEs are associated with an increased risk of developing psychotic as well as non-psychotic mental disorders (Kaymaz et al., 2012; Kusztrits et al., 2020; Thompson & Broome, 2020, p.290). In line with this, one recent systematic review and meta-analysis showed that the risk of developing psychosis is four time higher for adults who had experienced PLEs during their childhood (Healy et al., 2019). Yet, it still remains unclear why PLEs are transient for some individuals but transitory for others (Kalman et al., 2019).

These findings empirically support the continuum approach to psychosis, which suggests that there is a temporal as well as phenomenological continuity between clinical symptomatology and ordinary experiences and that they differ from each other only quantitatively; and that they are distributed across the general population (Feyaerts, Henriksen, et al., 2021; Johns & Van Os, 2001; Toutountzidis et al., 2022).

Yet, continuum approach to psychosis has multiple shortcomings. For example, since it is a model in-progress, there is a lack of agreed upon terminology, definitions, criteria and categorization of PLEs (Hinterbuchinger & Mossaheb, 2021; Lee et al., 2016; Seiler et al., 2020). Moreover, this lack of clarity further extends to the interrelations and boundaries between neighboring concepts such as PLEs, attenuated psychotic symptoms, prodromal psychotic symptoms, ultra-high risk states, at-risk mental states or schizotypy/schizotypal traits (Isaksson et al., 2022; Lee et al., 2016). Another shortcoming concerns the validity and reliability of the assessment instruments of PLEs (for a detailed review, see: Hinterbuchinger & Mossaheb, 2021).

However, despite its shortcomings, continuum approach might provide opportunities to investigate the roots of and transition to psychoses, inform prevention studies, improve interventions (Hinterbuchinger & Mossaheb, 2021; Isaksson et al., 2022; Lee et al., 2016)

and importantly, help with weakening the stigmatization of the mental disorders (Guloksuz & van Os, 2021).



1.6. The aims and objectives of this study

As described in the relevant sections, distortions in the reasoning and decision making processes such as JTC (R. Dudley et al., 2016) and BADE (Broyd et al., 2017; Eisenacher & Zink, 2017) have been associated with delusions and delusion-proneness, respectively. In the same vein, meta-analytic data and findings imply that JTC (McLean et al., 2017) and BADE (Eisenacher & Zink, 2017; McLean et al., 2017) might play a role as a “trait representing liability to delusions”. In line with these findings, indeed both JTC and BADE have been observed among participants with high scores on schizotypy/psychotic-like experiences (PLEs) scales (Eisenacher & Zink, 2017; Livet et al., 2020). Yet, some aspects pertaining to JTC and BADE remain unresolved and my thesis aims to address these caveats.

The first shortcoming concerns the representativity of studies for the entire psychosis spectrum. Although the JTC has a relatively richer literature in comparison to BADE, the majority of the studies investigating both biases have been carried out with patients with established psychoses, early psychoses (i.e., FEP) or at risk mental state (ARMS) (Rauschenberg et al., 2021; Reininghaus, Oorschot, et al., 2019). Considering the currently influential continuum approach to psychosis (Johns & Van Os, 2001; Murphy et al., 2018; J. Van Os et al., 2009), studies with PLEs should be given more focus.

Secondly, despite the wide range of the existing paradigms, particularly the JTC but also the BADE have been mostly evaluated with probabilistic reasoning tasks (Scheunemann et al., 2020). Given that the majority of the delusional themes pertain to the social world (Bell et al., 2006, 2021; Wellstein et al., 2020), conceptualization of the new paradigms focusing on the social interactions is needed.

Thirdly, although the contribution of JTC and BADE to delusion formation and maintenance seems valid, the exact mechanism underlying JTC and BADE and whether there is an association between these biases are far from being satisfactorily understood (Gawęda et al., 2017; Kotowicz et al., 2020; McLean et al., 2017). With this target in mind, more focus should be given to the paradigms that investigate both biases simultaneously. This is of particular importance because JTC and BADE are important elements of the two-stage cognitive theory of positive symptoms, at the heart of which the LA bias is situated (Moritz, Pfuhl, et al., 2017). LA and thus the two-stage cognitive theory of positive symptoms may

also explain the emergence of JTC as a formative element and BADE as a maintenance factor, hence the formation and maintenance of delusions.

Therefore the objective of the current study is as follows:

1. To conceptualize a paradigm based on social interactions that investigates JTC, BADE and LA within the same task.

While the current paradigm combines the concepts of JTC, BADE and LA, the aim of the study was to investigate the JTC, BADE and LA biases in PLEs and to test the following hypotheses:

1. High PLEs will show a greater JTC bias than Low PLEs.
2. High PLEs will demonstrate a higher BADE in comparison to Low PLEs.
3. The positive sub-scores of the CAPE will be more significantly correlated with JTC as well as with incorrect and absurd decisions than the depressive sub-scores of the CAPE and positive sub-scores, but not the depressive sub-scores, of the CAPE will be negatively correlated with correct decisions on the sample level.
4. High PLEs will exhibit a stronger LA bias by assigning overall higher plausibility ratings to options and by making more decisions in favor of the incorrect and absurd options compared to Low PLEs.
5. Low PLEs will make more correct decisions in comparison to High PLEs.
6. Incorrect decisions will be positively correlated with subjective social competency and inversely correlated with perceived difficulty in High PLEs but not in Low PLEs.
7. Perceived difficulty and subjective social competency will be negatively correlated in High PLEs but not in Low PLEs.

2. METHOD

2.1. Recruitment

Participants were recruited via Amazon Mechanical Turk (Mturk – www.mturk.com). Participants who completed the entire survey successfully were compensated with 1.75 U.S. dollars for their participation. Amazon MTurk allows obtaining great amount of data in a very short time from a diverse population. Previous studies have demonstrated the quality of the data obtained via Mturk (McCredie & Morey, 2019). We authorized only participants with an US I.P. address to enroll in the study. On the very first page of the survey, participants were informed about the aim of the study, the approximate duration, the amount of the compensation and that participation was based on a voluntary basis and that participants could withdraw anytime. Only the participants who agreed that they were above the age of 18 **and** to participate in the study could start the survey.

Recruited participants were then via Cloudresearch (www.cloudresearch.com) (Litman et al., 2017) directed to Qualtrics® (www.qualtrics.com), an online survey platform where they completed the experimental instruments.

Of **874** participants who began the survey, 81 did not finish the entire survey. The remaining 793 participants went through a detailed iterative screening process. Data sets of 12 participants were eliminated due to their failure in the explicit attention check, a self-report 7-point scale whereby participants rated their attentiveness level during the task. Participants who rated their attentiveness level below 5 were eliminated. Data sets of 44 were eliminated due to their failure in the implicit attention check, that is, an item that was placed in the socio-demographic questionnaire, asking: *“People vary in the amount they pay attention to these kinds of surveys. Some take them seriously and read each question, whereas others go very quickly and barely read the questions at all. If you have read this question carefully, please write the word **yes** in the blank box below labeled other. There is no need for you to respond to the scale below”* (Oppenheimer et al., 2009). Other data sets of 19 participants were eliminated due to their over-speed who completed the entire survey in less than 50 % of the median completion time [540 sec.]. Further 9 participants were eliminated due to high ratings on the false items of the Community Assessment of Psychic Experiences (CAPE) scale. Further information about the CAPE scale and the false items is given in the CAPE section. Lastly, data sets of another 37 participants were eliminated because they met multiple

elimination criteria mentioned above as well as due to their repetitive response pattern. All exclusions were made blind to results. After the deletion of **202** participants (4.2%) in total, the data of the remaining **672** participants were included in the analysis.

The recruitment and the study protocol were approved by the Ethics Committee of the Yeditepe University.

2.2. Participants

After the elimination of the inattentive participants, remaining 672 participants were divided into two groups according to their reported frequency of psychotic-like experiences (PLEs) in the positive subscale of the Community Assessment of Psychotic Experiences (CAPE): High PLEs (at least 2 SD above the mean) and Low PLEs (lower-equal 0.5 above the mean). Separating groups with regards to extreme group comparison usually improves discriminatory power compared to analyzing complete data sets (Preacher et al., 2005).

In order to avoid the possible confounding effects of age, gender, education and the depressive sub-scores, for each High PLE participant a match from Low PLEs was selected via the MatchIt function in R, as described by Randolph et al. (Randolph et al., 2014) by employing the method “nearest” (propensity score) based on age, gender, education and CAPE depressive sub-score. This resulted in two equally sized groups ($n = 46$ for each group) with similar age, gender, education and depressive sub-score. All analyses were performed among this matched sample ($n = 92$). Socio-demographic information which was obtained at the end of the task, and, the CAPE sub-scores of the matched sample can be derived from Table 1.

Table 1 Socio-demographic and psychopathological variables between groups

Variable	PLE-Low (<i>n</i> = 46)	PLE-High (<i>n</i> = 46)	Statistics
<i>Socio-demographic characteristics</i>			
Gender (female/male/other/no answer)	28/15/1/2	15/31/0/0	$\chi^2 (3) = 12.49, p = .006$
Age in years	36.21 (9.11)	34.15 (7.00)	$t (90) = 1.21, p = .226, d = .257$
Education – College Degree or Above (Yes / No)	46/0	46/0	$\chi^2 (4) = 4.84, p = .304$
Some College Degree	6	2	
2-year Degree	3	1	
4-year Degree	26	32	
Professional Degree	8	10	
Doctorate	3	1	
<i>Psychopathology</i>			
	Mean (SD)	Mean (SD)	
CAPE positive	1.46 (0.20)	3.09 (0.23)	$t (90) = 35.20, p < .001, d = 7.421$
CAPE depressive	2.75 (0.45)	2.92 (0.39)	$t (90) = 1.88, p = .063, d = 0.396$
Diagnosis (Yes / No) *	29/17	40/6	$\chi^2 (12) = 32.07, p = .001$
*Multiple answers are possible			
SCZ / OPD	0	4	
Depression	25	22	
Anxiety Disorder	25	11	
PTSD	2	8	

OCD	3	3
BD	5	6
Eating Disorder	3	11
Substance or Alcohol Dependence	1	1
PD	3	5
ADHD	6	3
ASD	2	1

Notes, CAPE = Community Assessment of Psychic Experiences, PLE = psychotic-like experiences, SCZ = Schizophrenia, OPD = Other Psychotic Disorder, PTSD = Posttraumatic Stress Disorder, OCD = Obsessive Compulsive Disorder, BD = Bipolar Disorder, PD = Personality Disorder, ADHD = Attention Deficit Hyperactivity Disorder, ASD = Autism Spectrum Disorder

2.3. Experimental Procedure

Participants who were recruited via Amazon Mturk were directed to the Qualtrics[®] survey. In the first page of the survey, participants were informed about the task (see the recruitment section for details). On the same page, participants who agreed to participate *and* who were at least 18 years of age could proceed after they inserted their MTurk ID's. Figure 1 depicts the introduction page of the survey.

Figure 1 Introduction page of the survey

Dear participant,
We invite you to take part in our academic study on social judgments during conversations.

You will be shown short dialogues and will be asked questions about them. Additionally, you will be asked to fill in some questionnaires.
Participation in the study takes about 35 minutes and you will be paid \$1,75.
Taking part in this study is voluntary. You can withdraw before finishing the survey with no penalty or disadvantage. However, if you exit before answering all the questions, you will not be paid.

Confidentiality of your records will be strictly maintained. We will not collect any identifying information such as your name or email address.
The data from the study will be kept at least five years after publication, as recommended by the American Psychological Association. It will then be destroyed by deleting the electronic files.

Please do not continue to the next page unless you have read this information and agree to participate, AND you are at least 18 years of age.
If you have read this information and agree to participate, AND are at least 18 years of age, please enter your MTurk ID to confirm your will to participate.

My MTurk Worker ID is:

After the introduction page, participants were directed to the psychopathology section.

2.3.1. Psychopathology Measure: The Community Assessment of Psychic Experience Scale (CAPE)

In order to measure the psychosis-proneness of the participants, the Community Assessment of Psychic Experience Scale (*CAPE* - Stefanis et al., 2002) was administered before the task. The *CAPE* is a self-report scale, measuring lifetime psychotic-like experiences. It consists of 42 items along three dimensions with those dimensions being positive; depressive and negative.

Items of the scale are placed in random order. Participants are expected to rate the each item on a 4-point Likert scale (e.g., “Never”, “Sometimes”, “Often” and “Nearly

Always”). For the current study, we used a modified version of the CAPE including only the positive (e.g., “Do you ever think that people can communicate telepathically?”) and depressive subscale items (e.g., “Do you ever feel pessimistic about everything?”) as well as extra four lie items representing certain misconceptions and clichés about schizophrenia and psychosis (Moritz et al., 2013).

The CAPE has been commonly used in studies on the dimensionality of psychosis experiences (Healy & Cannon, 2020; Jim Van Os, 2003) as well as studies with populations from different cultures and age groups (Bukenaitė et al., 2017; Konings et al., 2006; Schlier et al., 2015). The CAPE has good criterion as well as construct validity (Healy & Cannon, 2020; Mark & Touloupoulou, 2016; Schlier et al., 2015).



2.3.2. Experimental Paradigm

After the participants had completed the CAPE, they proceeded with the experimental paradigm. Participants were first informed about the task and they gained familiarity to the task via one sample item, the data of which were not included in the analyses. After the sample item trial, participants continued with the task items.

The paradigm composed of 14 items, equally distributed to A and B conditions in a balanced randomized order. Each item of the paradigm, at the heart of which one brief dialogue situated, consist of three steps, gradually disclosing more information about the dialogue. In the first step, participants were only presented with the dialogue, whereby one speaker utters a sentence to an addressee (e.g., “A said [statement] to B”). Participants were then asked to give their *plausibility ratings* for four options (e.g., “Why do you think A said [statement] to B?”) on a 7-point Likert scale (e.g., “1 = impossible [Excluded], 2 = very unlikely, 3 = likely, 4 = not sure, 5 = likely, 6 = very likely, 7 = true [Decision]”). Each four option (True, Absurd, Lure and Suspicious) represents one likely reason of the said utterance. On the same page, upon receiving their plausibility ratings, participants were additionally asked a two-choice question (i.e., *decision ratings*), as to whether they already made a decision in the light of the given information or whether they needed more information to reach a decision. Even in case of a decision, participants had to proceed with the second and third steps of the items.

In steps 2 and 3, more information regarding the context of the dialogue was given. Yet, the items in the A and B condition differed from each other with respect to the information given in the second step. While in the A condition, the plausibility of the true option increased and the plausibility of the other options accordingly decreased with the each information; in the B condition, the information given in the second step was designed to make the lure option more plausible/salient. With the disclosure of the third information in both conditions, true option architected to seem of the highest plausibility. The figures 2, 3 and 4; representing the original sample item, exemplify the three steps.

Figure 2 Sample item, first sentence

Example item

1. After Evan left his room, Adam shouted at his back and said: "Couldn't you find the door handle?"

Why do you think Adam said this to Evan?

	Impossible (Excluded)	very unlikely	unlikely	not sure	likely	very likely	True (Decision)
Evan was repairing Adam's door.	☐	☐	☐	☐	☐	☐	☐
Evan forgot to close the door of Adam's room when he left.	☐	☐	☐	☐	☐	☐	☐
Compared to steel doors, Adam finds wooden doors more aesthetically pleasing.	☐	☐	☐	☐	☐	☐	☐
Adam thinks sleeping in unlocked rooms is very dangerous.	☐	☐	☐	☐	☐	☐	☐

You will see more information on the next page. However, we would like to know if you would have reached a decision already at this point.

Yes, I think the information is sufficient enough to make a decision.

No, the information is not sufficient to make a decision.

Figure 3 Sample item, second sentence

Example item

1. After Evan left his room, Adam shouted at his back and said: "Couldn't you find the door handle?"

2. Adam has an important exam tomorrow and finds it hard to concentrate when the door to his room is open.

Why do you think Adam said this to Evan?

	Impossible (Excluded)	very unlikely	unlikely	not sure	likely	very likely	True (Decision)
Evan was repairing Adam's door.	☐	☐	☐	☐	☐	☐	☐
Evan forgot to close the door of Adam's room when he left.	☐	☐	☐	☐	☐	☐	☐
Compared to steel doors, Adam finds wooden doors more aesthetically pleasing.	☐	☐	☐	☐	☐	☐	☐
Adam thinks sleeping in unlocked rooms is very dangerous.	☐	☐	☐	☐	☐	☐	☐

You will see more information on the next page. However, we would like to know if you would have reached a decision already at this point.

Yes, I think the information is sufficient enough to make a decision.

No, the information is not sufficient to make a decision.

Figure 4 Sample item, third sentence

Example item

1. After Evan left his room, Adam shouted at his back and said: "Couldn't you find the door handle?"
2. Adam has an important exam tomorrow and finds it hard to concentrate when the door to his room is open.
3. Adam's room is now too noisy.

Why do you think Adam said this to Evan?

	Impossible (Excluded)	very unlikely	unlikely	not sure	likely	very likely	True (Decision)
Evan was repairing Adam's door.	☐	☐	☐	☐	☐	☐	☐
Evan forgot to close the door of Adam's room when he left.	☐	☐	☐	☐	☐	☐	☐
Compared to steel doors, Adam finds wooden doors more aesthetically pleasing.	☐	☐	☐	☐	☐	☐	☐
Adam thinks sleeping in unlocked rooms is very dangerous.	☐	☐	☐	☐	☐	☐	☐

We would like to know, if you reached a final decision at this point, indicating that the given information was sufficient.

Yes, I think the information was sufficient to make a decision.

No, the information was not sufficient to make a decision.

2.3.3. Subjective Social Competency and Perceived Difficulty Measures

In addition to the plausibility and decision ratings, participants were asked to rate their subjective social competency levels as well as the perceived difficulty levels of the items.

Subjective social competency was evaluated with the same question two times: before the sample item trial and after the termination of the task. Participants were asked to select their social competency level (e.g., "How competent do you feel during social interactions") on a 5-point Likert scale (e.g., "1 = very incompetent, 2 = somewhat incompetent, 3 = neither incompetent nor competent, 4 = somewhat competent, 5 = very competent").

In order to evaluate the participants perceived difficulty ratings regarding the items, at the end of the each item (i.e., after the third and final step of the each item) participants were asked to rate the difficulty of that particular item (e.g., "How challenging did you find this item?") on a 5-point Likert scale (e.g., "1 = very challenging, 2 = somewhat challenging, 3 = neither challenging nor easy, 4 = somewhat easy, 5 = very easy").

3. RESULTS

3.1. Statistical Analysis

Data analyses were performed with the SPSS V26. Independent samples t-tests were used to compare the group averages for continuous variables (e.g., age, CAPE sub-scores etc.) and chi-square tests were used to compare the group proportions for categorical variables (e.g., gender, education and diagnosis). In order to execute a sophisticated examination of JTC, BADE and LA, mixed model repeated measures analysis of variance (ANOVA) using the General Linear Model (GLM) module of the SPSS was employed. Pearson's two-tailed correlation coefficients were used to examine the correspondences between the change in subjective social competency, subjective difficulty, incorrect decisions, JTC and CAPE sub-scores. For all of the analyses the level of significance was set to $\alpha=0.05$.

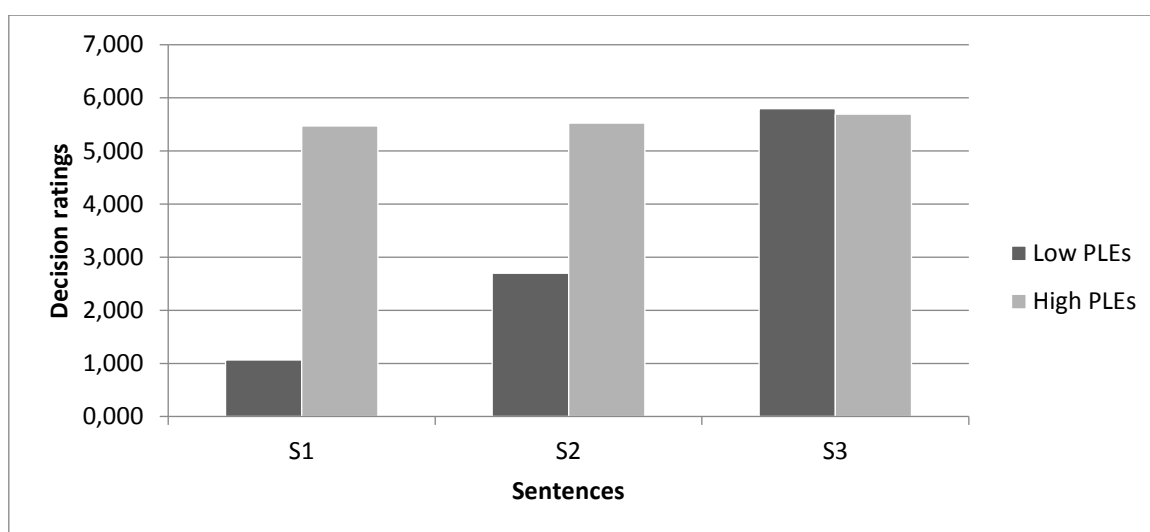
3.2. Outcomes

3.2.1. JTC

In order to evaluate the JTC, we ran a mixed three-way ANOVA with sentence (First, Second, Third), condition (A, B) as within-subject factor and group (Low-, and High-PLE) as between-subject factor. Decision ratings served as dependent variable. Preconditions for computing this procedure were met. We confine exposition to the effects of group.

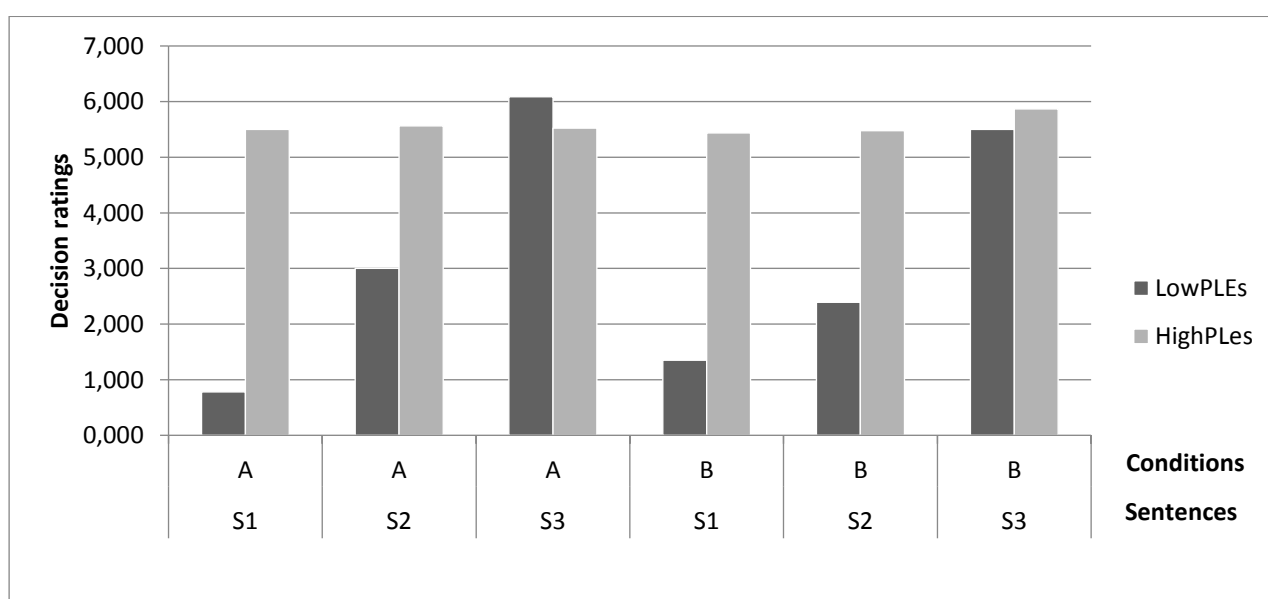
The group effect was significant with a strong effect size, ($F(1,90) = 71.27$, $p < .001$, $\eta^2 = .442$). As expected, the two-way interaction of group x sentence was significant with a strong effect size, ($F(2,180) = 139.72$, $p < .001$, $\eta^2 = .608$). As can be seen from Figure 5, this significant interaction reflects the pattern that Low PLEs increased the number of decision ratings from the first to the third sentence, while High PLEs displayed stable and high decision ratings across sentences.

Figure 5 Number of decision ratings of groups across sentences



The three-way interaction of group x sentence x condition yielded significance, ($F(2,180) = 11.27, p < .001, \eta^2 = .111$). As can be seen from the Figure 6, in addition to the trend level increase in Low PLEs decision ratings across sentences, this increase is sharper and reaches its peak in the A condition where the decision ratings of the Low PLEs in the third sentence exceeds those of the High PLEs, hence the significance. As will be further discussed in the results of BADE, this finding tentatively shows that the lure option tempted higher ratings and hence, the soundness of the aimed difference between conditions.

Figure 6 Number of decision ratings of groups across sentences and conditions



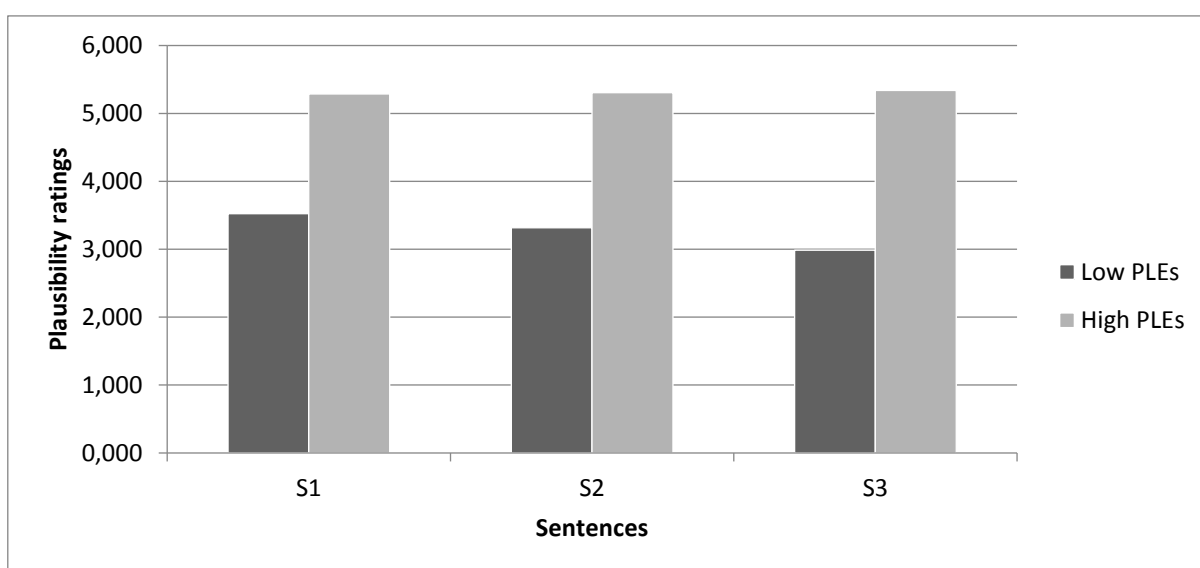
Taken together these findings suggest that while High PLEs showed a JTC bias (defined as decision after first sentence) for the majority of the items; they did not change their decision ratings in the face of new information. However, while Low PLEs demonstrated a more conservative decision pattern in the first sentence, they increased their decision ratings with the each new information.

3.2.2. BADE

In order to evaluate the BADE, we computed a mixed four-way ANOVA with sentence (First, Second, Third), condition (A, B) and options (True, Absurd, Suspicious and Lure) as within-subject factor and group (Low-, and High-PLEs) as between-subject factor. The plausibility ratings for the options functioned as the dependent variable. Preconditions for computing this analysis were met. We cover interpretations for the effects of group.

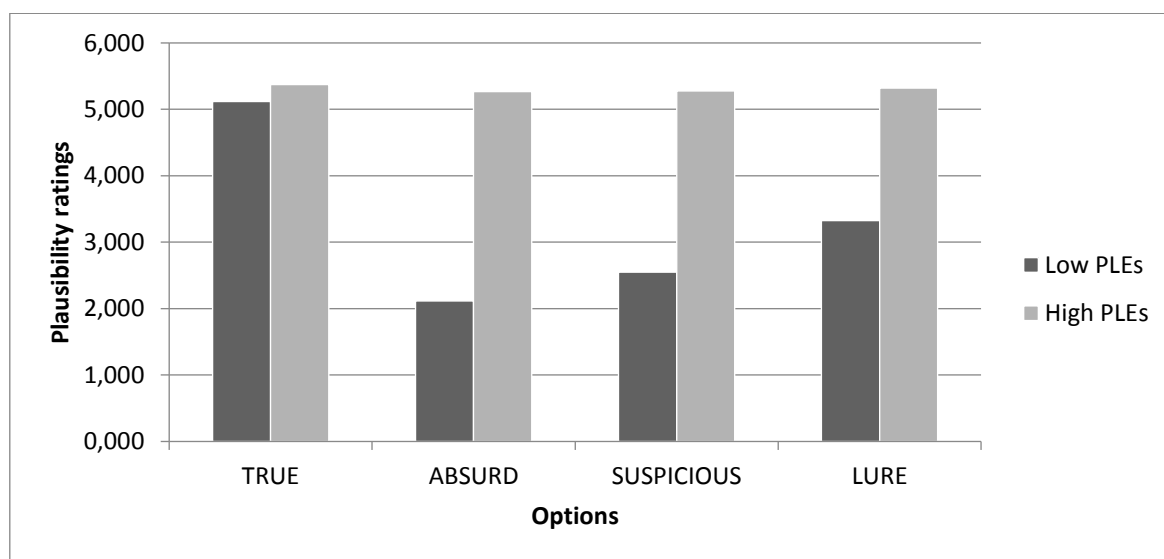
The effect of the group was significant, ($F(1,90) = 324.87, p < .001, \eta^2 = .783$). As expected, the two-way interaction of group x sentence reached significance, ($F(2,180) = 56.43, p < .001, \eta^2 = .385$), indicating a change in plausibility ratings from first sentence to third. As a possible reason of this significance, Figure 7 reflects a decrease in the plausibility ratings of Low PLEs from first sentence to third, in contrast to High PLEs constant ratings across sentences. However the interaction of group x condition did not yield significance.

Figure 7 Plausibility ratings of groups across sentences



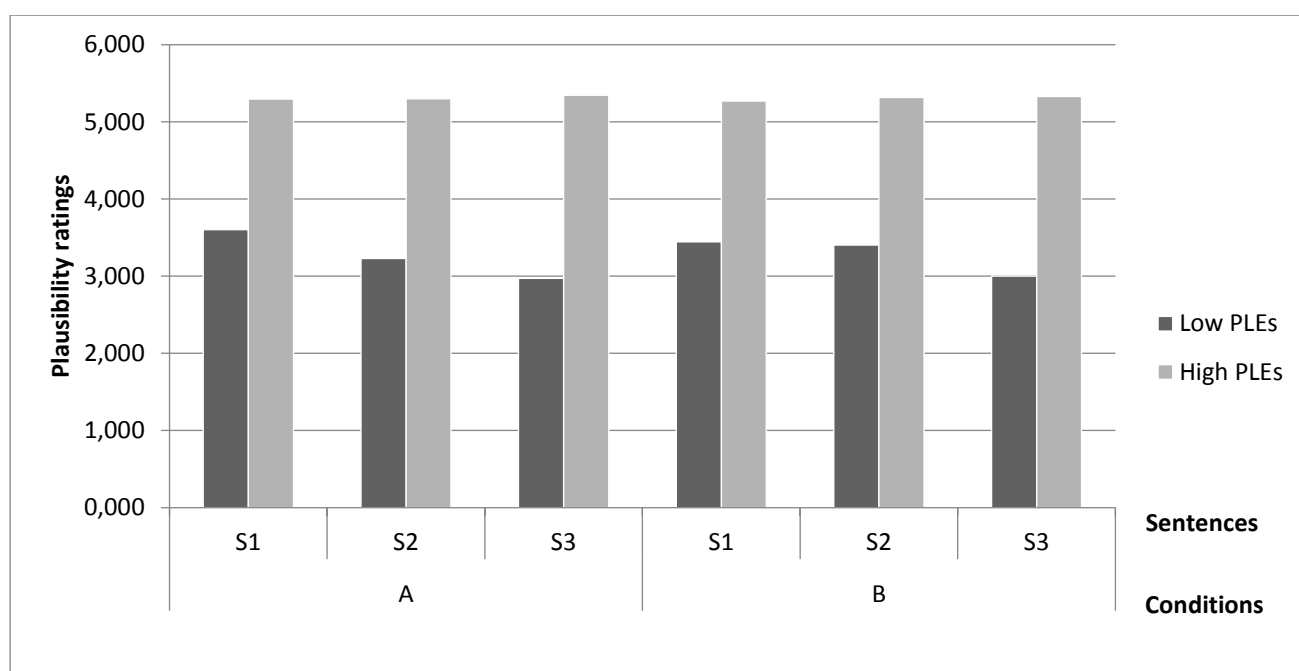
The two-way interaction of group x option reached significance, ($F(3,270) = 307.71$, $p < .001$, $\eta^2 = .774$). As a possible explanation of this interaction, Figure 8 demonstrates an increase in the plausibility ratings of Low PLEs across options (absurd < suspicious < lure < true) against High PLEs higher yet stable plausibility ratings per options. Moreover and in line with the LA, the difference between the groups in terms of their plausibility ratings per option reaches its highest for the absurd option.

Figure 8 Plausibility ratings of groups across options



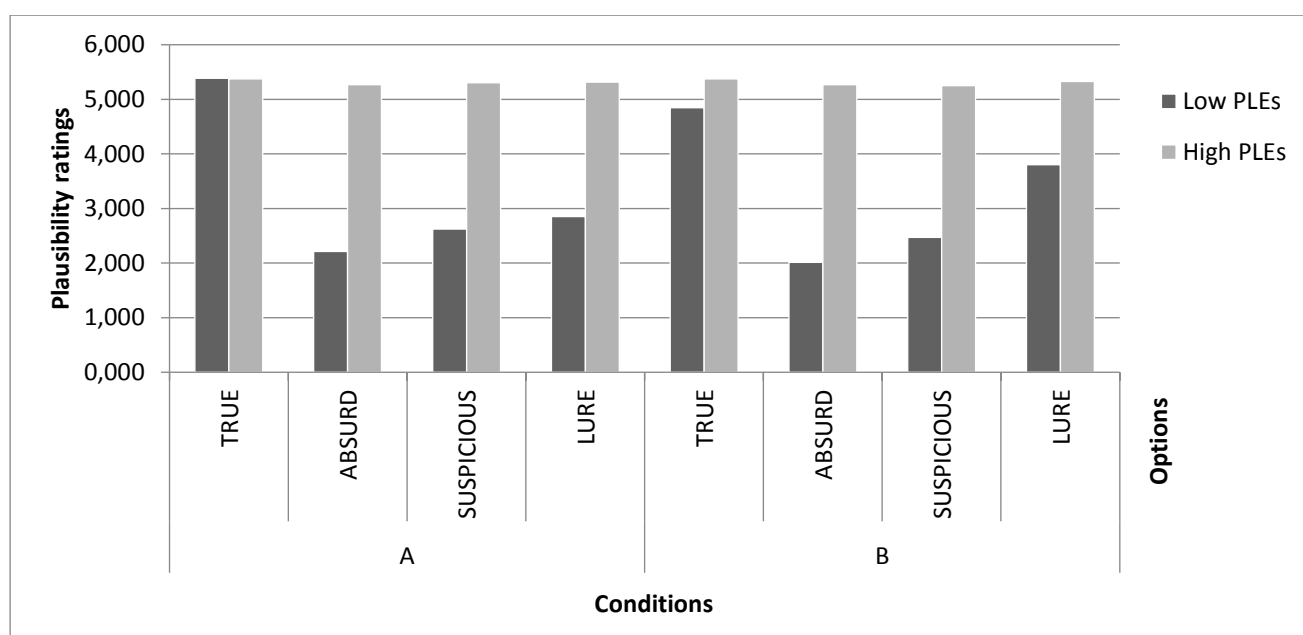
The three-way interaction of group x condition x sentence was significant at a medium to large effect size, ($F(2,180) = 8.48$, $p < .001$, $\eta^2 = .086$). As Figure 9 shows, while High PLEs demonstrated a constant plausibility rating pattern across sentences, Low PLEs exhibited a trend level decrease in their plausibility ratings from first sentence to third in both conditions. Yet, what is more is that in the B condition, the trend level decrease in the plausibility ratings of Low PLEs is relatively less sharp between the first and second sentence, hence the significance. As will be discussed later, this pattern might be attributed to the soundness of the lure options.

Figure 9 Plausibility ratings of groups across sentences and conditions



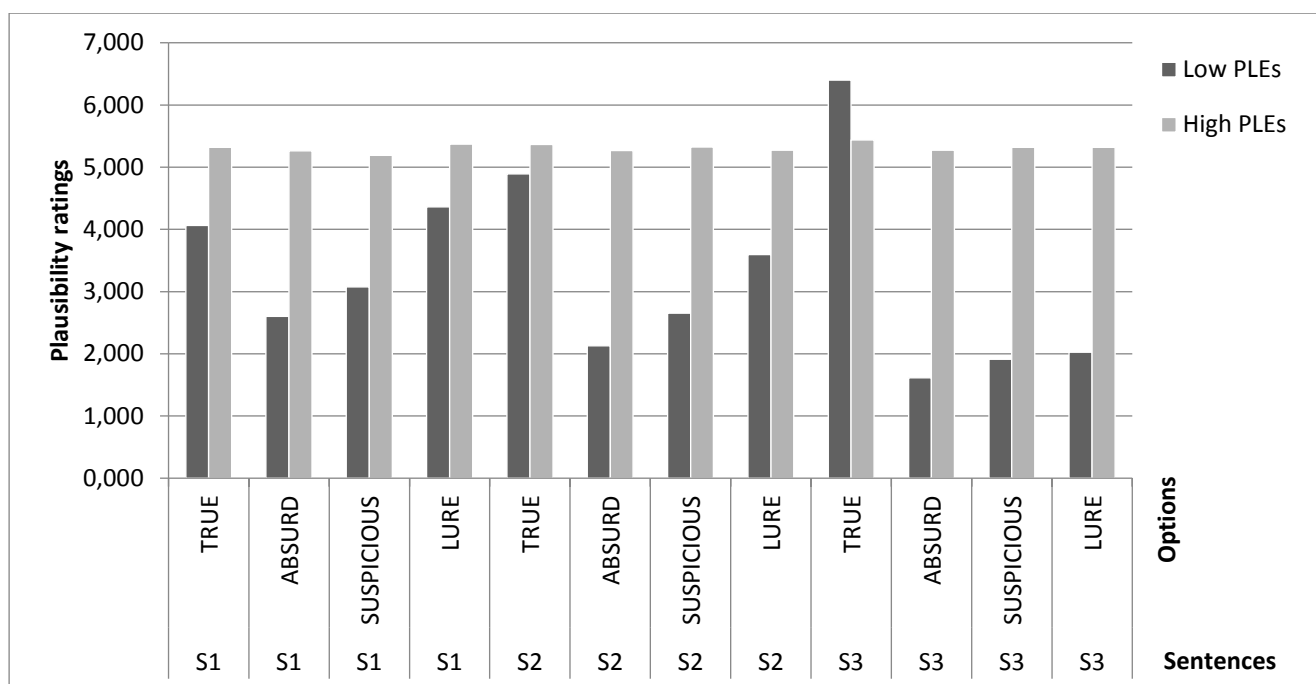
The three way interaction of group x condition x option yielded significance, ($F(3,270) = 52.18$, $p < .001$, $\eta^2 = .367$). As Figure 10 depicts, while High PLEs kept their plausibility ratings for each option in both condition constant, this interaction can be explained with the decrease in the plausibility ratings of Low PLEs for the true option and the increase in the plausibility ratings of Low PLEs for the lure option from A condition to B condition. This interaction, taken together with the findings illustrated in the Figure 6 (see the outcomes of the JTC) and Figure 9, can be speculated to hint at the confusion of Low PLEs between the true and lure options.

Figure 10 Plausibility ratings of groups across options and conditions



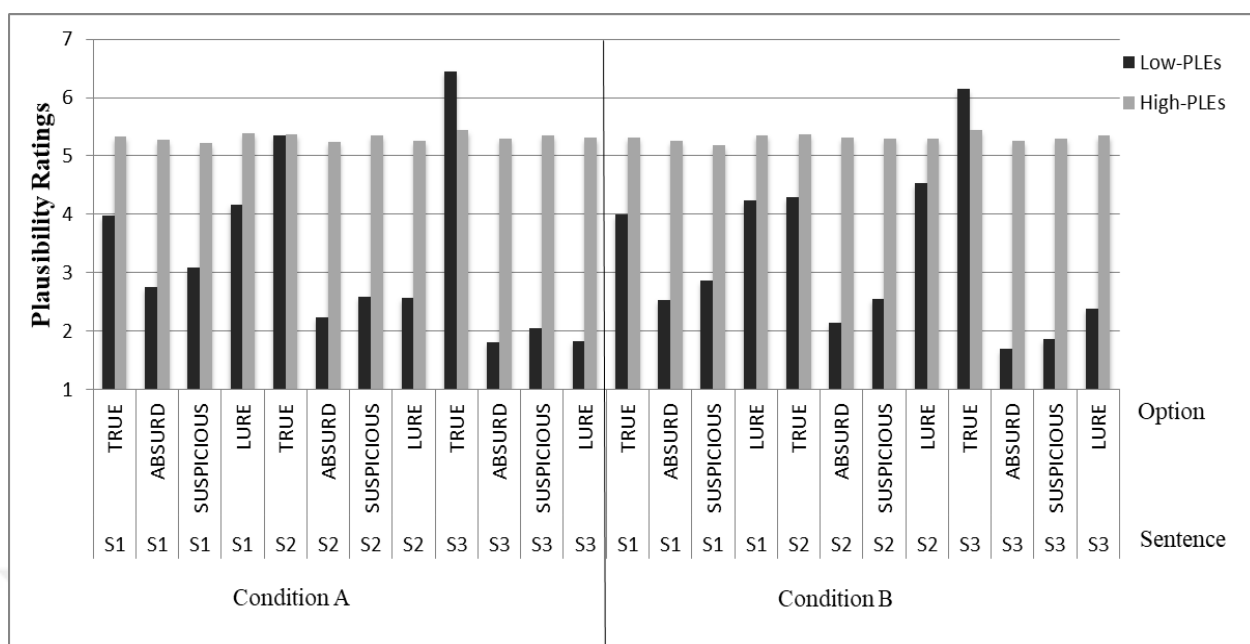
The three-way interaction of group x sentence x option was also significant, ($F(6,540) = 195.71$, $p < .001$, $\eta^2 = .685$). As Figure 11 illustrates, this significant interaction can be interpreted to result from Low PLEs' plausibility ratings for the true option which displays a trend level increase from first sentence to third, where it reaches its peak by even exceeding those of High PLEs. Moreover, Low PLEs' plausibility ratings for the lure option demonstrate a trend level decrease, yet the decline from second sentence to third is more pronounced, which also contributes to the significance.

Figure 11 Plausibility ratings of groups across sentences and options



Lastly, the four-way interaction of group x condition x sentence x option also reached significance, ($F(6,540) = 30.43$, $p < .001$, $\eta^2 = .253$). As it is illustrated in the Figure 12, this significant interaction can be attributed to the following pattern: As opposed to High PLEs steady plausibility ratings for the options across sentences in both condition; Low PLEs increased their plausibility ratings for the true option on a trend level from first sentence to third in both condition, yet this increase is sharper in the A condition in comparison to the B condition. Moreover, Low PLEs decreased their plausibility ratings for the lure option on a trend level from first sentence to third in the A condition; however in the B condition, they first slightly increased their plausibility ratings for the lure option from first sentence to the second and then sharply decreased their plausibility ratings for the lure option from second sentence to the third option. Hence, the changes in Low PLE's plausibility ratings for the true as well as lure options across sentences in both conditions elicit the significance here.

Figure 12 Plausibility ratings of groups across options, sentences and conditions



To conclude, in line with the BADE and as hypothesized, High PLEs initially gave higher plausibility ratings to each option in comparison to Low PLEs, who primarily demonstrated a more conservative pattern in their plausibility ratings. Moreover, group difference regarding the plausibility ratings per option was at its highest for the absurd option. Yet, while Low PLEs increased their plausibility ratings for true option with the each new information to the extent that it exceeded those of high PLEs with the third sentence in both conditions; High PLEs kept their decision ratings for the options stable across sentences in both conditions.

3.2.3. Decisions: Correct, Incorrect and Absurd Decisions

3.2.3.1. Correct Decisions

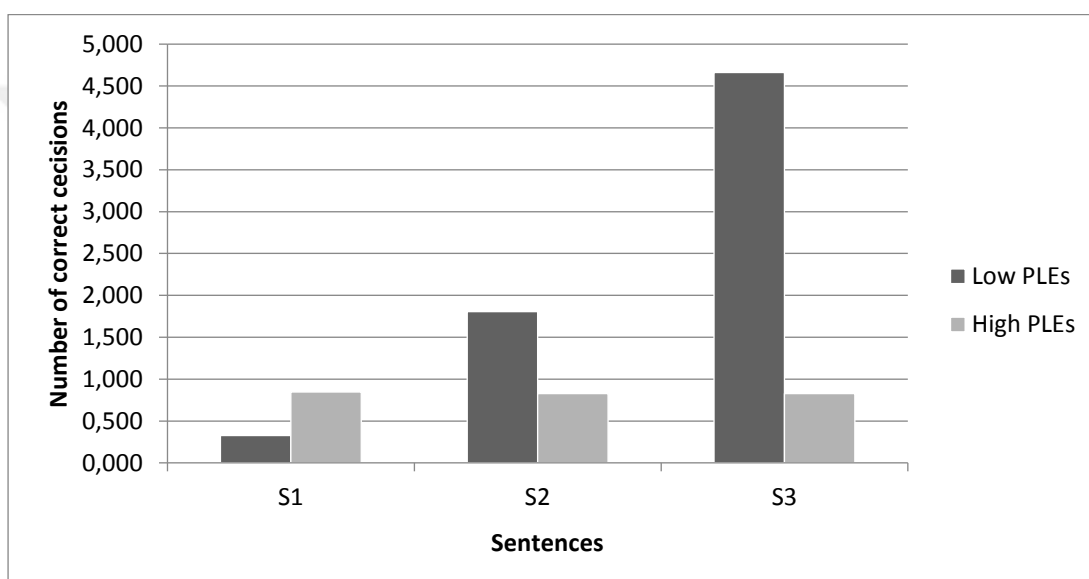
As expected, Low PLEs made significantly higher number of correct decisions ($M = 13.59$, $SD = 5.8$) in comparison to High PLEs ($M = 5.0$, $SD = 4.2$), $t(90) = 8.13$, $p < .001$, $d = 1.70$.

In order to investigate the interactions between number of correct decisions, sentence and condition, we ran a mixed three-way ANOVA with sentence (First, Second and Third) and condition (A, B) as within-subject factors as well as group (Low-, and High-PLEs) as

between-subject factor. Total number of correct decisions served as dependent variable. The report is limited with the effects of group.

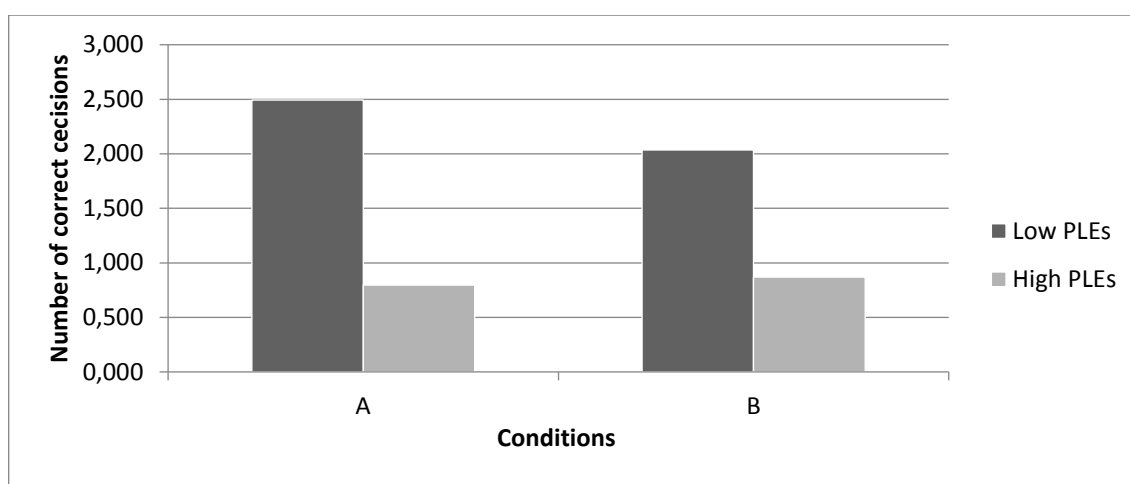
The group effect was significant with a large effect size ($F(1,90) = 66.10$, $p < .001$, $\eta^2 = .423$). Two way-interaction of group x sentence also reached significance with a strong effect size ($F(2, 180) = 201.79$, $p < .001$, $\eta^2 = .692$). As a possible explanation of this interaction, Figure 13 reflects the trend level of increase in the total number of correct decisions of Low PLEs as opposed to High PLEs fixed number of correct decisions across sentences.

Figure 13 Number of correct decisions of groups across sentences



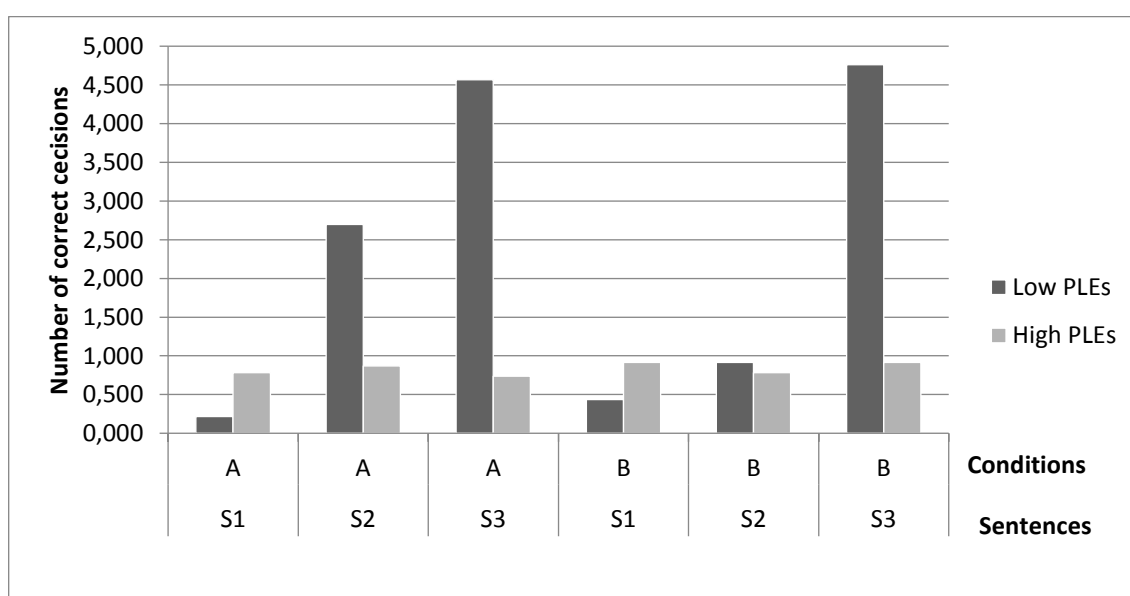
Two-way interaction of group x condition yielded significance with an intermediate effect size ($F(1,90) = 12.22$, $p = .001$, $\eta^2 = .120$). Figure 14 depicts that Low PLEs gave less correct decisions in the B condition, in comparison to High PLEs, whose correct decision number did not change across conditions, hence the significance.

Figure 14 Number of correct decisions of groups across conditions



Lastly, three way interaction of group x sentence x condition was significant with a large effect size ($F(2, 180) = 18.22, p < .001, \eta^2 = .168$). As depicted in Figure 15, while Low PLEs' total number of correct decisions demonstrates an increase in both conditions, due to the sharper rise in the second sentence of the A condition this interaction reaches significance.

Figure 15 Number of correct decisions of groups across conditions and sentences



Taken together, as opposed to High PLEs who made overall significantly less correct decisions; Low PLEs increased their total number of correct decisions from first sentence to third in both conditions. However the increase in the total number of correct decisions of Low PLEs is less pronounced in the B condition, and when interpreted with the other findings, this might be attributed to the effect of the lure option. Another important outcome is that, although Low PLEs did more correct decisions, the number of correct decisions of High PLEs in fact exceeds those of Low PLEs in the first sentence in both conditions. As it was already demonstrated in the previous outcomes and will be strengthen with the upcoming ones, High PLEs did not just gave higher plausibility ratings to each option in comparison to Low PLEs but they also did more decisions in favor of the correct, incorrect and absurd options with the first sentence. These findings further solidify a lowered decision threshold as a possible underlying mechanism of JTC and BADE.

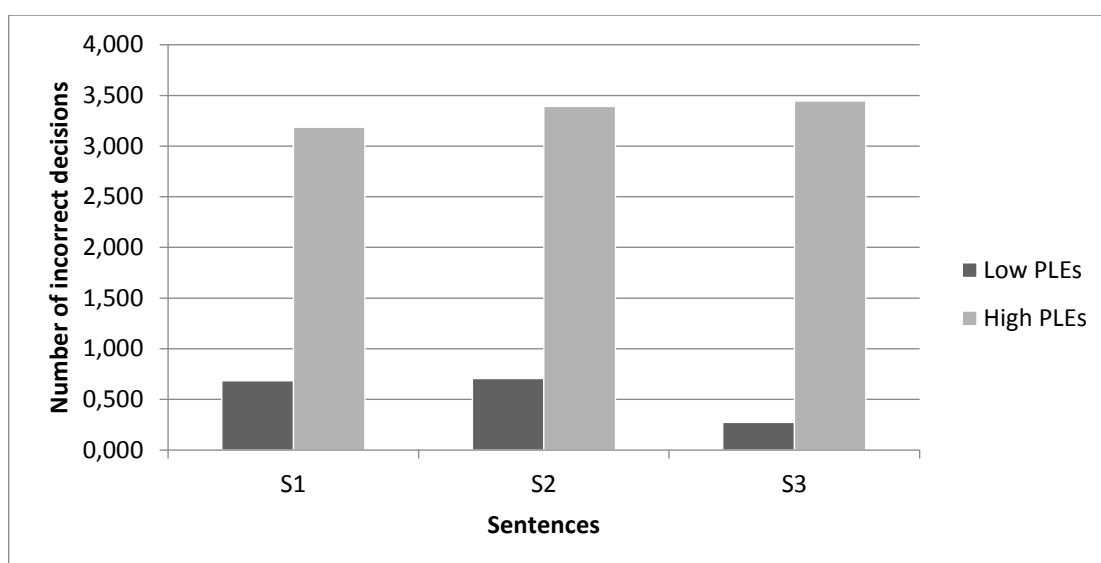
3.2.3.2. Incorrect Decisions

In line with the expectations, High PLEs made significantly higher incorrect decisions ($M = 20.04$, $SD = 6.9$) compared to Low PLEs ($M = 3.33$ $SD = 4.2$), $t(90) = 14.0$, $p < .001$, $d = 2.92$.

In order to evaluate the interactions between number of incorrect decisions, sentence and condition, we ran a mixed three-way ANOVA with sentence (First, Second and Third) and condition (A, B) as within-subject factors and group (Low-, and High-PLEs) as between-subject factor. Total number of incorrect decisions entered as dependent variable. We confine expositions to the effects of group.

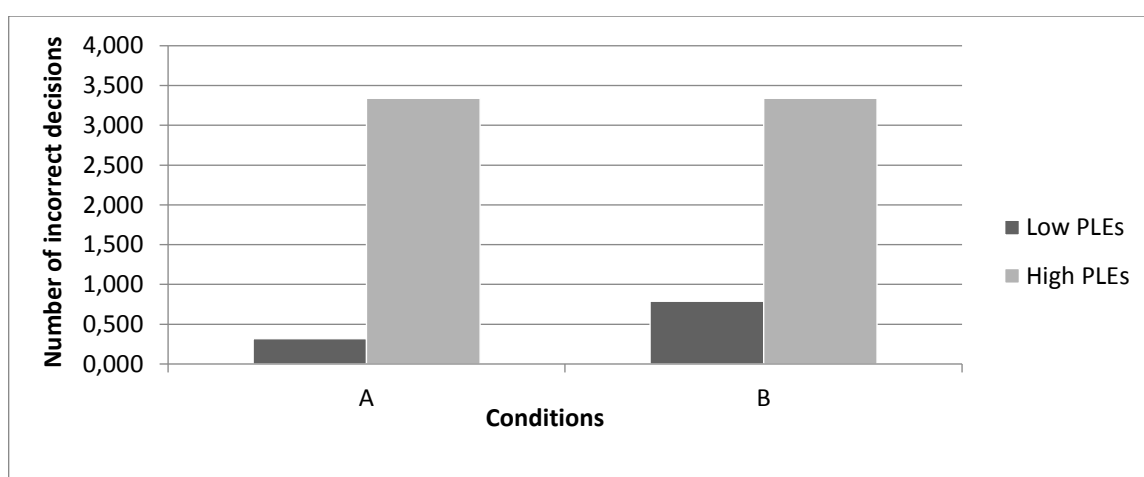
The group effect was significant with a large effect size ($F(1,90) = 196.23$, $p < .001$, $\eta^2 = .686$). Two-way interaction of group x sentence was significant at a small to medium effect size ($F(2,180) = 5.95$, $p = 0.003$, $\eta^2 = .062$). As a possible explanation of this significant interaction, Figure 16 depicts the pattern that Low PLEs decreased number of incorrect decisions from second sentence to third as opposed to slight increase in High PLEs' number of incorrect decisions.

Figure 16 Number of incorrect decisions of groups across sentences



Two-way interaction of group x condition yielded significance at a small effect size ($F(1,90) = 4.30$, $p = .041$, $\eta p^2 = .046$). This interaction, as Figure 17 illustrates, reaches significance due to the increase in the incorrect decisions of Low PLEs in the B condition as opposed to High PLEs fixed number of incorrect decisions in both conditions. However three-way interaction of group x sentence x condition did not reach significance.

Figure 17 Number of incorrect decisions of groups across conditions



Taken together, these findings confirmed our fourth hypothesis in that High PLEs made significantly more number of incorrect decisions in comparison to Low PLEs.

Moreover, the number of incorrect decisions of High PLEs displayed a slight increase across sentences, suggestive of impairment in information integration. On the other hand, number of incorrect decisions of Low PLEs showed a sharp increase from second sentence to third and they made more incorrect decisions in the B condition compared to A condition, hinting at the effect of the lure option.

3.2.3.3. Absurd Decisions

In line with the hypothesis and the LA, High PLEs decided for significantly higher number of absurd decisions ($M = 4.28$, $SD = 3.3$) than Low PLEs ($M = 0.22$, $SD = 1.1$), $t(90) = 7.951$, $p < .001$, $d = 1.66$.

A mixed three-way ANOVA with sentence (First, Second and Third) and condition (A, B) as within-subject factors and group (Low-, and High-PLEs) as between-subject factor was computed to investigate the interactions between decisions for absurd option, sentences and conditions. Total number of absurd decisions served as dependent variable. We cover the reports for the effects of group.

The group effect yielded significance at a large effect size ($F(1,90) = 63.22$, $p < .005$, $\eta^2 = .413$). However, neither the two-way interactions between group x sentence and group x condition nor the three-way interactions between group x sentence x condition reached significance.

These findings confirm our fourth hypothesis in that High PLEs demonstrated a stronger LA bias by making more decisions in favor of the absurd options. Moreover, the lack of significant interactions between group x sentence and group x condition as well as between group x sentence x condition reflects the pattern that group patterns did not show any changes neither across sentences nor across conditions.

3.2.4. Correlational Analyses: Delusion Proneness, JTC, Incorrect & Correct Decisions, Subjective Social Competency and Perceived Difficulty

3.2.4.1. Sample Level Correlations between CAPE sub-scores, JTC and Correct, Incorrect & Absurd Decisions

In order to evaluate the associations between the changes in the CAPE sub-scores and JTC as well as correct, incorrect and absurd decisions, Pearson's correlations coefficients

were calculated on the sample ($N = 92$) level. The results of the correlational analyses are depicted in the Table 2.

As expected, JTC was more strongly correlated with Positive CAPE sub-scores than Depressive CAPE sub-scores. Moreover, Positive CAPE sub-scores were positively correlated with incorrect decisions and absurd decisions yet inversely correlated with correct decisions. However, Depressive CAPE sub-scores were not significantly correlated with neither of these variables, except with Positive CAPE sub-scores. Although the correlational associations do not hint at causal relationships and more sophisticated analyses should be seek before jumping to conclusions about the possible relationships between the psychosis liability, JTC and incorrect (or correct) judgments; current findings point at a positive association between delusion proneness, JTC behavior and incorrect decisions.

Table 2 Correlations between the CAPE sub-scores and incorrect, correct & absurd decisions on the sample level

Correlations x	CAPE positive	JTC	incorrect Decisions	absurd Decisions	correct Decisions
CAPE positive	1	.805**	.794**	.600**	-.656**
CAPE depressive	.248*	.274**	.162	.097	-.064

Notes, * $p < .005$, ** $p < .001$ (2-tailed)

3.2.4.2. Group Level Correlations between Incorrect Decisions, Subjective Social Competency and Perceived Difficulty

In order to make group comparisons regarding the correlational associations between incorrect decisions, subjective social competency and subjective difficulty, Pearson's correlations coefficients were calculated ($N = 46$ per group). The outcomes of the correlational analyses are illustrated in the Table 3.

In line with the hypotheses, incorrect decisions were positively correlated with subjective competency and subjective competency was inversely correlated with subjective difficulty in the High PLE group. Moreover, and as expected, correlational analyses of these variables did not yield any significant results for the Low PLE group. However, as opposed to the expectations, there were no correlations between incorrect decisions and subjective

difficulty for the High PLE group. Possible interpretations of these findings will be further elaborated in the discussion section.

Table 3 Correlations between incorrect decisions, subjective social competency and subjective difficulty on the group level

Correlations x	Low-PLEs (n = 46)			High-PLEs (n = 46)		
	Incorrect Decisions	Subjective Social Competency	Subjective Difficulty	Incorrect Decisions	Subjective Social Competency	Subjective Difficulty
Incorrect Decisions	1	.092	.041	1	.359*	-.060
Subjective Social Competency	.092	1	-.152	.359*	1	-.383**
Subjective Difficulty	.041	-.152	1	-.060	-.383**	1

Notes, * $p < .005$, ** $p < .001$ (2-tailed)

4. DISCUSSION

This study pursued several aims. The primary aim was to investigate JTC and the BADE in people with psychotic-like experiences within a social context. JTC and BADE constitute the essential elements of the *two-stage cognitive theory of positive symptoms* at the heart of which a lowered decision threshold (LA bias) is located. In this vein, another aim of this study was to evaluate the LA bias and its associations with JTC. Moreover, in order to replicate the previous findings demonstrating impairments in self-assessment of schizophrenia patients (e.g., discrepancy between objective performance and subjective competence) it was also aimed at investigating the associations between incorrect decisions and subjective competency as well as subjective difficulty. To address these questions, a novel paradigm based on interpersonal dialogues that enables the investigation of the aforementioned biases and constructs was devised. In what follows, the outcomes of the present study will be summarized and discussed in the light of the previous findings.

In line with the prior findings (Livet et al., 2020), the results of the current study demonstrated a stronger JTC bias (*defined as decision after first sentence*) in the High PLE group in comparison to Low PLEs in both conditions. Moreover, a BADE for the High-PLE group was confirmed as they did not change the number of decision ratings in the face of new information as opposed to Low PLEs, who increased their decision ratings from first sentence to third in both conditions. However this increase in the decision ratings of Low PLEs was more evident in the A condition (in the condition where with the each new information true option gains plausibility and other options lose plausibility), where their decision ratings even exceeded those of High PLEs with the third sentence. Taken with the other findings that will be discussed below, less pronounced increase in the decision ratings of the Low PLEs in the B condition could be partially due to the effect of the lure option.

These results are consistent with the small but accumulating evidence addressing to the positive associations between JTC and psychotic-like experiences in the general population (Livet et al., 2020; Robert Malcolm Ross et al., 2015). Additionally, a stronger correlation emerged between the positive subscale of the CAPE and JTC than the depressive subscale scores of the CAPE and JTC on the sample level, which confirmed our third hypothesis. Although the contribution of JTC in delusion formation might be smaller than previously thought (Broyd et al., 2017; Pytlik, Soll, Hesse, Moritz, et al., 2020; Sulik et al.,

2022), our findings are in line with the meta-analytic data implying that JTC might play a role as a “trait representing liability to delusions” (Bell et al., 2006; R. Dudley et al., 2016; Peters & Garety, 2006).

In the current study, we assessed the JTC via a paradigm where the participants presented with multiple alternatives (*high ambiguity situation*), as opposed to the classical beads tasks with two alternatives (*low ambiguity situation*). While according to some researchers draws to decision variant of the beads task is the most reliable measure of JTC bias (Fine et al., 2007); when JTC is assessed via paradigms with multiple alternatives studies have found a weaker JTC effect (Broyd et al., 2017; Pytlik, Soll, Hesse, Moritz, et al., 2020). According to the proponents of the Liberal Acceptance account, due to a reduced decision threshold SZ patients assign higher plausibility ratings to alternative hypotheses that would be deemed improbable by others. Consequently, in high ambiguity situations where the alternatives are close to each other in terms of probability, this lowered decision threshold drives JTC behavior (Moritz, Pfuhl, et al., 2017). Hence, what may seem like a hasty decision making at the face value would be better described as a readiness to accept alternative hypotheses that would normally be rejected by healthy controls (Moritz, Scheunemann, Lüdtke, et al., 2020). Outcomes of the current study indeed confirmed this. In the current high ambiguity task, High PLEs gave higher plausibility ratings for each incorrect alternative in comparison to Low PLEs and the difference between the plausibility ratings for groups was at its highest for the absurd alternative. Moreover, High PLEs did *not* show an inclination to hastily reject multiple alternatives by hanging onto one; while in fact it was the Low PLE group who was more conservative by ruling out implausible options. These findings tentatively speak for a lowered decision threshold as an underlying mechanism of JTC under certain circumstances.

With respect to the BADE, we hypothesized that High PLEs will demonstrate a stronger BADE in comparison to Low PLEs. The results of the study confirmed our hypothesis regarding BADE speaking for an impairment in belief revision in High PLEs. Results of the current study demonstrated that Low PLEs decreased their total plausibility ratings from first sentence to third, whereas plausibility ratings of High PLEs remained stable across sentences in both conditions. In this vein, while the findings in the literature regarding associations between BADE and subclinical psychosis-proneness (for a review, see: Eisenacher & Zink, 2017) are inconsistent, this inconsistency might be attributed to the variety of the employed tasks. With that said, our paradigm is a modified version of the

BADE task with written scenarios. Studies which employed written scenarios paradigm with subclinical populations (Buchy et al., 2007; Menon et al., 2013; Woodward et al., 2007; Zawadzki et al., 2012) yielded associations between impairments in belief revision and psychosis proneness in healthy individuals; as opposed to other paradigms such as advice weighting (Scheunemann et al., 2020) or pictures disclosure task (Juárez-Ramos et al., 2014) where the findings were rather contradictory. This suggests that belief revision might depend on the nature of the provided information and the context in which it is delivered and that High PLEs might have difficulties in belief revision when the information is given in a social context.

Regarding the plausibility ratings for options, while High PLE group assigned higher plausibility ratings to each option in comparison to Low PLEs, as expected, the highest discrepancy with respect to the plausibility ratings between groups was seen for the absurd option. Moreover, High PLEs did not just assign significantly higher plausibility ratings for absurd options but they also decided significantly more in favor of the absurd as well as incorrect (*defined as highest ratings for an option other than true in case of a decision*) options than the low-PLE group. These findings confirm our third hypothesis that High PLEs will exhibit a lowered decision threshold (i.e., LA bias). This pattern indeed confirmed that as opposed to strict JTC account, High PLEs did not hold onto one particular alternative, but rather embarked on multiple alternatives.

However, it should be noted that while these findings can be speculatively said to hint at LA bias as a possible underlying mechanism of JTC in particular cases, studies evaluating LA differ from each other in terms of the definition and the calculation of LA. While in some studies LA was confirmed when participants assigned higher plausibility ratings for all alternatives or particularly for absurd option (Moritz & Woodward, 2004; Panula et al., 2022, PREPRINT; Prike et al., 2018), in other studies a lowered decision threshold was assessed as decisions based on low probability estimates (Moritz et al., 2006c; Moritz, Scheunemann, Lüdtke, et al., 2020). Yet, and then again, the nature of the current paradigm is very distinctive from other paradigms such as the box task (Moritz, Scheunemann, Lüdtke, et al., 2020), the copy figure task (Moritz, Scheunemann, & Peters, 2020) or the sheep task (Moritz et al., 2016) where LA was evaluated via probability estimates on which the decisions were made. These paradigms encompass more numerical tasks in nature and do not include an absurd or multiple alternatives to assign plausibility ratings. On the contrary, similar to the tasks employed in (Moritz & Woodward, 2004; Panula et al., 2022, PREPRINT; Prike et al.,

2018), our paradigm included multiple alternatives to be rated in an ambiguous scenario and participants were presented with subsequent information which enabled them to adjust their ratings.

In the current study, in addition to the plausibility ratings and decisions for the absurd and incorrect alternatives, we also calculated plausibility ratings and decisions for the true option. Results demonstrated that while High PLEs total plausibility ratings for true option exceeded those of Low PLEs, it was Low PLEs who did more decisions in favor of the true option; hence they gave more correct decisions, which confirmed our fourth hypothesis.

Regarding the change in the plausibility ratings of groups, as opposed to High PLEs whose plausibility ratings remained same across sentences, Low PLEs increased their plausibility ratings for the true option in both conditions at a trend level. Yet, this increase was less so in the B condition between the first and second sentence, which reflects presence of the lure option in the second sentence. Adding to this, while Low PLEs decreased their plausibility ratings for lure option in both conditions, this decrease demonstrated a flat downtrend in the A condition, as opposed to B condition (the condition in which the lure option was designed to tempt the participants into lure option) where they first increased their ratings for the lure alternative with the second information and then decreased their plausibility ratings with the third and final information, another finding suggestive of the effectiveness of the lure interpretation for the Low PLEs. Taken together, these findings suggest that High PLEs display a difficulty in belief revision in their social interactions.

Moreover, previous studies have demonstrated impairments in introspective accuracy (IA) in schizophrenia patients. IA is defined as the ability to precisely assess self-abilities, performance and decisions (J. Silberstein & Harvey, 2019). Poor IA has been observed in a variety of subdomains and has been associated with debilitating outcomes (J. Silberstein & Harvey, 2019). Social cognition is another domain where schizophrenia patients exhibit impaired IA (J. M. Silberstein et al., 2018; Uchino et al., 2022). Current study has been carried out with a community sample (i.e., non-clinical population; for the further discussion, see: the limitations section), in order to assess whether the impairments in IA also hold true for people with psychosis-proneness. To this end, we looked at the correlational associations between incorrect decisions and perceived difficulty as well as subjective competency (two proxies to self-confidence).

In line with the expectations, at the sample level analyses yielded positive correlations between incorrect (as well as absurd) decisions and positive CAPE sub-scores. In addition, correct decisions were inversely correlated with positive CAPE sub-scores. As expected, there were no significant correlations between depressive CAPE sub-scores and incorrect, absurd or correct decisions. While we should be cautious in interpreting these findings, since simple correlational analyses cannot be interpreted causally; these findings tentatively speak for a specific association between impairments in IA and delusion proneness.

Secondly, we compared the High- and Low-PLE groups with regards to correlations between incorrect decisions, subjective social competency and subjective difficulty. In the Low PLE group analyses did not yield any significant correlations between any of these variables. However, and in line with the expectations, for the High PLEs there was a positive correlation between incorrect decisions and subjective social competency. These results reveal a discrepancy between objective task performance and self-assessment. Adding to this, for the same group there was a reverse correlation between subjective social competency and subjective difficulty.

However, our hypotheses were only partially confirmed. We hypothesized that for the High PLEs there will be an additional negative correlation between incorrect decisions and subjective difficulty, yet analyses did not yield any significant correlations between these two variables. One reason of this could be the calculation of the difficulty ratings. While we asked difficulty ratings after each item, in order to do the correlational analyses we calculated the means of all ratings without considering the possible implications of the conditions. It could be that the difficulty ratings per conditions cancelled out one another; since the items in the A condition could be perceived easier due to their increasingly disambiguating nature in comparison to items in the B condition, which could be perceived as more difficult due to the strong lure option.

While rating the subjective social competency, participants are expected to assess a rather stable construct (i.e., self and self-abilities) as opposed to difficulty ratings, where participants evaluate rather dynamic (non-self-related) items that differ from each other in terms of quality. This is why associations between incorrect decisions and subjective competency could be more reliable in evaluating impairments in IA than associations between incorrect decisions and perceived difficulty because the latter might encompass confounding variables. As such, interrelations among IA, subjective competency and perceived difficulty

in delusion prone individuals as well as clinical populations await further studies. With that said, our results are suggestive of an association between delusion proneness and impairments in IA in social cognition domain.



5. LIMITATIONS

Current study has several limitations. First of all, we aimed to create a novel paradigm which requires participants to use their socio-cognitive abilities while concurrently evaluates their decision making patterns. While this can be addressed as a strength since most of the BADE and JTC paradigms ignores the social nature of delusions and employs predominantly probabilistic reasoning tasks (Scheunemann et al., 2020), the same novelty necessitates replications of the paradigm in order to evaluate the validity and reliability of the test items.

Furthermore, although the main hypotheses of the study rest on the continuum approach to the psychosis (Johns & Van Os, 2001; Smigielski et al., 2021; Jim Van Os, 2003), it should be noted that supra-threshold patients might exhibit different decision making patterns compared to sub-threshold PLEs, hence, the same paradigm should be administered with patients diagnosed with a primary psychosis disorder as well as other mental disorders where the delusions accompany to the symptom presentation.

Moreover, the test items include utterances involving indirect speech examples and the nature of the task requires integration of contextual information as well as consideration of other person's perspective. It has been shown that schizophrenia patients have communicative-pragmatic deficits at multiple levels such as comprehension of non-literal language or figurative speech (Colle et al., 2013; Parola et al., 2021) and moreover, impairments in ToM (Bora et al., 2009; Champagne-Lavau et al., 2006; Mazza et al., 2021) and in context processing (Y. S. Chung et al., 2011; M. Green et al., 2005; Uhlhaas et al., 2006). While concerns regarding the duration of the task and relatedly, the attentiveness of the participants, —which are of more importance for an online study—, did not allow us to employ multiple tasks simultaneously, future studies can concurrently utilize tasks that assess context processing, ToM or communicative-pragmatic abilities to control for the confounding effects of such impairments.

Additionally, while we allowed participants to gain familiarity to the paradigm with a sample item before the task, it might have taken some time for participants to entirely comprehend the aim of the task. Therefore, future studies might employ a modified version of the paradigm whereby task items depicted in pictures to avoid the confounding effects of miscomprehension by facilitating the understanding of the task.

One particular strength of the study is that, as opposed to most of the JTC and BADE paradigms, current task allowed us to assess probability estimates in terms of plausibility ratings and decisions separately, which in turn permits the calculation of the point at which plausibility ratings convert into decisions. However, the nature of the paradigm did not require participants to generate response options themselves. Participants' information integration pattern should be further investigated with the same step-by-step-disambiguated dialogues when self-generated responses are allowed. For instance, when presented with only the first information, patients might be asked to generate a certain number of options as well as plausibility ratings for each of them and later on to adjust the number of the given options and the plausibility ratings with the each new information; while another group can be presented with pre-designated options. This way, it can also be tested whether participants rely on their self-generated ideas more firmly (Gohari et al., 2022).

One further limitation concerns not only the current study but online studies in general. Although we applied multiple explicit as well as implicit attention checks and despite the rigorous iterative screening process to eliminate the inattentive participants, it is not possible to fully control for the attentiveness of the participants. It should also be noted that relatively unvarying ratings of high PLEs are less likely to be due to insufficient attention checks and their inattentiveness, while the same pattern was not observed for low PLEs. In relation to that, while initially we recruited a relatively large sample ($n = 874$), after the screening process and after matching the high and low PLEs for their education, age, gender and depressive subscores; all of the analyses were made with the remaining small group ($n = 92$). Therefore, the small size of the matched sample can be addressed as another limitation of the study.

Lastly, current study carried out with participants from USA with a native English sample. Although the test items were developed by a researcher who is native Turkish speaker, the grammatical preciseness and cultural convenience of the test items were revised by a professional copy editor who is native English speaker. Therefore, the quality and authenticity of the items in accordance with the grammar and the *Geist* of the English language were examined meticulously. Associatively, future studies using the current paradigm with populations from different countries should be aware of the possible language- and culture-related differences and therefore pay attention to the proper localization of the test items. In comparison to most of the probability estimation tasks that does not heavily depend on language-related cognitive operations but are rather numerical in nature, cultural and

language-related differences might be of particular significance for such paradigms like the current one that taps into socio-cognitive skills to a degree (Hajdúk et al., 2020).

Overall, while the social nature of the task as well as the choice of the sample group, that is, PLEs, can be addressed as the strengths of the study due to respective gaps in the literature, the paradigm needs further replications with larger samples including different patient groups and samples from different cultures.



6. CONCLUSIONS AND FUTURE DIRECTIONS

The present thesis opened several insights into the role of cognitive biases in delusion formation and maintenance. Firstly, using a new paradigm, delusion-prone participants demonstrated a JTC bias in comparison to participants with low scores on PLE scale by arriving to decisions based on lesser information. Thus, JTC extends to the social sphere. From the study we can also implicate that High PLEs have impairments in belief flexibility (i.e., BADE) in the face of new information when the information is given in a social context. While JTC and BADE have been investigated via variety of paradigms, it is important to confirm their contribution in delusion formation in an interactional, social task since delusions are predominantly exacerbate in a social context. To this end, future studies should aim to conceptualize new paradigms assessing cognitive biases in social vs. neutral contexts. In addition, the ability to take the perspective of others, an important subcomponent of social cognition, is known as Theory of Mind (ToM) and previous studies have demonstrated ToM impairments in people with psychoses. While we should be cautious in interpreting the results, it should be further investigated whether cognitive biases and the incorrect judgments of the delusion-prone participants are associated with impairments in ToM. In this regard, ToM impairments, cognitive biases and delusion-proneness are under-investigated and future research should put more emphasis on the interrelations between them.

Furthermore, our results are essentially in line with the arguments of the two-stage cognitive theory of positive symptoms in that delusion-prone individuals demonstrated a LA bias by giving higher plausibility as well as decision ratings to the plausible as well as implausible alternatives. This, in turn, resulted with a JTC behavior in a high-ambiguity task. Adding to this, High PLEs' resistance to change their plausibility ratings across sentences verified the second step of the theory, which tentatively propounds that BADE strengthen the belief maintenance.

In addition, findings of the study hinted at impairments in Introspective Accuracy (IA) in social judgments among High PLEs. IA and metacognition are different, yet substantially close constructs. While our study provided preliminary findings on the associations between delusion proneness and impairments in IA; future studies should further investigate the possible links between delusion proneness, metacognitive biases and IA.

Lastly, in our opinion the findings of the current study have multiple clinical implications. Our results are contributing to the accumulating evidence hinting at the role of the cognitive biases in delusion formation and maintenance. Cognitive biases are not exclusive to the patient groups; they are ubiquitous and not impairments *per se*. Two understandings that i) delusions arise from prevalent cognitive biases and that ii) psychotic-like experiences are also common among general population might help with reducing the stigmatization.

Of all the mental afflictions, individuals with psychotic disorders (e.g., schizophrenia) are may be the most stigmatized, feared and excluded ones among lay people. This stigmatization, fear and exclusion partly arise from lack of knowledge and partly due to the *illusion of poor recovery*. Lack of knowledge might be targeted with educational interventions designed for the general as well as clinical populations. And with respect to the illusions of “poor recovery”, interventions targeting cognitive distortions such as MCT have been proven effective in alleviating the psychotic symptoms as well as functioning (Penney et al., 2022). Investigating and targeting the cognitive biases may help those who suffer from psychoses beyond symptom improvement.

REFERENCES

- Aakre, J. M., Seghers, J. P., St-Hilaire, A., & Docherty, N. (2009). Attributional style in delusional patients: A comparison of remitted paranoid, remitted nonparanoid, and current paranoid patients with nonpsychiatric controls. *Schizophrenia Bulletin*, 35(5), 994–1002. <https://doi.org/10.1093/schbul/sbn033>
- Adhikari, B. M., Hong, L. E., Sampath, H., Chiappelli, J., Jahanshad, N., Thompson, P. M., Rowland, L. M., Calhoun, V. D., Du, X., Chen, S., & Kochunov, P. (2019). Functional network connectivity impairments and core cognitive deficits in schizophrenia. *Human Brain Mapping*, 40(16), 4593–4605. <https://doi.org/10.1002/hbm.24723>
- Ahonen, M. (2014). *Mental Disorders in Ancient Philosophy*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-03431-7>
- American Psychiatric Association. (2013). DSM-5 Diagnostic Classification. In *Diagnostic and Statistical Manual of Mental Disorders*. American Psychiatric Publishing. <https://doi.org/10.1176/appi.books.9780890425596.x00diagnosticclassification>
- Andreou, C., Moritz, S., Veith, K., Veckenstedt, R., & Naber, D. (2014). Dopaminergic Modulation of Probabilistic Reasoning and Overconfidence in Errors: A Double-Blind Study. *Schizophrenia Bulletin*, 40(3), 558–565. <https://doi.org/10.1093/schbul/sbt064>
- Arango, C., & Carpenter, W. T. (2011). The Schizophrenia Construct: Symptomatic Presentation. In *Schizophrenia: Third Edition*. <https://doi.org/10.1002/9781444327298.ch2>
- Arango, C., Dragioti, E., Solmi, M., Cortese, S., Domschke, K., Murray, R. M., Jones, P. B., Uher, R., Carvalho, A. F., Reichenberg, A., Shin, J. I. I., Andreassen, O. A., Correll, C. U., & Fusar-Poli, P. (2021). Risk and protective factors for mental disorders beyond genetics: an evidence-based atlas. *World Psychiatry*, 20(3), 417–436. <https://doi.org/10.1002/wps.20894>
- Arnon-Ribenfeld, N., Hasson-Ohayon, I., Lavidor, M., Atzil-Slonim, D., & Lysaker, P. H. (2017). The association between metacognitive abilities and outcome measures among people with schizophrenia: A meta-analysis. *European Psychiatry*, 46, 33–41. <https://doi.org/10.1016/j.eurpsy.2017.08.002>
- Ashinoff, B. K., Singletary, N. M., Baker, S. C., & Horga, G. (2021). Rethinking delusions: A selective review of delusion research through a computational lens. *Schizophrenia Research*, March. <https://doi.org/10.1016/j.schres.2021.01.023>
- Ayano, G. (2016). Schizophrenia: a concise overview of etiology, epidemiology diagnosis and management. *Journal of Schizophrenia Research*, 3(2), 1–7.
- Azis, M., Rouhakhtar, P. R., Schiffman, J. E., Ellman, L. M., Strauss, G. P., & Mittal, V. A. (2021). Structure of positive psychotic symptoms in individuals at clinical high risk for psychosis. *Early Intervention in Psychiatry*, 15(3), 505–512. <https://doi.org/10.1111/eip.12969>
- Badcock, J. C., & Georgie, P. (Eds.). (2020). *A Clinical Introduction to Psychosis*. Academic Press. <https://doi.org/10.1016/C2017-0-01829-3>
- Baker, S. C., Konova, A. B., Daw, N. D., & Horga, G. (2019). A distinct inferential

- mechanism for delusions in schizophrenia. *Brain*, 142(6), 1797–1812.
<https://doi.org/10.1093/brain/awz051>
- Balzan, R. P. (2016). Overconfidence in psychosis: The foundation of delusional conviction? *Cogent Psychology*, 3(1). <https://doi.org/10.1080/23311908.2015.1135855>
- Balzan, R. P., Delfabbro, P. H., Galletly, C. A., & Woodward, T. S. (2012). Over-adjustment or miscomprehension? A re-examination of the jumping to conclusions bias. *Australian and New Zealand Journal of Psychiatry*, 46(6), 532–540.
<https://doi.org/10.1177/0004867411435291>
- Balzan, R. P., Gilder, M., Nancarrow, T., Mavrangelos, T., & Wade, T. D. (2022). Hasty decision-making in individuals at higher risk of developing an eating disorder. *Journal of Behavior Therapy and Experimental Psychiatry*, 75, 101717.
<https://doi.org/https://doi.org/10.1016/j.jbtep.2021.101717>
- Balzan, R. P., & Moritz, S. (2020). Cognitive biases and psychosis: From bench to bedside. *Schizophrenia Research*, xxxx. <https://doi.org/10.1016/j.schres.2020.07.014>
- Bebbington, P., & Freeman, D. (2017). Transdiagnostic extension of delusions: Schizophrenia and beyond. *Schizophrenia Bulletin*, 43(2), 273–282.
<https://doi.org/10.1093/schbul/sbw191>
- Bell, V., Halligan, P. W., & Ellis, H. D. (2006). Explaining delusions: a cognitive perspective. *Trends in Cognitive Sciences*, 10(5), 219–226. <https://doi.org/10.1016/j.tics.2006.03.004>
- Bell, V., Raihani, N., & Wilkinson, S. (2021). Derationalizing Delusions. *Clinical Psychological Science*, 9(1), 24–37. <https://doi.org/10.1177/2167702620951553>
- Bentall, R. P., Corcoran, R., Howard, R., Blackwood, N., & Kinderman, P. (2001). Persecutory delusions: A review and theoretical integration. In *Clinical Psychology Review*. [https://doi.org/10.1016/S0272-7358\(01\)00106-4](https://doi.org/10.1016/S0272-7358(01)00106-4)
- Bentall, R. P., de Sousa, P., Varese, F., Wickham, S., Sitko, K., Haarmans, M., & Read, J. (2014). From adversity to psychosis: pathways and mechanisms from specific adversities to specific symptoms. *Social Psychiatry and Psychiatric Epidemiology*, 49(7), 1011–1022. <https://doi.org/10.1007/s00127-014-0914-0>
- Bentall, R. P., Kinderman, P., & Kaney, S. (1994). The self, attributional processes and abnormal beliefs: Towards a model of persecutory delusions. *Behaviour Research and Therapy*, 32(3), 331–341. [https://doi.org/10.1016/0005-7967\(94\)90131-7](https://doi.org/10.1016/0005-7967(94)90131-7)
- Berrios, G. E. (1991). History of Mental Symptoms, Diseases and Mechanisms. *Current Opinion in Psychiatry*, 4, 747–752.
- Biedermann, F., & Fleischhacker, W. W. (2016). Psychotic disorders in DSM-5 and ICD-11. *CNS Spectrums*, 21(4), 349–354. <https://doi.org/10.1017/S1092852916000316>
- Bighelli, I., Salanti, G., Huhn, M., Schneider-thoma, J., Krause, M., Reitmeir, C., Schwermann, F., Pitschel-walz, G., Barbui, C., Furukawa, T. A., & Leucht, S. (2018). *Psychological interventions to reduce positive symptoms in schizophrenia : systematic review and network meta-analysis*. *October*, 316–329. <https://doi.org/10.1002/wps.20577>
- Biondi, M., Pasquini, M., & Picardi, A. (2018). Dimensional psychopathology. In *Dimensional Psychopathology*. <https://doi.org/10.1007/978-3-319-78202-7>
- Bora, E. (2017). Relationship between insight and theory of mind in schizophrenia: A meta-

- analysis. *Schizophrenia Research*, 190, 11–17.
<https://doi.org/10.1016/j.schres.2017.03.029>
- Bora, E. (2020). Theory of mind and schizotypy: A meta-analysis. *Schizophrenia Research*, 222(xxxx), 97–103. <https://doi.org/10.1016/j.schres.2020.04.024>
- Bora, E., & Pantelis, C. (2013). Theory of mind impairments in first-episode psychosis, individuals at ultra-high risk for psychosis and in first-degree relatives of schizophrenia: Systematic review and meta-analysis. *Schizophrenia Research*, 144(1–3), 31–36.
<https://doi.org/10.1016/j.schres.2012.12.013>
- Bora, E., Yucel, M., & Pantelis, C. (2009). Theory of mind impairment in schizophrenia: Meta-analysis. *Schizophrenia Research*, 109(1–3), 1–9.
<https://doi.org/10.1016/j.schres.2008.12.020>
- Bortolotti, L., & Miyazono, K. (2015). Recent Work on the Nature and Development of Delusions. In *Philosophy Compass* (Vol. 10, Issue 9, pp. 636–645).
<https://doi.org/10.1111/phc3.12249>
- Breil, C., Kanske, P., Pittig, R., & Böckler, A. (2021). A revised instrument for the assessment of empathy and Theory of Mind in adolescents: Introducing the EmpaToM-Y. *Behavior Research Methods*. <https://doi.org/10.3758/s13428-021-01589-3>
- Bronstein, M. V., & Cannon, T. D. (2017). Bias against Disconfirmatory Evidence in a large Nonclinical Sample: Associations with Schizotypy and Delusional Beliefs. *Journal of Experimental Psychopathology*, 8(3), 288–302. <https://doi.org/10.5127/jep.057516>
- Bronstein, M. V., & Cannon, T. D. (2018). Measuring bias against disconfirmatory evidence: An evaluation of BADE task scoring methods and the case for a novel method. *Psychiatry Research*, 261, 535–540. <https://doi.org/10.1016/j.psychres.2018.01.007>
- Bronstein, M. V., Pennycook, G., Joormann, J., Corlett, P. R., & Cannon, T. D. (2019). Dual-process theory, conflict processing, and delusional belief. *Clinical Psychology Review*, 72(April), 101748. <https://doi.org/10.1016/j.cpr.2019.101748>
- Broyd, A., Balzan, R. P., Woodward, T. S., & Allen, P. (2017). Dopamine, cognitive biases and assessment of certainty: A neurocognitive model of delusions. *Clinical Psychology Review*, 54, 96–106. <https://doi.org/10.1016/j.cpr.2017.04.006>
- Brüne, M. (2005). “Theory of mind” in schizophrenia: A review of the literature. *Schizop*, 31(1), 21–42. <https://doi.org/10.1093/schbul/sbi002>
- Brüne, M. (2016). *Textbook of Evolutionary Psychiatry and Psychosomatic Medicine*. Oxford University Press. <https://doi.org/10.1093/med:psych/9780198717942.001.0001>
- Brunet-Gouet, E., Decaix-Tisserand, C., Urbach, M., Bazin, N., Aouizerate, B., Brunel, L., Capdevielle, D., Chereau, I., Dubertret, C., Dubreucq, J., Fond, G., Lançon, C., Leignier, S., Mallet, J., Misdrahi, D., Pires, S., Schneider, P., Schurhoff, F., Yazbek, H., ... Roux, P. (2021). Outcome prediction with a social cognitive battery: a multicenter longitudinal study. *Npj Schizophrenia*, 7(1). <https://doi.org/10.1038/s41537-021-00160-5>
- Buchy, L., Woodward, T. S., & Liotti, M. (2007). A cognitive bias against disconfirmatory evidence (BADE) is associated with schizotypy. *Schizophrenia Research*, 90(1–3), 334–337. <https://doi.org/10.1016/j.schres.2006.11.012>
- Buck, K. D., Warman, D. M., Huddy, V., & Lysaker, P. H. (2012). The relationship of

- metacognition with jumping to conclusions among persons with schizophrenia spectrum disorders. *Psychopathology*, 45(5), 271–275. <https://doi.org/10.1159/000330892>
- Bukenaite, A., Stochl, J., Mossaheb, N., Schäfer, M. R., Klier, C. M., Becker, J., Schloegelhofer, M., Papageorgiou, K., Montejo, A. L., Russo, D. A., Jones, P. B., Perez, J., & Amminger, G. P. (2017). Usefulness of the CAPE-P15 for detecting people at ultra-high risk for psychosis: Psychometric properties and cut-off values. *Schizophrenia Research*, 189, 69–74. <https://doi.org/10.1016/j.schres.2017.02.017>
- Cardella, V., & Gangemi, A. (2019). From the Categorical to the Dimensional Approach in Psychopathology: The Case of Auditory Hallucinations. *Mediterranean Journal of Clinical Psychology*, 7, 1–13. <https://doi.org/10.6092/2282-1619/2019.7.2106>
- Carota, A., & Bogousslavsky, J. (2019). Neurology versus Psychiatry? Hallucinations, Delusions, and Confabulations. *Frontiers of Neurology and Neuroscience*, 44, 127–140. <https://doi.org/10.1159/000494960>
- Catalan, A., Tognin, S., Kempton, M. J., Stahl, D., de Pablo, G. S., Nelson, B., Pantelis, C., Riecher-Rössler, A., Bressan, R., Barrantes-Vidal, N., Krebs, M. O., Nordentoft, M., Ruhrmann, S., Sachs, G., Rutten, B. P. F., van Os, J., de Haan, L., van der Gaag, M., Valmaggia, L. R., & McGuire, P. (2020). Relationship between jumping to conclusions and clinical outcomes in people at clinical high-risk for psychosis. *Psychological Medicine*, 1–9. <https://doi.org/10.1017/S0033291720003396>
- Cavieres, A., Acuña, V., Wachtendorff, C., & Maldonado, R. (2022). People with schizophrenia use less information to interpret ambiguous social situations. *Journal of Behavior Therapy and Experimental Psychiatry*, 74, 101690. <https://doi.org/10.1016/J.JBTEP.2021.101690>
- Champagne-Lavau, M., Fossard, M., Martel, G., Chapdelaine, C., Blouin, G., Rodriguez, J. P., & Stip, E. (2009). Do patients with schizophrenia attribute mental states in a referential communication task? *Cognitive Neuropsychiatry*, 14(3), 217–239. <https://doi.org/10.1080/13546800903004114>
- Champagne-Lavau, M., Stip, E., & Joanette, Y. (2006). Social Cognition Deficit in Schizophrenia: Accounting for Pragmatic Deficits in Communication Abilities? *Current Psychiatry Reviews*, 2(3), 309–315. <https://doi.org/10.2174/157340006778018184>
- Chan, V. (2017). Schizophrenia and Psychosis: Diagnosis, Current Research Trends, and Model Treatment Approaches with Implications for Transitional Age Youth. *Child and Adolescent Psychiatric Clinics of North America*, 26(2), 341–366. <https://doi.org/10.1016/j.chc.2016.12.014>
- Chung, Y., & Cannon, T. D. (2015). Brain imaging during the transition from psychosis prodrome to Schizophrenia. *Journal of Nervous and Mental Disease*, 203(5), 336–341. <https://doi.org/10.1097/NMD.0000000000000286>
- Chung, Y. S., Mathews, J. R., & Barch, D. M. (2011). The effect of context processing on different aspects of social cognition in schizophrenia. *Schizophrenia Bulletin*, 37(5), 1048–1056. <https://doi.org/10.1093/schbul/sbq012>
- Cohen, B. M., Öngür, D., & Babb, S. M. (2021). Alternative Diagnostic Models of the Psychotic Disorders: Evidence-Based Choices. *Psychotherapy and Psychosomatics*, 90(6), 373–385. <https://doi.org/10.1159/000517027>

- Coleborne, C. (2020). *Why Talk About Madness?* Springer International Publishing. <https://doi.org/10.1007/978-3-030-21096-0>
- Colle, L., Angeleri, R., Vallana, M., Sacco, K., Bara, B. G., & Bosco, F. M. (2013). Understanding the communicative impairments in schizophrenia: A preliminary study. *Journal of Communication Disorders*, 46(3), 294–308. <https://doi.org/10.1016/j.jcomdis.2013.01.003>
- Coltheart, M. (2013). On the Distinction between Monothematic and Polythematic Delusions. *Mind and Language*, 28(1), 103–112. <https://doi.org/10.1111/mila.12011>
- Coltheart, M., Langdon, R., & McKay, R. (2011). Delusional belief. *Annual Review of Psychology*, 62, 271–298. <https://doi.org/10.1146/annurev.psych.121208.131622>
- Connors, M. H., & Halligan, P. W. (2015). *A cognitive account of belief: a tentative road map*. 5(February), 1–14. <https://doi.org/10.3389/fpsyg.2014.01588>
- Connors, M. H., & Halligan, P. W. (2017). Belief and Belief Formation: Insights from Delusions. In H.-F. Angel, L. Oviedo, R. F. Paloutzian, A. L. C. Runehov, & R. J. Seitz (Eds.), *Processes of Believing: The Acquisition, Maintenance, and Change in Creditions* (Vol. 1, pp. 153–165). Springer International Publishing. <https://doi.org/10.1007/978-3-319-50924-2>
- Connors, M. H., & Halligan, P. W. (2020). Delusions and theories of belief. *Consciousness and Cognition*, 81(March), 102935. <https://doi.org/10.1016/j.concog.2020.102935>
- Corcoran, R., Mercer, G., & Frith, C. D. (1995). Schizophrenia, symptomatology and social inference: Investigating “theory of mind” in people with schizophrenia. *Schizophrenia Research*, 17(1), 5–13. [https://doi.org/10.1016/0920-9964\(95\)00024-G](https://doi.org/10.1016/0920-9964(95)00024-G)
- Corlett, P. R., Taylor, J. R., Wang, X. J., Fletcher, P. C., & Krystal, J. H. (2010). Toward a neurobiology of delusions. *Progress in Neurobiology*, 92(3), 345–369. <https://doi.org/10.1016/j.pneurobio.2010.06.007>
- Cunningham, C., & Peters, K. (2014). Aetiology of Schizophrenia and Implications for Nursing Practice: A Literature Review. *Issues in Mental Health Nursing*, 35(10), 732–738. <https://doi.org/10.3109/01612840.2014.908441>
- Davies, C., Segre, G., Estradé, A., Radua, J., De Micheli, A., Provenzani, U., Oliver, D., Salazar de Pablo, G., Ramella-Cravaro, V., Besozzi, M., Dazzan, P., Miele, M., Caputo, G., Spallarossa, C., Crossland, G., Ilyas, A., Spada, G., Politi, P., Murray, R. M., ... Fusar-Poli, P. (2020). Prenatal and perinatal risk and protective factors for psychosis: a systematic review and meta-analysis. *The Lancet Psychiatry*, 7(5), 399–410. [https://doi.org/10.1016/S2215-0366\(20\)30057-2](https://doi.org/10.1016/S2215-0366(20)30057-2)
- Davies, M., Coltheart, M., Langdon, R., & Breen, N. (2001). Monothematic Delusions: Towards a Two-Factor Account. *Philosophy, Psychiatry, & Psychology*, 8(2), 133–158. <https://doi.org/10.1353/ppp.2001.0007>
- Davis, J., Eyre, H., Jacka, F. N., Dodd, S., Dean, O., McEwen, S., Debnath, M., McGrath, J., Maes, M., Amminger, P., McGorry, P. D., Pantelis, C., & Berk, M. (2016). A review of vulnerability and risks for schizophrenia: Beyond the two hit hypothesis. *Neuroscience and Biobehavioral Reviews*, 65, 185–194. <https://doi.org/10.1016/j.neubiorev.2016.03.017>
- Díaz-Cutraró, L., García-Mieres, H., López-Carrilero, R., Ferrer, M., Verdaguer-Rodríguez,

- M., Barrigón, M. L., Barajas, A., Grasa, E., Pousa, E., Lorente, E., Ruiz-Delgado, I., González-Higueras, F., Cid, J., Palma-Sevillano, C., Moritz, S., & Ochoa, S. (2021). Jumping to conclusions is differently associated with specific subtypes of delusional experiences: An exploratory study in first-episode psychosis. *Schizophrenia Research*, 228, 357–359. <https://doi.org/10.1016/j.schres.2020.12.037>
- Dorn, L. M. L., Struck, N., Bitsch, F., Falkenberg, I., Kircher, T., Rief, W., & Mehl, S. (2021). The Relationship Between Different Aspects of Theory of Mind and Symptom Clusters in Psychotic Disorders: Deconstructing Theory of Mind Into Cognitive, Affective, and Hyper Theory of Mind. *Frontiers in Psychiatry*, 12(April), 1–11. <https://doi.org/10.3389/fpsy.2021.607154>
- Dudley, R. E. J., & John, C. H. (1997). *The effect of self-referent material on the reasoning of people with delusions*. 575–584.
- Dudley, R., Taylor, P., Wickham, S., & Hutton, P. (2016). Psychosis, Delusions and the “Jumping to Conclusions” Reasoning Bias: A Systematic Review and Meta-analysis. *Schizophrenia Bulletin*, 42(3), 652–665. <https://doi.org/10.1093/schbul/sbv150>
- Durand, D., Strassnig, M. T., Moore, R. C., Depp, C. A., Ackerman, R. A., Pinkham, A. E., & Harvey, P. D. (2021). Self-reported social functioning and social cognition in schizophrenia and bipolar disorder: Using ecological momentary assessment to identify the origin of bias. *Schizophrenia Research*, 230(3), 17–23. <https://doi.org/10.1016/j.schres.2021.02.011>
- Eghigian, G. (Ed.). (2017). *The Routledge History of Madness and Mental Health*. Routledge. <https://doi.org/10.4324/9781315202211>
- Eichner, C., & Berna, F. (2016). Acceptance and efficacy of metacognitive training (mct) on positive symptoms and delusions in patients with schizophrenia: A meta-analysis taking into account important moderators. *Schizophrenia Bulletin*, 42(4), 952–962. <https://doi.org/10.1093/schbul/sbv225>
- Eifler, S., Rausch, F., Schirmbeck, F., Veckenstedt, R., Englisch, S., Meyer-Lindenberg, A., Kirsch, P., & Zink, M. (2014). Neurocognitive capabilities modulate the integration of evidence in schizophrenia. *Psychiatry Research*, 219(1), 72–78. <https://doi.org/10.1016/j.psychres.2014.04.056>
- Eisenacher, S., & Zink, M. (2017). Holding on to false beliefs: The bias against disconfirmatory evidence over the course of psychosis. *Journal of Behavior Therapy and Experimental Psychiatry*, 56, 79–89. <https://doi.org/10.1016/j.jbtep.2016.08.015>
- Ellis, H. D., & Young, A. W. (1990). Accounting for delusional misidentifications. *British Journal of Psychiatry*, 157(AUG.), 239–248. <https://doi.org/10.1192/bjp.157.2.239>
- Ellis, Hadyn D., & Lewis, M. B. (2001). Capgras delusion: A window on face recognition. *Trends in Cognitive Sciences*, 5(4), 149–156. [https://doi.org/10.1016/S1364-6613\(00\)01620-X](https://doi.org/10.1016/S1364-6613(00)01620-X)
- Ellis, R., Kendal, S., & Taylor, S. J. (2021). *Voices in the History of Madness: An Introduction to Personal and Professional Perspectives*. https://doi.org/10.1007/978-3-030-69559-0_1
- Elvevåg, B., & Goldberg, T. E. (2000). Cognitive impairment in schizophrenia is the core of the disorder. *Critical Reviews in Neurobiology*, 14(1), 1–21.

<http://www.ncbi.nlm.nih.gov/pubmed/11253953>

- Erzin, G., & Gülöksüz, S. (2021). The exposome paradigm to understand the environmental origins of mental disorders. *Anadolu Psikiyatri Dergisi*, 22(4), 171–176. <https://doi.org/10.5152/alphapsychiatry.2021.21307>
- Feeney, E. J., Groman, S. M., Taylor, J. R., & Corlett, P. R. (2017). Explaining delusions: Reducing uncertainty through basic and computational neuroscience. *Schizophrenia Bulletin*, 43(2), 263–272. <https://doi.org/10.1093/schbul/sbw194>
- Fekete, Z., Vass, E., Balajthy, R., Tana, Ü., Nagy, A. C., Oláh, B., Domján, N., & Kuritárné, I. S. (2022). Efficacy of metacognitive training on symptom severity, neurocognition and social cognition in patients with schizophrenia: A single-blind randomized controlled trial. *Scandinavian Journal of Psychology*. <https://doi.org/10.1111/sjop.12811>
- Fernández-Modamio, M., Arrieta-Rodríguez, M., Bengochea-Seco, R., Santacoloma-Cabero, I., Gómez de Tojeiro-Roce, J., García-Polavieja, B., González-Fraile, E., Martín-Carrasco, M., Griffin, K., & Gil-Sanz, D. (2018). Faux-Pas Test: A Proposal of a Standardized Short Version. *Clinical Schizophrenia & Related Psychoses, aop*. <https://doi.org/10.3371/csrp.fear.061518>
- Fett, A. K. J., Viechtbauer, W., Dominguez, M. de G., Penn, D. L., van Os, J., & Krabbendam, L. (2011). The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: A meta-analysis. *Neuroscience and Biobehavioral Reviews*, 35(3), 573–588. <https://doi.org/10.1016/j.neubiorev.2010.07.001>
- Feyaerts, J., Henriksen, M. G., Vanheule, S., Myin-Germeys, I., & Sass, L. A. (2021). Delusions beyond beliefs: a critical overview of diagnostic, aetiological, and therapeutic schizophrenia research from a clinical-phenomenological perspective. *The Lancet Psychiatry*, 8(3), 237–249. [https://doi.org/10.1016/S2215-0366\(20\)30460-0](https://doi.org/10.1016/S2215-0366(20)30460-0)
- Feyaerts, J., Kusters, W., Van Duppen, Z., Vanheule, S., Myin-Germeys, I., & Sass, L. (2021). Uncovering the realities of delusional experience in schizophrenia: a qualitative phenomenological study in Belgium. *The Lancet Psychiatry*, 8(9), 784–796. [https://doi.org/10.1016/S2215-0366\(21\)00196-6](https://doi.org/10.1016/S2215-0366(21)00196-6)
- Fine, C., Gardner, M., Craigie, J., & Gold, I. (2007). Hopping, skipping or jumping to conclusions? Clarifying the role of the JTC bias in delusions. *Cognitive Neuropsychiatry*, 12(1), 46–77. <https://doi.org/10.1080/13546800600750597>
- Fonseca-Pedrero, E., Debbané, M., Rodríguez-Testal, J. F., Cohen, A. S., Docherty, A. R., & Ortuño-Sierra, J. (2021). Schizotypy: The way ahead. *Psicothema*, 33(1), 16–27. <https://doi.org/10.7334/psicothema2019.285>
- Freedman, R., Hunter, S. K., Law, A. J., Clark, A. M., Roberts, A., & Hoffman, M. C. (2021). Choline, folic acid, Vitamin D, and fetal brain development in the psychosis spectrum. *Schizophrenia Research*, xxxx. <https://doi.org/10.1016/j.schres.2021.03.008>
- Freeman, D., & Garety, P. (2014). Advances in understanding and treating persecutory delusions: A review. *Social Psychiatry and Psychiatric Epidemiology*, 49(8), 1179–1189. <https://doi.org/10.1007/s00127-014-0928-7>
- Freeman, D., Garety, P. A., Kuipers, E., Fowler, D., & Bebbington, P. E. (2002). A cognitive model of persecutory delusions. *The British Journal of Clinical Psychology*, 41(Pt 4), 331–347. <https://doi.org/10.1348/014466502760387461>

- Freeman, D., Pugh, K., & Garety, P. (2008). Jumping to conclusions and paranoid ideation in the general population. *Schizophrenia Research*, 102(1–3), 254–260. <https://doi.org/10.1016/j.schres.2008.03.020>
- Frith, Chris D, & Frith, U. (2006). The Neural Basis of Mentalizing. *Neuron*, 50(4), 531–534. <https://doi.org/https://doi.org/10.1016/j.neuron.2006.05.001>
- Frith, Christopher D. (1992). The cognitive neuropsychology of schizophrenia. Hove, UK, Hillsdale, USA: L. Erlbaum Associates. DOI, 10, 9781315785011.
- Frith, Christopher Donald. (2014). *The cognitive neuropsychology of schizophrenia*. Psychology press.
- Galderisi, S., Mucci, A., Buchanan, R. W., & Arango, C. (2018). Negative symptoms of schizophrenia : new developments and unanswered research questions. *The Lancet Psychiatry*, 0366(18), 1–14. [https://doi.org/10.1016/S2215-0366\(18\)30050-6](https://doi.org/10.1016/S2215-0366(18)30050-6)
- Galindo, B., Iwanski, C., Haut, K. M., Demos, A., Pridgen, S., Lee, A., Nahum, M., & Hooker, C. I. (2021). Does a Computerized Social Cognitive Intervention Improve Implicit or Explicit Theory of Mind in Individuals With Psychosis? *Biological Psychiatry*, 89(9), S312. <https://doi.org/10.1016/j.biopsych.2021.02.778>
- Garety, P. A., Hemsley, D. R., & Wessely, S. (1991). Reasoning in deluded schizophrenic and paranoid patients biases in performance on a probabilistic inference task. In *Journal of Nervous and Mental Disease* (Vol. 179, Issue 4, pp. 194–201). <https://doi.org/10.1097/00005053-199104000-00003>
- Garety, P. A., Kuipers, E., Fowler, D., Freeman, D., & Bebbington, P. E. (2001). A cognitive model of the positive symptoms of psychosis. *Psychological Medicine*, 31(2), 189–195. <https://doi.org/10.1017/S0033291701003312>
- Garety, Philippa A., Freeman, D., Jolley, S., Bebbington, P. E., Kuipers, E., Dunn, G., Fowler, D. G., & Dudley, R. (2005). Reasoning, emotions, and delusional conviction in psychosis. *Journal of Abnormal Psychology*, 114(3), 373–384. <https://doi.org/10.1037/0021-843X.114.3.373>
- Gawe, Ł., & Prochwicz, K. (2015). *Original article A comparison of cognitive biases between schizophrenia patients with delusions and healthy individuals with delusion-like experiences*. 30, 943–949. <https://doi.org/10.1016/j.eurpsy.2015.08.003>
- Gawęda, Ł., Staszkiwicz, M., & Balzan, R. P. (2017). The relationship between cognitive biases and psychological dimensions of delusions: The importance of jumping to conclusions. *Journal of Behavior Therapy and Experimental Psychiatry*, 56, 51–56. <https://doi.org/10.1016/j.jbtep.2016.08.003>
- Giulio, P. (2020). Psychotic spectrum disorders: Definitions, classifications, neural correlates and clinical profiles. *Annals of Psychiatry and Treatment*, 4, 070–084. <https://doi.org/10.17352/apt.000023>
- Gohari, E., Moore, R. C., Depp, C. A., Ackerman, R. A., Pinkham, A. E., & Harvey, P. D. (2022). Momentary severity of psychotic symptoms predicts overestimation of competence in domains of everyday activities and work in schizophrenia: An ecological momentary assessment study. *Psychiatry Research*, 310, 114487. <https://doi.org/https://doi.org/10.1016/j.psychres.2022.114487>
- Gold, I. (2017). Outline of a Theory of Delusion: Irrationality and Pathological Belief. In

- Rationality: Constraints and Contexts*. Elsevier Inc. <https://doi.org/10.1016/B978-0-12-804600-5.00006-4>
- Grant, N., Lawrence, M., Preti, A., Wykes, T., & Cella, M. (2017). Social cognition interventions for people with schizophrenia: a systematic review focussing on methodological quality and intervention modality. *Clinical Psychology Review*, 56(May), 55–64. <https://doi.org/10.1016/j.cpr.2017.06.001>
- Green, M. F., Horan, W. P., & Lee, J. (2019). Nonsocial and social cognition in schizophrenia: current evidence and future directions. *World Psychiatry*, 18(2), 146–161. <https://doi.org/10.1002/wps.20624>
- Green, M. F., Olivier, B., Crawley, J. N., Penn, D. L., & Silverstein, S. (2005). Social cognition in schizophrenia: Recommendations from the Measurement and Treatment Research to Improve Cognition in Schizophrenia New Approaches Conference. *Schizophrenia Bulletin*, 31(4), 882–887. <https://doi.org/10.1093/schbul/sbi049>
- Green, M., Uhlhaas, P., & Coltheart, M. (2005). Context Processing and Social Cognition in Schizophrenia. *Current Psychiatry Reviews*, 1(1), 11–22. <https://doi.org/10.2174/1573400052953529>
- Gross, G. M., Mellin, J., Silvia, P. J., Barrantes-Vidal, N., & Kwapil, T. R. (2014). Comparing the factor structure of the Wisconsin Schizotypy Scales and the Schizotypal Personality Questionnaire. *Personality Disorders: Theory, Research, and Treatment*, 5(4), 397–405. <https://doi.org/10.1037/per0000090>
- Guerrin, C. G. J., Doorduyn, J., Sommer, I. E., & de Vries, E. F. J. (2021). The dual hit hypothesis of schizophrenia: Evidence from animal models. *Neuroscience and Biobehavioral Reviews*, 131(July), 1150–1168. <https://doi.org/10.1016/j.neubiorev.2021.10.025>
- Guloksuz, S., & van Os, J. (2021). En attendant Godot: Waiting for the Funeral of “Schizophrenia” and the Baby Shower of the Psychosis Spectrum. *Frontiers in Psychiatry*, 12(May). <https://doi.org/10.3389/fpsyt.2021.618842>
- Guloksuz, S., Van Os, J., & Rutten, B. P. F. (2018). The Exposome Paradigm and the Complexities of Environmental Research in Psychiatry. *JAMA Psychiatry*, 75(10), 985–986. <https://doi.org/10.1001/jamapsychiatry.2018.1211>
- Hager, B. M., & Keshavan, M. S. (2015). Neuroimaging Biomarkers for Psychosis. *Current Behavioral Neuroscience Reports*, 2(2), 102–111. <https://doi.org/10.1007/s40473-015-0035-4>
- Hajdúk, M., Achim, A. M., Brunet – Gouet, E., Mehta, U. M., & Pinkham, A. E. (2020). How to move forward in social cognition research? Put it into an international perspective. *Schizophrenia Research*, 215(xxxx), 463–464. <https://doi.org/10.1016/j.schres.2019.10.001>
- Haller, C. S., Padmanabhan, J. L., Lizano, P., Torous, J., & Keshavan, M. (2014). Recent advances in understanding schizophrenia. *F1000Prime Reports*, 6(July), 1–11. <https://doi.org/10.12703/P6-57>
- Halverson, T. F., Orleans-Pobee, M., Merritt, C., Sheeran, P., Fett, A. K., & Penn, D. L. (2019). Pathways to functional outcomes in schizophrenia spectrum disorders: Meta-analysis of social cognitive and neurocognitive predictors. *Neuroscience and*

- Biobehavioral Reviews*, 105(April), 212–219.
<https://doi.org/10.1016/j.neubiorev.2019.07.020>
- Healy, C., Brannigan, R., Dooley, N., Coughlan, H., Clarke, M., Kelleher, I., & Cannon, M. (2019). Childhood and adolescent psychotic experiences and risk of mental disorder: A systematic review and meta-analysis. *Psychological Medicine*, 49(10), 1589–1599.
<https://doi.org/10.1017/S0033291719000485>
- Healy, C., & Cannon, M. (2020). Psychotic-like experiences in the general population. In *Risk Factors for Psychosis*. Elsevier Inc. <https://doi.org/10.1016/b978-0-12-813201-2.00007-7>
- Heaton, R. K., Gladsjo, J. A., Palmer, B. W., Kuck, J., Marcotte, T. D., & Jeste, D. V. (2001). Stability and Course of Neuropsychological Deficits in Schizophrenia. *Archives of General Psychiatry*, 58(1), 24. <https://doi.org/10.1001/archpsyc.58.1.24>
- Heilskov, S. E. R., Urfer-Parnas, A., & Nordgaard, J. (2020). Delusions in the general population: A systematic review with emphasis on methodology. *Schizophrenia Research*, 216(xxxx), 48–55. <https://doi.org/10.1016/j.schres.2019.10.043>
- Hemsley, D. R., & Garety, P. A. (1986). The formation of maintenance of delusions: A Bayesian analysis. *British Journal of Psychiatry*, 149(JULY), 51–56.
<https://doi.org/10.1192/bjp.149.1.51>
- Henquet, C., Van Os, J., Pries, L. K., Rauschenberg, C., Delespaul, P., Kenis, G., Luykx, J. J., Lin, B. D., Richards, A. L., Akdede, B., Binbay, T., & Alt, V. (2022). A replication study of JTC bias, genetic liability for psychosis and delusional ideation.
- Hermans, K., Achterhof, R., Myin-Germeys, I., Kasanova, Z., Kirtley, O., & Schneider, M. (2019). Improving ecological validity in research on social cognition. In *Social Cognition in Psychosis*. Elsevier Inc. <https://doi.org/10.1016/B978-0-12-815315-4.00010-0>
- Hilker, R., Helenius, D., Fagerlund, B., Skytthe, A., Christensen, K., Werge, T. M., Nordentoft, M., & Glenthøj, B. (2018). Heritability of Schizophrenia and Schizophrenia Spectrum Based on the Nationwide Danish Twin Register. *Biological Psychiatry*, 83(6), 492–498. <https://doi.org/10.1016/j.biopsych.2017.08.017>
- Hinterbuchinger, B., & Mossaheb, N. (2021). Psychotic-Like Experiences: A Challenge in Definition and Assessment. *Frontiers in Psychiatry*, 12(March), 1–7.
<https://doi.org/10.3389/fpsy.2021.582392>
- Hjorthøj, C., Stürup, A. E., McGrath, J. J., & Nordentoft, M. (2017). Years of potential life lost and life expectancy in schizophrenia: a systematic review and meta-analysis. *The Lancet Psychiatry*, 4(4), 295–301. [https://doi.org/10.1016/S2215-0366\(17\)30078-0](https://doi.org/10.1016/S2215-0366(17)30078-0)
- Hollander, J. A., Cory-Slechta, D. A., Jacka, F. N., Szabo, S. T., Guilarte, T. R., Bilbo, S. D., Mattingly, C. J., Moy, S. S., Haroon, E., Hornig, M., Levin, E. D., Pletnikov, M. V., Zehr, J. L., McAllister, K. A., Dzierlenga, A. L., Garton, A. E., Lawler, C. P., & Ladd-Acosta, C. (2020). Beyond the looking glass: recent advances in understanding the impact of environmental exposures on neuropsychiatric disease. *Neuropsychopharmacology*, 45(7), 1086–1096. <https://doi.org/10.1038/s41386-020-0648-5>
- Holleran, L., Kelly, S., Alloza, C., Agartz, I., Andreassen, O. A., Arango, C., Banaj, N.,

- Calhoun, V., Cannon, D., Carr, V., Corvin, A., Glahn, D. C., Gur, R., Hong, E., Hoschl, C., Howells, F. M., James, A., Janssen, J., Kochunov, P., ... Donohoe, G. (2020). The relationship between white matter microstructure and general cognitive ability in patients with schizophrenia and healthy participants in the ENIGMA consortium. *American Journal of Psychiatry*, 177(6), 537–547. <https://doi.org/10.1176/appi.ajp.2019.19030225>
- Horwitz, A. V. (2019). *Between Sanity and Madness*. Oxford University Press.
<https://doi.org/10.1093/med/9780190907860.001.0001>
- Horwitz, A. V. (2021). *DSM: A History of Psychiatry's Bible*. Johns Hopkins University Press.
- Howe, J., Ross, R., McKay, R., & Balzan, R. P. (2018). How Do Delusion-Prone Individuals Respond to Disconfirmatory Evidence?: Improving Comprehension of the Beads Task May Help. *Zeitschrift Fur Psychologie / Journal of Psychology*, 226(3), 182–190.
<https://doi.org/10.1027/2151-2604/a000333>
- Hu, W., Macdonald, M. L., Elswick, D. E., & Sweet, R. A. (2015). The glutamate hypothesis of schizophrenia: Evidence from human brain tissue studies. *Annals of the New York Academy of Sciences*, 1338(1), 38–57. <https://doi.org/10.1111/nyas.12547>
- Huhn, M., Nikolakopoulou, A., Schneider-Thoma, J., Krause, M., Samara, M., Peter, N., Arndt, T., Bäckers, L., Rothe, P., Cipriani, A., Davis, J., Salanti, G., & Leucht, S. (2019). Comparative efficacy and tolerability of 32 oral antipsychotics for the acute treatment of adults with multi-episode schizophrenia: a systematic review and network meta-analysis. *The Lancet*, 394(10202), 939–951. [https://doi.org/10.1016/S0140-6736\(19\)31135-3](https://doi.org/10.1016/S0140-6736(19)31135-3)
- Huq, S. F., Garety, P. A., & Hemsley, D. R. (1988). Probabilistic Judgements in Deluded and Non-Deluded Subjects. *The Quarterly Journal of Experimental Psychology Section A*, 40(4), 801–812. <https://doi.org/10.1080/14640748808402300>
- Hynes, C. A., Baird, A. A., & Grafton, S. T. (2006). Differential role of the orbital frontal lobe in emotional versus cognitive perspective-taking. *Neuropsychologia*, 44(3), 374–383. <https://doi.org/10.1016/J.NEUROPSYCHOLOGIA.2005.06.011>
- Isaksson, J., Angenfelt, M., Frick, M. A., Olofsdotter, S., & Vadlin, S. (2022). Psychotic-like experiences from adolescence to adulthood: A longitudinal study. *Schizophrenia Research*, 248(October 2021), 1–7. <https://doi.org/10.1016/j.schres.2022.07.010>
- Jaaro-Peled, H., & Sawa, A. (2020). Neurodevelopmental Factors in Schizophrenia. *Psychiatric Clinics of North America*, 43(2), 263–274.
<https://doi.org/10.1016/j.psc.2020.02.010>
- Jalbrzikowski, M., Hayes, R. A., Wood, S. J., Nordholm, D., Zhou, J. H., Fusar-Poli, P., Uhlhaas, P. J., Takahashi, T., Sugranyes, G., Kwak, Y. Bin, Mathalon, D. H., Katagiri, N., Hooker, C. I., Smigielski, L., Colibazzi, T., Via, E., Tang, J., Koike, S., Rasser, P. E., ... Hernaus, D. (2021). Association of Structural Magnetic Resonance Imaging Measures With Psychosis Onset in Individuals at Clinical High Risk for Developing Psychosis: An ENIGMA Working Group Mega-analysis. *JAMA Psychiatry*, 78(7), 753–766.
<https://doi.org/10.1001/jamapsychiatry.2021.0638>
- Janoutová, J., Janácková, P., Serý, O., Zeman, T., Ambroz, P., Kovalová, M., Varechová, K., Hosák, L., Jířík, V., & Janout, V. (2016). Epidemiology and risk factors of schizophrenia. *Neuro Endocrinology Letters*, 37(1), 1–8.
<https://doi.org/10.1159/000453013>

- Jaspers, K. (1963). *Allgemeine Psychopathologie* (9th ed.). Springer-Verlag Berlin Heidelberg New York. <https://doi.org/>:
- Javed, A., & Charles, A. (2018). The importance of social cognition in improving functional outcomes in schizophrenia. *Frontiers in Psychiatry*, 9(APR), 1–14. <https://doi.org/10.3389/fpsyt.2018.00157>
- Johns, L. C., & Van Os, J. (2001). The continuity of psychotic experiences in the general population. *Clinical Psychology Review*, 21(8), 1125–1141. [https://doi.org/10.1016/S0272-7358\(01\)00103-9](https://doi.org/10.1016/S0272-7358(01)00103-9)
- Juárez-Ramos, V., Rubio, J. L., Delpero, C., Mioni, G., Stablum, F., & Gómez-Milán, E. (2014). Jumping to Conclusions bias, BADE and Feedback Sensitivity in schizophrenia and schizotypy. *Consciousness and Cognition*. <https://doi.org/10.1016/j.concog.2014.03.006>
- Kalkstein, S., Hurford, I., & Gur, R. C. (2010). Neurocognition in Schizophrenia. In N.R. Swerdlow (Ed.), *Brain Imaging in Behavioral Neuroscience* (Issue November 2011, pp. 373–390). https://doi.org/10.1007/7854_2010_42
- Kalman, J. L., Bresnahan, M., Schulze, T. G., & Susser, E. (2019). Predictors of persisting psychotic like experiences in children and adolescents: A scoping review. *Schizophrenia Research*, 209, 32–39. <https://doi.org/10.1016/j.schres.2019.05.012>
- Kashyap, S., Rao, V., Venkatesha Prasad, R. R., & Staring, T. (2021). State of the Art. *SpringerBriefs in Applied Sciences and Technology*, 35–39. https://doi.org/10.1007/978-3-030-85836-0_4
- Kaymaz, N., Drukker, M., Lieb, R., Wittchen, H. U., Werbeloff, N., Weiser, M., Lataster, T., & Van Os, J. (2012). Do subthreshold psychotic experiences predict clinical outcomes in unselected non-help-seeking population-based samples? A systematic review and meta-analysis, enriched with new results. *Psychological Medicine*, 42(11), 2239–2253. <https://doi.org/10.1017/S0033291711002911>
- Keefe, R. S. E., & Harvey, P. D. (2012). Cognitive Impairment in Schizophrenia. In M. A. Geyer & G. Gross (Eds.), *Handbook of Experimental Pharmacology* (Vol. 213, pp. 11–37). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-25758-2_2
- Kemp, K. C., Bathery, A. J., Barrantes-vidal, N., & Kwapil, T. R. (2020). *Positive , Negative , and Disorganized Schizotypy Predict Differential Patterns of Symptoms and Impairment*. <https://doi.org/10.1177/1073191119900008>
- Kendler, K. S. (2018). Classification of psychopathology: conceptual and historical background. *World Psychiatry*, 17(3), 241–242. <https://doi.org/10.1002/wps.20549>
- Keshavan, M. S., Collin, G., Guimond, S., Kelly, S., Prasad, K. M., & Lizano, P. (2020). Neuroimaging in Schizophrenia. *Neuroimaging Clinics of North America*, 30(1), 73–83. <https://doi.org/10.1016/j.nic.2019.09.007>
- Kharawala, S., Hastedt, C., Podhorna, J., Shukla, H., Kappelhoff, B., & Harvey, P. D. (2022). The relationship between cognition and functioning in schizophrenia: A semi-systematic review. *Schizophrenia Research: Cognition*, 27(February 2021), 100217. <https://doi.org/10.1016/j.scog.2021.100217>
- Kinderman, P., & Bentall, R. P. (1997). Causal attributions in paranoia and depression: Internal, personal, and situational attributions for negative events. *Journal of Abnormal*

- Psychology*, 106(2), 341–345. <https://doi.org/10.1037//0021-843x.106.2.341>
- Konings, M., Bak, M., Hanssen, M., Van Os, J., & Krabbendam, L. (2006). Validity and reliability of the CAPE: A self-report instrument for the measurement of psychotic experiences in the general population. *Acta Psychiatrica Scandinavica*, 114(1), 55–61. <https://doi.org/10.1111/j.1600-0447.2005.00741.x>
- Kotowicz, K., Gawęda, Ł., Misiak, B., & Frydecka, D. (2020). The role of the cognitive biases along the psychosis continuum: from pathophysiology to treatment options. *Archives of Psychiatry and Psychotherapy*, 24(1), 49–53. <https://doi.org/10.12740/app/130365>
- Krause, M., Zhu, Y., Huhn, M., Schneider, J., Irene, T., Nikolakopoulou, A., & Leucht, S. (2018). Antipsychotic drugs for patients with schizophrenia and predominant or prominent negative symptoms : a systematic review and meta- analysis. *European Archives of Psychiatry and Clinical Neuroscience*, 0(0), 0. <https://doi.org/10.1007/s00406-018-0869-3>
- Krueger, R. F., Kotov, R., Watson, D., Forbes, M. K., Eaton, N. R., Ruggero, C. J., Simms, L. J., Widiger, T. A., Achenbach, T. M., Bach, B., Bagby, R. M., Bornovalova, M. A., Carpenter, W. T., Chmielewski, M., Cicero, D. C., Clark, L. A., Conway, C., DeClercq, B., DeYoung, C. G., ... Zimmermann, J. (2018). Progress in achieving quantitative classification of psychopathology. *World Psychiatry*, 17(3), 282–293. <https://doi.org/10.1002/wps.20566>
- Kusztrits, I., Larøi, F., Laloyaux, J., Marquardt, L., Sinkeviciute, I., Kjelby, E., Johnsen, E., Sommer, I. E., Hugdahl, K., & Hirnstein, M. (2020). Mapping psychotic-like experiences: Results from an online survey. *Scandinavian Journal of Psychology*. <https://doi.org/10.1111/sjop.12683>
- Langdon, R., & Coltheart, M. (2000). The Cognitive Neuropsychology of Delusions. *Mind and Language*, 15(1), 184–218. <https://doi.org/10.1111/1468-0017.00129>
- Langdon, R., Flynn, M., Connaughton, E., & Brüne, M. (2017). Impairments of spontaneous and deliberative mentalizing co-occur, yet dissociate, in schizophrenia. *British Journal of Clinical Psychology*, 56(4), 372–387. <https://doi.org/10.1111/bjc.12144>
- Langdon, R., Still, M., Connors, M. H., Ward, P. B., & Catts, S. V. (2014). Jumping to delusions in early psychosis. *Cognitive Neuropsychiatry*, 19(3), 241–256. <https://doi.org/10.1080/13546805.2013.854198>
- Lasebikan, V. O., & Ayinde, O. O. (2013). Family burden in caregivers of schizophrenia patients: Prevalence and socio-demographic correlates. *Indian Journal of Psychological Medicine*, 35(1), 60–66. <https://doi.org/10.4103/0253-7176.112205>
- Lawrie, S. M., O'Donovan, M. C., Saks, E., Burns, T., & Lieberman, J. A. (2016). Improving classification of psychoses. *The Lancet Psychiatry*, 3(4), 367–374. [https://doi.org/10.1016/S2215-0366\(15\)00577-5](https://doi.org/10.1016/S2215-0366(15)00577-5)
- Lee, K. W., Chan, K. W., Chang, W. C., Lee, E. H. M., Hui, C. L. M., & Chen, E. Y. H. (2016). A systematic review on definitions and assessments of psychotic-like experiences. *Early Intervention in Psychiatry*, 10(1), 3–16. <https://doi.org/10.1111/eip.12228>
- Lewandowski, K., & Moustafa, A. A. (Eds.). (2019). *Social Cognition in Psychosis*. Elsevier.

<https://doi.org/10.1016/C2017-0-03061-6>

- Lincoln, T. M., & Peters, E. (2019). A systematic review and discussion of symptom specific cognitive behavioural approaches to delusions and hallucinations. *Schizophrenia Research*, 203, 66–79. <https://doi.org/10.1016/j.schres.2017.12.014>
- Lincoln, T. M., Salzmann, S., Ziegler, M., & Westermann, S. (2011). When does jumping-to-conclusions reach its peak? the interaction of vulnerability and situation-characteristics in social reasoning. *Journal of Behavior Therapy and Experimental Psychiatry*, 42(2), 185–191. <https://doi.org/10.1016/j.jbtep.2010.09.005>
- Linscott, R. J., & Van Os, J. (2013). An updated and conservative systematic review and meta-analysis of epidemiological evidence on psychotic experiences in children and adults: On the pathway from proneness to persistence to dimensional expression across mental disorders. *Psychological Medicine*, 43(6), 1133–1149. <https://doi.org/10.1017/S0033291712001626>
- Litman, L., Robinson, J., & Abberbock, T. (2017). TurkPrime.com: A versatile crowdsourcing data acquisition platform for the behavioral sciences. *Behavior Research Methods*, 49(2), 433–442. <https://doi.org/10.3758/s13428-016-0727-z>
- Liu, Y. C., Tang, C. C., Hung, T. T., Tsai, P. C., & Lin, M. F. (2018). The Efficacy of Metacognitive Training for Delusions in Patients With Schizophrenia: A Meta-Analysis of Randomized Controlled Trials Informs Evidence-Based Practice. *Worldviews on Evidence-Based Nursing*, 15(2), 130–139. <https://doi.org/10.1111/wvn.12282>
- Livet, A., Navarri, X., Potvin, S., & Conrod, P. (2020). Cognitive biases in individuals with psychotic-like experiences: A systematic review and a meta-analysis. *Schizophrenia Research*, 222(xxxx), 10–22. <https://doi.org/10.1016/j.schres.2020.06.016>
- Lizcano-Cortés, F., Rasgado-Toledo, J., Giudicessi, A., & Giordano, M. (2021). Theory of Mind and Its Elusive Structural Substrate. *Frontiers in Human Neuroscience*, 15(March), 1–9. <https://doi.org/10.3389/fnhum.2021.618630>
- Maher, B. A. (1988). *Anomalous experience and delusional thinking: the logic of explanations*.
- Maher, B. A. (1999). Anomalous Experience in Everyday Life. *Monist*, 82(4), 547–570. <https://doi.org/10.5840/monist199982428>
- Maher, B. A. (2006). The relationship between delusions and hallucinations. *Current Psychiatry Reports*, 8(3), 179–183. <https://doi.org/10.1007/s11920-006-0021-3>
- Mailman, R., & Paoli, R. (2017). Related Papers. *Over The Rim*, 191–199. <https://doi.org/10.2307/j.ctt46nrzt.12>
- Maj, M., van Os, J., De Hert, M., Gaebel, W., Galderisi, S., Green, M. F., Guloksuz, S., Harvey, P. D., Jones, P. B., Malaspina, D., McGorry, P., Miettunen, J., Murray, R. M., Nuechterlein, K. H., Peralta, V., Thornicroft, G., van Winkel, R., & Ventura, J. (2021). The clinical characterization of the patient with primary psychosis aimed at personalization of management. *World Psychiatry*, 20(1), 4–33. <https://doi.org/10.1002/wps.20809>
- Mark, W., & Touloupoulou, T. (2016). Psychometric Properties of “community Assessment of Psychic Experiences”: Review and Meta-analyses. *Schizophrenia Bulletin*, 42(1), 34–44. <https://doi.org/10.1093/schbul/sbv088>

- Mazza, M., Pino, M. C., Keller, R., Vagnetti, R., Attanasio, M., Filocamo, A., Le Donne, I., Masedu, F., & Valenti, M. (2021). Qualitative Differences in Attribution of Mental States to Other People in Autism and Schizophrenia: What are the Tools for Differential Diagnosis? *Journal of Autism and Developmental Disorders*, 0123456789. <https://doi.org/10.1007/s10803-021-05035-3>
- McCredie, M. N., & Morey, L. C. (2019). Who Are the Turkers? A Characterization of MTurk Workers Using the Personality Assessment Inventory. *Assessment*, 26(5), 759–766. <https://doi.org/10.1177/1073191118760709>
- McCutcheon, R. A., Reis Marques, T., & Howes, O. D. (2020). Schizophrenia - An Overview. *JAMA Psychiatry*, 77(2), 201–210. <https://doi.org/10.1001/jamapsychiatry.2019.3360>
- McGrath, J. J. (2006). Variations in the incidence of schizophrenia: Data versus dogma. *Schizophrenia Bulletin*, 32(1), 195–197. <https://doi.org/10.1093/schbul/sbi052>
- McGrath, J., Saha, S., Chant, D., & Welham, J. (2008). Schizophrenia: A concise overview of incidence, prevalence, and mortality. *Epidemiologic Reviews*, 30(1), 67–76. <https://doi.org/10.1093/epirev/mxn001>
- McLean, B. F., Mattiske, J. K., & Balzan, R. P. (2017). Association of the jumping to conclusions and evidence integration biases with delusions in psychosis: A detailed meta-analysis. *Schizophrenia Bulletin*, 43(2), 344–354. <https://doi.org/10.1093/schbul/sbw056>
- McNally, K. (2016). *A critical history of schizophrenia*. palgrave macmillan.
- Mediavilla, R., Muñoz-Sanjose, A., Rodriguez-Vega, B., Lahera, G., Palao, A., Bayon, C., Vidal-Villegas, M.-P., Chadwick, P., & Bravo-Ortiz, M.-F. (2021). People with psychosis improve affective social cognition and self-care after a mindfulness-based social cognition training program (SocialMIND). *Psychiatric Rehabilitation Journal*. <https://doi.org/10.1037/prj0000466>
- Mehl, S., Rief, W., Lüllmann, E., Ziegler, M., Kesting, M. L., & Lincoln, T. M. (2010). Are theory of mind deficits in understanding intentions of others associated with persecutory delusions? *Journal of Nervous and Mental Disease*, 198(7), 516–519. <https://doi.org/10.1097/NMD.0b013e3181e4c8d2>
- Menon, M., Quilty, L. C., Zawadzki, J. A., Woodward, T. S., Sokolowski, H. M., Boon, H. S., & Wong, A. H. C. (2013). The role of cognitive biases and personality variables in subclinical delusional ideation. *Cognitive Neuropsychiatry*. <https://doi.org/10.1080/13546805.2012.692873>
- Miyazono, K., & McKay, R. (2019). Explaining delusional beliefs: a hybrid model. *Cognitive Neuropsychiatry*, 24(5), 335–346. <https://doi.org/10.1080/13546805.2019.1664443>
- Miyazono, K., McKay, R., Bell, V., Halligan, P. W., Ellis, H. D., Krabbendam, L., Myin-Germeyns, I., Bak, M., Van Os, J., Bell, V., Halligan, P. W., & Ellis, H. D. (2006). Explaining delusions: a cognitive perspective. *Trends in Cognitive Sciences*, 10(5), 219–226. <https://doi.org/10.1016/j.tics.2006.03.004>
- Montag, C., Dziobek, I., Richter, I. S., Neuhaus, K., Lehmann, A., Sylla, R., Heekeren, H. R., Heinz, A., & Gallinat, J. (2011). Different aspects of theory of mind in paranoid schizophrenia: Evidence from a video-based assessment. *Psychiatry Research*, 186(2–3),

- 203–209. <https://doi.org/10.1016/j.psychres.2010.09.006>
- Moreno-Fernández, M. M., Blanco, F., & Matute, H. (2021). The tendency to stop collecting information is linked to illusions of causality. *Scientific Reports*, 11(1), 1–15. <https://doi.org/10.1038/s41598-021-82075-w>
- Moritz, S., Balzan, R. P., Kulagin, S. C., & Andreou, C. (2017). *A New Paradigm to Measure Probabilistic Reasoning and a Possible Answer to the Question Why Psychosis-Prone Individuals Jump to Conclusions*. 126(4), 406–415.
- Moritz, S., Favrod, J., Andreou, C., Morrison, A. P., Bohn, F., Veckenstedt, R., Tonn, P., & Karow, A. (2013). Beyond the usual suspects: Positive attitudes towards positive symptoms is associated with medication noncompliance in psychosis. *Schizophrenia Bulletin*, 39(4), 917–922. <https://doi.org/10.1093/schbul/sbs005>
- Moritz, S., Menon, M., Balzan, R., & Woodward, T. S. (2022). Metacognitive training for psychosis (MCT): past, present, and future. *European Archives of Psychiatry and Clinical Neuroscience*, 0123456789. <https://doi.org/10.1007/s00406-022-01394-9>
- Moritz, S., Pfuhl, G., Lüdtke, T., Menon, M., Balzan, R. P., & Andreou, C. (2017). A two-stage cognitive theory of the positive symptoms of psychosis. Highlighting the role of lowered decision thresholds. *Journal of Behavior Therapy and Experimental Psychiatry*, 56, 12–20. <https://doi.org/10.1016/j.jbtep.2016.07.004>
- Moritz, S., Ramdani, N., Klass, H., Andreou, C., Jungclaussen, D., Eifler, S., Englisch, S., Schirmbeck, F., & Zink, M. (2014). Overconfidence in incorrect perceptual judgments in patients with schizophrenia. *Schizophrenia Research: Cognition*, 1(4), 165–170. <https://doi.org/10.1016/j.scog.2014.09.003>
- Moritz, S., Scheu, F., Andreou, C., Pfueller, U., Weisbrod, M., & Roesch-Ely, D. (2016). Reasoning in psychosis: Risky but not necessarily hasty. *Cognitive Neuropsychiatry*, 21(2), 91–106. <https://doi.org/10.1080/13546805.2015.1136611>
- Moritz, S., Scheunemann, J., Lüdtke, T., Westermann, S., Pfuhl, G., Balzan, R. P., & Andreou, C. (2020). Prolonged rather than hasty decision-making in schizophrenia using the box task. Must we rethink the jumping to conclusions account of paranoia? *Schizophrenia Research*, 222(xxxx), 202–208. <https://doi.org/10.1016/j.schres.2020.05.056>
- Moritz, S., Scheunemann, J., & Peters, M. J. V. (2020). Effort and liberal acceptance bias in patients with schizophrenia. *Cognitive Neuropsychiatry*, 25(5), 364–370. <https://doi.org/10.1080/13546805.2020.1805306>
- Moritz, S., Stojisavlevic, M., Göritz, A. S., Riehle, M., & Scheunemann, J. (2019). Does uncertainty breed conviction? On the possible role of compensatory conviction in jumping to conclusions and overconfidence in psychosis. *Cognitive Neuropsychiatry*, 24(4), 284–299. <https://doi.org/10.1080/13546805.2019.1642863>
- Moritz, S., Thoering, T., Kühn, S., Willenborg, B., Westermann, S., & Nagel, M. (2015). Metacognition-augmented cognitive remediation training reduces jumping to conclusions and overconfidence but not neurocognitive deficits in psychosis. *Frontiers in Psychology*, 6(August), 1–11. <https://doi.org/10.3389/fpsyg.2015.01048>
- Moritz, S., Van Quaquebeke, N., & Lincoln, T. M. (2012). Jumping to Conclusions Is Associated with Paranoia but Not General Suspiciousness: A Comparison of Two

- Versions of the Probabilistic Reasoning Paradigm. *Schizophrenia Research and Treatment*, 2012, 1–9. <https://doi.org/10.1155/2012/384039>
- Moritz, S., Veckenstedt, R., Hottenrott, B., Woodward, T. S., Randjbar, S., & Lincoln, T. M. (2010). Different sides of the same coin? Intercorrelations of cognitive biases in schizophrenia. *Cognitive Neuropsychiatry*, 15(4), 406–421. <https://doi.org/10.1080/13546800903399993>
- Moritz, S., Veckenstedt, R., Randjbar, S., Hottenrott, B., Woodward, T. S., & Eckstaedt, F. V. (2009). *Decision making under uncertainty and mood induction : further evidence for liberal acceptance in schizophrenia*. 1821–1829. <https://doi.org/10.1017/S0033291709005923>
- Moritz, S., & Woodward, T. S. (2004). Plausibility judgement in schizophrenic patients: Evidence for a liberal acceptance bias. *German Journal of Psychiatry*, 7(4), 66–74.
- Moritz, S., & Woodward, T. S. (2005). Jumping to conclusions in delusional and non-delusional schizophrenic patients. *British Journal of Clinical Psychology*, 44(2), 193–207. <https://doi.org/10.1348/014466505X35678>
- Moritz, S., & Woodward, T. S. (2006). A generalized bias against disconfirmatory evidence in schizophrenia. *Psychiatry Research*, 142(2–3), 157–165. <https://doi.org/10.1016/j.psychres.2005.08.016>
- Moritz, S., Woodward, T. S., & Hausmann, D. (2006). Incautious Reasoning as a Pathogenetic Factor for the Development of Psychotic Symptoms in Schizophrenia. *Schizophrenia Bulletin*, 32(2), 327–331. <https://doi.org/10.1093/schbul/sbj034>
- Moritz, S., Woodward, T. S., & Lambert, M. (2007). Under what circumstances do patients with schizophrenia jump to conclusions? A liberal acceptance account. *British Journal of Clinical Psychology*, 46(2), 127–137. <https://doi.org/10.1348/014466506X129862>
- Murphy, J., McBride, O., Fried, E., & Shevlin, M. (2018). Distress, Impairment and the Extended Psychosis Phenotype: A Network Analysis of Psychotic Experiences in an US General Population Sample. *Schizophrenia Bulletin*, 44(4), 768–777. <https://doi.org/10.1093/schbul/sbx134>
- Murray, R M, Bora, E., Modinos, G., & Vernon, A. (2022). Schizophrenia : A developmental disorder with a risk of non-specific but avoidable decline. *Schizophrenia Research*, 243(April), 181–186. <https://doi.org/10.1016/j.schres.2022.03.005>
- Murray, Robin M., Kendler, K. S., McGuffin, P., Wessely, S., & Castle, D. J. (2008). *Essential Psychiatry* (Robin M. Murray, K. S. Kendler, P. McGuffin, S. Wessely, & D. J. Castle (Eds.)). Cambridge University Press. <https://doi.org/10.1017/CBO9780511544125>
- 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>
- Nielsen, K. (2020). *What is Mental Disorder ? Developing an Embodied , Embedded , and Enactive Post-Defence Version for Researchgate : CC BY-NC-ND 4 . 0 What is Mental Disorder ? Developing an Embodied , Embedded , A Thesis Submitted in Fulfillment of the Requirements for th. January*. <https://doi.org/10.13140/RG.2.2.12498.09922/1>
- Nijman, S. A., Veling, W., van der Stouwe, E. C. D., & Pijnenborg, G. H. M. (2020). Social

- cognition training for people with a psychotic disorder: A network meta-analysis. *Schizophrenia Bulletin*, 46(5), 1086–1103. <https://doi.org/10.1093/schbul/sbaa023>
- Okano, H., Kubota, R., Okubo, R., Hashimoto, N., Ikezawa, S., Toyomaki, A., Miyazaki, A., Sasaki, Y., Yamada, Y., Nemoto, T., & Mizuno, M. (2021). Evaluation of social cognition measures for Japanese patients with schizophrenia using an expert panel and modified delphi method. *Journal of Personalized Medicine*, 11(4). <https://doi.org/10.3390/jpm11040275>
- Onaolapo, A. Y., & Onaolapo, O. J. (2018). Schizophrenia Aetiology and Drug Therapy: A Tale of Progressive Demystification and Strides in Management. *Advances in Pharmacology and Pharmacy*, 6(2), 19–42. <https://doi.org/10.13189/app.2018.060201>
- Oppenheimer, D. M., Meyvis, T., & Davidenko, N. (2009). Instructional manipulation checks: Detecting satisficing to increase statistical power. *Journal of Experimental Social Psychology*, 45(4), 867–872. <https://doi.org/10.1016/j.jesp.2009.03.009>
- Palmer, B. W., Dawes, S. E., & Heaton, R. K. (2009). What Do We Know About Neuropsychological Aspects Of Schizophrenia? *Neuropsychology Review*, 19(3), 365–384. <https://doi.org/10.1007/s11065-009-9109-y>
- Palomar-Ciria, N., Cegla-Schvartzman, F., Lopez-Morinigo, J. D., Bello, H. J., Ovejero, S., & Baca-García, E. (2019). Diagnostic stability of schizophrenia: A systematic review. *Psychiatry Research*, 279(April), 306–314. <https://doi.org/10.1016/j.psychres.2019.04.020>
- Palumbo, D., Caporusso, E., Piegari, G., Mencacci, C., Torriero, S., Giuliani, L., Fabrazzo, M., Pinto, D., & Galderisi, S. (2022). Social Cognition Individualized Activities Lab for Social Cognition Training and Narrative Enhancement in Patients With Schizophrenia: A Randomized Controlled Study to Assess Efficacy and Generalization to Real-Life Functioning (Prot. n°: NCT05130853). *Frontiers in Psychiatry*, 13. <https://doi.org/10.3389/FPSYT.2022.833550>
- Panula, J., Lindgren, M., Suvisaari, J., Raij, T., & Imaging, A. M. (2022). *Liberal Acceptance Bias in First-Episode Psychosis Patients; a Longitudinal Study - Preprint*. <https://ssrn.com/abstract=4002097>
- Park, S. (2018). A Study on the Theory of Mind Deficits and Delusions in Schizophrenic Patients. *Issues in Mental Health Nursing*, 39(3), 269–274. <https://doi.org/10.1080/01612840.2017.1378782>
- Parola, A., Gabbatore, I., Berardinelli, L., Salvini, R., & Bosco, F. M. (2021). Multimodal assessment of communicative-pragmatic features in schizophrenia: a machine learning approach. *Npj Schizophrenia*, 7(1), 1–9. <https://doi.org/10.1038/s41537-021-00153-4>
- Penney, D., Sauvé, G., Mendelson, D., Thibodeau, É., Moritz, S., & Lepage, M. (2022). Immediate and Sustained Outcomes and Moderators Associated With Metacognitive Training for Psychosis. *JAMA Psychiatry*. <https://doi.org/10.1001/JAMAPSYCHIATRY.2022.0277>
- Perez, M. M., Tercero, B. A., Penn, D. L., Pinkham, A. E., & Harvey, P. D. (2020). Overconfidence in social cognitive decision making: Correlations with social cognitive and neurocognitive performance in participants with schizophrenia and healthy individuals. *Schizophrenia Research*, xxxx. <https://doi.org/10.1016/j.schres.2020.10.005>

- Peters, E., & Garety, P. (2006). Cognitive functioning in delusions: A longitudinal analysis. *Behaviour Research and Therapy*, 44(4), 481–514. <https://doi.org/https://doi.org/10.1016/j.brat.2005.03.008>
- Phalen, P., Millman, Z., Rouhakhtar, P. R., Andorko, N., Reeves, G., & Schiffman, J. (2022). Categorical versus dimensional models of early psychosis. *Early Intervention in Psychiatry*, 16(1), 42–50. <https://doi.org/10.1111/eip.13128>
- Picardi, A., Viroli, C., Tarsitani, L., Miglio, R., de Girolamo, G., Dell'Acqua, G., & Biondi, M. (2012). Heterogeneity and symptom structure of schizophrenia. *Psychiatry Research*, 198(3), 386–394. <https://doi.org/10.1016/j.psychres.2011.12.051>
- Pinkham, A. E. (2014). Social cognition in schizophrenia. *Journal of Clinical Psychiatry*, 75(SUPPL. 2), 14–19. <https://doi.org/10.4088/JCP.13065su1.04>
- Pinkham, A. E., Harvey, P. D., & Penn, D. L. (2018). Social Cognition Psychometric Evaluation: Results of the Final Validation Study. *Schizophrenia Bulletin*, 44(4), 737–748. <https://doi.org/10.1093/schbul/sbx117>
- Pinkham, A. E., Penn, D. L., Green, M. F., Buck, B., Healey, K., & Harvey, P. D. (2014). The social cognition psychometric evaluation study: Results of the expert survey and RAND Panel. *Schizophrenia Bulletin*, 40(4), 813–823. <https://doi.org/10.1093/schbul/sbt081>
- Piovan, C., Gava, L., Campeol, M., Parola, A., Salvini, R., Gabbatore, I., Colle, L., Berardinelli, L., Bosco, F. M., Dorn, L. M. L., Struck, N., Bitsch, F., Falkenberg, I., Kircher, T., Rief, W., Mehl, S., Park, S., Gavilán Ibáñez, J. M., García-Albea Ristol, J. E., ... Wagner, M. (2020). Theory of mind and language comprehension in schizophrenia. *Frontiers in Psychiatry*, 12(1), 1–11. <https://doi.org/10.1080/01612840.2017.1378782>
- Pohl, R. (2016). Cognitive Illusions. In *Cognitive Illusions*. <https://doi.org/10.4324/9781315696935>
- Potuzak, M., Ravichandran, C., Lewandowski, K. E., Ongür, D., & Cohen, B. M. (2012). Categorical vs dimensional classifications of psychotic disorders. *Comprehensive Psychiatry*, 53(8), 1118–1129. <https://doi.org/10.1016/j.comppsy.2012.04.010>
- Preacher, K. J., MacCallum, R. C., Rucker, D. D., & Nicewander, W. A. (2005). Use of the extreme groups approach: A critical reexamination and new recommendations. *Psychological Methods*, 10(2), 178–192. <https://doi.org/10.1037/1082-989X.10.2.178>
- Prike, T., Arnold, M. M., & Williamson, P. (2018). The relationship between anomalistic belief and biases of evidence integration and jumping to conclusions. *Acta Psychologica*, 190(February), 217–227. <https://doi.org/10.1016/j.actpsy.2018.08.006>
- Pytlik, N., Soll, D., Hesse, K., Moritz, S., Bechdorf, A., Herrlich, J., Kircher, T., Klingberg, S., Landsberg, M. W., Müller, B. W., Wiedemann, G., Wittorf, A., Wölwer, W., Wagner, M., & Mehl, S. (2020). Problems in measuring the JTC-bias in patients with psychotic disorders with the fish task: a secondary analysis of a baseline assessment of a randomized controlled trial. *BMC Psychiatry*, 20(1), 554. <https://doi.org/10.1186/s12888-020-02959-5>
- Pytlik, N., Soll, D., Hesse, K., & Wagner, M. (2020). *Problems in measuring the JTC-bias in patients with psychotic disorders with the sh task : A secondary analysis of a baseline assessment of a randomized controlled trial*. 1–21.

- Raimo, S., Cropano, M., Ammendola, L., Malangone, D., & Santangelo, G. (2022). *Cognitive and Affective Theory of Mind across Adulthood*. 1–14.
- Randolph, J. J., Falbe, K., Manuel, A. K., & Balloun, J. L. (2014). A step-by-step guide to propensity score matching in R. *Practical Assessment, Research and Evaluation*, 19(18), 1–6.
- Rausch, F., Eisenacher, S., Elkin, H., Englisch, S., Kayser, S., Striepens, N., Lautenschlager, M., Heinz, A., Gudlowski, Y., Janssen, B., Gaebel, W., Michel, T. M., Schneider, F., Lambert, M., Naber, D., Juckel, G., Krueger-Oezguerda, S., Wobrock, T., Hasan, A., ... Wagner, M. (2016). Evaluation of the “Jumping to conclusions” bias in different subgroups of the at-risk mental state: From cognitive basic symptoms to UHR criteria. *Psychological Medicine*, 46(10), 2071–2081. <https://doi.org/10.1017/S0033291716000465>
- Rauschenberg, C., Reininghaus, U., Ten Have, M., De Graaf, R., Van Dorsselaer, S., Simons, C. J. P., Gunther, N., Henquet, C., Pries, L. K., Guloksuz, S., Bak, M., & Van Os, J. (2021). The jumping to conclusions reasoning bias as a cognitive factor contributing to psychosis progression and persistence: Findings from NEMESIS-2. *Psychological Medicine*, 51(10), 1696–1703. <https://doi.org/10.1017/S0033291720000446>
- Ravichandran, C., Ongur, D., & Cohen, B. M. (2021). Clinical Features of Psychotic Disorders: Comparing Categorical and Dimensional Models. *Psychiatric Research and Clinical Practice*, 3(1), 29–37. <https://doi.org/10.1176/appi.prcp.20190053>
- Reckziegel, R., Czepielewski, L. S., Hasse-Sousa, M., Martins, D. S., de Britto, M. J., Lapa, C. de O., Schwartzhaupt, A. W., & Gama, C. S. (2022). Heterogeneous trajectories in schizophrenia: insights from neurodevelopment and neuroprogression models. *Brazilian Journal of Psychiatry*, 44(1), 74–80. <https://doi.org/10.1590/1516-4446-2020-1670>
- Reininghaus, U., Böhnke, J. R., Chavez-Baldini, U. Y., Gibbons, R., Ivleva, E., Clementz, B. A., Pearson, G. D., Keshavan, M. S., Sweeney, J. A., & Tamminga, C. A. (2019). Transdiagnostic dimensions of psychosis in the Bipolar-Schizophrenia Network on Intermediate Phenotypes (B-SNIP). *World Psychiatry*, 18(1), 67–76. <https://doi.org/10.1002/wps.20607>
- Reininghaus, U., Oorschot, M., Moritz, S., Gayer-Anderson, C., Kempton, M. J., Valmaggia, L., McGuire, P., Murray, R., Garety, P., Wykes, T., Morgan, C., & Myin-Germeys, I. (2019). Liberal acceptance bias, momentary aberrant salience, and psychosis: An experimental experience sampling study. *Schizophrenia Bulletin*, 45(4), 871–882. <https://doi.org/10.1093/schbul/sby116>
- Rietkerk, T., Boks, M., Sommer, I., Liddle, P., Ophoff, R., & Kahn, R. (2008). The genetics of symptom dimensions of schizophrenia: Review and meta-analysis. *Schizophrenia Research*, 102(1–3), 197–205. <https://doi.org/10.1016/j.schres.2008.01.023>
- Ritsner, M. (Ed.). (2011). *Handbook of Schizophrenia Spectrum Disorders, Volume II*. Springer Netherlands. <https://doi.org/10.1007/978-94-007-0831-0>
- Rocca, P., Galderisi, S., Rossi, A., Bertolino, A., Rucci, P., Gibertoni, D., Montemagni, C., Bellino, S., Aguglia, E., Amore, M., Bellomo, A., Biondi, M., Carpiniello, B., Cuomo, A., D’Ambrosio, E., dell’Osso, L., Girardi, P., Marchesi, C., Monteleone, P., ... Goracci, A. (2018). Disorganization and real-world functioning in schizophrenia: Results from the multicenter study of the Italian Network for Research on Psychoses. *Schizophrenia*

- Research*, 201, 105–112. <https://doi.org/10.1016/j.schres.2018.06.003>
- Rognlien, H. F., & Sahl, A. C. (2021). *Theory of Mind and IQ Subgrouping in Schizophrenia Cognitive and Affective ToM and Mentalizing Styles*.
- Romain, K., Eriksson, A., Onyon, R., & Kumar, M. (2019). The psychosis risk timeline: can we improve our preventive strategies? Part 3: primary common pathways and preventive strategies. *BJPsych Advances*, 25(05), 321–332. <https://doi.org/10.1192/bja.2019.34>
- Rooijen, G. Van, Isvoranu, A., Meijer, C. J., Borkulo, C. D. Van, & Ruhé, H. G. (2017). A symptom network structure of the psychosis spectrum. *Schizophrenia Research*. <https://doi.org/10.1016/j.schres.2017.02.018>
- Ross, Robert M., Pennycook, G., McKay, R., Gervais, W. M., Langdon, R., & Coltheart, M. (2016). Analytic cognitive style, not delusional ideation, predicts data gathering in a large beads task study. *Cognitive Neuropsychiatry*, 21(4), 300–314. <https://doi.org/10.1080/13546805.2016.1192025>
- Ross, Robert Malcolm, McKay, R., Coltheart, M., & Langdon, R. (2015). Jumping to conclusions about the beads task? A meta-analysis of delusional ideation and data-gathering. *Schizophrenia Bulletin*, 41(5), 1183–1191. <https://doi.org/10.1093/schbul/sbu187>
- Rössler, W., Joachim Salize, H., Van Os, J., & Riecher-Rössler, A. (2005). Size of burden of schizophrenia and psychotic disorders. *European Neuropsychopharmacology*, 15(4), 399–409. <https://doi.org/10.1016/j.euroneuro.2005.04.009>
- Rubio, J. L., Ruiz-Veguilla, M., Hernández, L., Barrigón, M. L., Salcedo, M. D., Moreno, J. M., Gómez, E., Moritz, S., & Ferrín, M. (2011). Jumping to conclusions in psychosis: A faulty appraisal. *Schizophrenia Research*, 133(1–3), 199–204. <https://doi.org/10.1016/j.schres.2011.08.008>
- Sakakibara, E. (2016). Irrationality and Pathology of Beliefs. *Neuroethics*, 9(2), 147–157. <https://doi.org/10.1007/s12152-016-9256-9>
- Sanati, A., & Kyratsous, M. (2015). Epistemic injustice in assessment of delusions. *Journal of Evaluation in Clinical Practice*, 21(3), 479–485. <https://doi.org/10.1111/jep.12347>
- Sanford, N., Veckenstedt, R., Moritz, S., Balzan, R. P., & Woodward, T. S. (2014). Impaired integration of disambiguating evidence in delusional schizophrenia patients. *Psychological Medicine*, 44(13), 2729–2738. <https://doi.org/DOI:10.1017/S0033291714000397>
- Schaefer, J., Giangrande, E., Weinberger, D. R., & Dickinson, D. (2013). The global cognitive impairment in schizophrenia: Consistent over decades and around the world. *Schizophrenia Research*, 150(1), 42–50. <https://doi.org/10.1016/j.schres.2013.07.009>
- Scheunemann, J., Gawęda, Ł., Reininger, K. M., Jelinek, L., Hildebrandt, H., & Moritz, S. (2020). Advice weighting as a novel measure for belief flexibility in people with psychotic-like experiences. *Schizophrenia Research*, 216(xxxx), 129–137. <https://doi.org/10.1016/j.schres.2019.12.016>
- Schlier, B., Jaya, E. S., Moritz, S., & Lincoln, T. M. (2015). The Community Assessment of Psychic Experiences measures nine clusters of psychosis-like experiences: A validation of the German version of the CAPE. *Schizophrenia Research*, 169(1–3), 274–279. <https://doi.org/10.1016/j.schres.2015.10.034>

- Schmidt, S. J., Mueller, D. R., & Roder, V. (2011). Social cognition as a mediator variable between neurocognition and functional outcome in schizophrenia: Empirical review and new results by structural equation modeling. *Schizophrenia Bulletin*, 37(SUPPL. 2). <https://doi.org/10.1093/schbul/sbr079>
- Schultze-Lutter, F., Nenadic, I., & Grant, P. (2019). Psychosis and Schizophrenia-Spectrum Personality Disorders Require Early Detection on Different Symptom Dimensions. *Frontiers in Psychiatry*, 10(July). <https://doi.org/10.3389/fpsyt.2019.00476>
- Schulz, S. C., Green, M. F., & Nelson, K. J. (2016). *Schizophrenia and Psychotic Spectrum Disorders* (S. C. Schulz, M. F. Green, & K. J. Nelson (Eds.)). Oxford University Press. <https://doi.org/10.1093/med/9780199378067.001.0001>
- Seiler, N., Nguyen, T., Yung, A., & O'Donoghue, B. (2020). Terminology and assessment tools of psychosis: A systematic narrative review. *Psychiatry and Clinical Neurosciences*, 74(4), 226–246. <https://doi.org/10.1111/pcn.12966>
- Shamay-Tsoory, S. G., & Aharon-Peretz, J. (2007). Dissociable prefrontal networks for cognitive and affective theory of mind: A lesion study. *Neuropsychologia*, 45(13), 3054–3067. <https://doi.org/10.1016/J.NEUROPSYCHOLOGIA.2007.05.021>
- Shamay-Tsoory, S. G., Shur, S., Barcai-Goodman, L., Medlovich, S., Harari, H., & Levkovitz, Y. (2007). Dissociation of cognitive from affective components of theory of mind in schizophrenia. *Psychiatry Research*, 149(1–3), 11–23. <https://doi.org/10.1016/j.psychres.2005.10.018>
- Silberstein, J., & Harvey, P. D. (2019). Impaired introspective accuracy in schizophrenia: an independent predictor of functional outcomes. *Cognitive Neuropsychiatry*, 24(1), 28–39. <https://doi.org/10.1080/13546805.2018.1549985>
- Silberstein, J. M., Pinkham, A. E., Penn, D. L., & Harvey, P. D. (2018). Self-assessment of social cognitive ability in schizophrenia: Association with social cognitive test performance, informant assessments of social cognitive ability, and everyday outcomes. *Schizophrenia Research*, 199, 75–82. <https://doi.org/10.1016/j.schres.2018.04.015>
- Smigielski, L., Papiol, S., Theodoridou, A., Heekeren, K., Gerstenberg, M., Wotruba, D., Buechler, R., Hoffmann, P., Herms, S., Adorjan, K., Anderson-Schmidt, H., Budde, M., Comes, A. L., Gade, K., Heilbronner, M., Heilbronner, U., Kalman, J. L., Klöhn-Saghatolislam, F., Reich-Erkelenz, D., ... Grünblatt, E. (2021). Polygenic risk scores across the extended psychosis spectrum. *Translational Psychiatry*, 11(1). <https://doi.org/10.1038/s41398-021-01720-0>
- So, S. H. wai, Siu, N. Y. fan, Wong, H. lam, Chan, W., & Garety, P. A. (2016). ‘Jumping to conclusions’ data-gathering bias in psychosis and other psychiatric disorders — Two meta-analyses of comparisons between patients and healthy individuals. *Clinical Psychology Review*, 46, 151–167. <https://doi.org/10.1016/j.cpr.2016.05.001>
- Song, J., Han, D., Kim, S., Hong, J., Min, K. J., Cheong, J., & Kim, B. (2015). Differences in gray matter volume corresponding to delusion and hallucination in patients with schizophrenia compared with patients who have bipolar disorder. *Neuropsychiatric Disease and Treatment*, 1211. <https://doi.org/10.2147/NDT.S80438>
- Speechley, W. J., Whitman, J. C., & Woodward, T. S. (2010). The contribution of hypersalience to the “jumping to conclusions” bias associated with delusions in schizophrenia. *Journal of Psychiatry and Neuroscience*, 35(1), 7–17.

<https://doi.org/10.1503/jpn.090025>

- Speechly, W. J., Nan, E. T., Moritz, S., & Woddward, T. S. (2012). Impaired evidence integration and delusions in schizophrenia. *Journal of Experimental Psychopathology*. <https://doi.org/10.5127/jep.018411>
- Stefanis, N. C., Hanssen, M., Smirnis, N. K., Avramopoulos, D. A., Evdokimidis, I. K., Stefanis, C. N., Verdoux, H., & Van Os, J. (2002). Evidence that three dimensions of psychosis have a distribution in the general population. *Psychological Medicine*, 32(2), 347–358. <https://doi.org/10.1017/S0033291701005141>
- Stępnicki, P., Kondej, M., & Kaczor, A. A. (2018). Current concepts and treatments of schizophrenia. *Molecules*, 23(8). <https://doi.org/10.3390/molecules23082087>
- Stilo, S. A., & Murray, R. M. (2019). Non-Genetic Factors in Schizophrenia. *Current Psychiatry Reports*, 21(10), 100. <https://doi.org/10.1007/s11920-019-1091-3>
- Stone, W. S., Phillips, M. R., Yang, L. H., Kegeles, L. S., Susser, E. S., & Lieberman, J. A. (2022). Neurodegenerative model of schizophrenia: Growing evidence to support a revisit. *Schizophrenia Research*, 243(February), 154–162. <https://doi.org/10.1016/j.schres.2022.03.004>
- Strauss, G. P. (2021). A Bioecosystem Theory of Negative Symptoms in Schizophrenia. *Frontiers in Psychiatry*, 12(March). <https://doi.org/10.3389/fpsy.2021.655471>
- Strube, W., Cimpianu, C. L., Ulbrich, M., Öztürk, Ö. F., Schneider-Axmann, T., Falkai, P., Marshall, L., Bestmann, S., & Hasan, A. (2022). Unstable Belief Formation and Slowed Decision-making: Evidence That the Jumping-to-Conclusions Bias in Schizophrenia Is Not Linked to Impulsive Decision-making. *Schizophrenia Bulletin*, 48(2), 347–358. <https://doi.org/10.1093/schbul/sbab108>
- Sulik, J., Ross, R. M., Balzan, R., & McKay, R. (2022). *Delusional Ideation and Data Quality : Are Classic Cognitive Biases an Artefact of Inattention ?* <https://doi.org/10.31234/osf.io/ntsve>
- Takahashi, T., & Suzuki, M. (2018). Brain morphologic changes in early stages of psychosis: Implications for clinical application and early intervention. *Psychiatry and Clinical Neurosciences*, 72(8), 556–571. <https://doi.org/10.1111/pcn.12670>
- Tamminga, C. A., Ivleva, E. I., Reininghaus, U., & van Os, J. (Eds.). (2020). *Psychotic Disorders: Comprehensive Conceptualization and Treatments*. Oxford University Press. <https://doi.org/10.1093/med/9780190653279.001.0001>
- Tandon, R., Gaebel, W., Barch, D. M., Bustillo, J., Gur, R. E., Heckers, S., Malaspina, D., Owen, M. J., Schultz, S., Tsuang, M., Van Os, J., & Carpenter, W. (2013). Definition and description of schizophrenia in the DSM-5. *Schizophrenia Research*, 150(1), 3–10. <https://doi.org/10.1016/j.schres.2013.05.028>
- Tandon, R., Nasrallah, H. A., & Keshavan, M. S. (2009). Schizophrenia, “just the facts” 4. Clinical features and conceptualization. *Schizophrenia Research*, 110(1–3), 1–23. <https://doi.org/10.1016/j.schres.2009.03.005>
- Thompson, A. D., & Broome, M. R. (2020). *Risk Psychosis Paradigms, Mechanisms, and Prevention*.
- Toutountzidis, D., Gale, T. M., Irvine, K., Sharma, S., & Laws, K. R. (2022). Childhood

- trauma and schizotypy in non-clinical samples: A systematic review and meta-analysis. *PLOS ONE*, 17(6), e0270494. <https://doi.org/10.1371/journal.pone.0270494>
- Tripoli, G., Quattrone, D., Ferraro, L., Gayer-Anderson, C., Rodriguez, V., La Cascia, C., La Barbera, D., Sartorio, C., Seminerio, F., Tarricone, I., Berardi, D., Szöke, A., Arango, C., Tortelli, A., Llorca, P. M., De Haan, L., Velthorst, E., Bobes, J., Bernardo, M., ... Di Forti, M. (2021). Jumping to conclusions, general intelligence, and psychosis liability: Findings from the multi-centre EU-GEI case-control study. *Psychological Medicine*, 51(4), 623–633. <https://doi.org/10.1017/S003329171900357X>
- Uchino, T., Okubo, R., Takubo, Y., Aoki, A., & Wada, I. (2022). *Perceptions of and subjective difficulties with social cognition in schizophrenia from an internet survey : Knowledge, clinical experiences, and awareness of association with social functioning*. <https://doi.org/10.1111/pcn.13435>
- Uher, R., & Zwickler, A. (2017). Etiology in psychiatry: embracing the reality of poly-gene-environmental causation of mental illness. *World Psychiatry*, 16(2), 121–129. <https://doi.org/10.1002/wps.20436>
- Uhlhaas, P. J., Phillips, W. A., Schenkel, L. S., & Silverstein, S. M. (2006). Theory of mind and perceptual context-processing in schizophrenia. *Cognitive Neuropsychiatry*, 11(4), 416–436. <https://doi.org/10.1080/13546800444000272>
- Van Dael, F., Versmissen, D., Janssen, I., Myin-Germeys, I., Van Os, J., & Krabbendam, L. (2006). Data gathering: Biased in psychosis? *Schizophrenia Bulletin*, 32(2), 341–351. <https://doi.org/10.1093/schbul/sbj021>
- Van Der Leer, L., Hartig, B., Goldmanis, M., & McKay, R. (2015). Delusion proneness and “jumping to conclusions”: Relative and absolute effects. *Psychological Medicine*, 45(6), 1253–1262. <https://doi.org/10.1017/S0033291714002359>
- van Neerven, T., Bos, D. J., & van Haren, N. E. (2021). Deficiencies in Theory of Mind in patients with schizophrenia, bipolar disorder, and major depressive disorder: A systematic review of secondary literature. *Neuroscience & Biobehavioral Reviews*, 120, 249–261. <https://doi.org/10.1016/j.neubiorev.2020.11.011>
- Van Os, J., Linscott, R. J., Myin-Germeys, I., Delespaul, P., & Krabbendam, L. (2009). A systematic review and meta-analysis of the psychosis continuum: Evidence for a psychosis proneness-persistence-impairment model of psychotic disorder. *Psychological Medicine*, 39(2), 179–195. <https://doi.org/10.1017/S0033291708003814>
- Van Os, Jim. (2003). Is there a continuum of psychotic experiences in the general population? *Epidemiologia e Psichiatria Sociale*, 12(4), 242–252. <https://doi.org/10.1017/S1121189X00003067>
- Van Os, Jim, & Reininghaus, U. (2016). Psychosis as a transdiagnostic and extended phenotype in the general population. *World Psychiatry*, 15(2), 118–124. <https://doi.org/10.1002/wps.20310>
- Vaskinn, A., Andersson, S., Østefjells, T., Andreassen, O. A., & Sundet, K. (2018). Emotion perception, non-social cognition and symptoms as predictors of theory of mind in schizophrenia. *Comprehensive Psychiatry*, 85, 1–7. <https://doi.org/10.1016/j.comppsy.2018.05.002>
- Vaskinn, A., & Horan, W. P. (2020). Social Cognition and Schizophrenia: Unresolved Issues

- and New Challenges in a Maturing Field of Research. *Schizophrenia Bulletin*, 46(3), 464–470. <https://doi.org/10.1093/schbul/sbaa034>
- Veckenstedt, R., Randjbar, S., Vitzthum, F., Hottenrott, B., Woodward, T. S., & Moritz, S. (2011). Incorrability, jumping to conclusions, and decision threshold in schizophrenia. *Cognitive Neuropsychiatry*, 16(2), 174–192. <https://doi.org/10.1080/13546805.2010.536084>
- Velthorst, E., Fett, A. K. J., Reichenberg, A., Perlman, G., Van Os, J., Bromet, E. J., & Kotov, R. (2017). The 20-year longitudinal trajectories of social functioning in individuals with psychotic disorders. *American Journal of Psychiatry*, 174(11), 1075–1085. <https://doi.org/10.1176/appi.ajp.2016.15111419>
- Vos, T., Abajobir, A. A., Abbafati, C., Abbas, K. M., Abate, K. H., Abd-Allah, F., Abdulle, A. M., Abebo, T. A., Abera, S. F., Aboyans, V., Abu-Raddad, L. J., Ackerman, I. N., Adamu, A. A., Adetokunboh, O., Afarideh, M., Afshin, A., Agarwal, S. K., Aggarwal, R., Agrawal, A., ... Murray, C. J. L. (2017). Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: A systematic analysis for the Global Burden of Disease Study 2016. *The Lancet*, 390(10100), 1211–1259. [https://doi.org/10.1016/S0140-6736\(17\)32154-2](https://doi.org/10.1016/S0140-6736(17)32154-2)
- Wallace, E. R., & Gach, J. (2008). *History of Psychiatry and Medical Psychology* (E. R. Wallace & J. Gach (Eds.)). Springer US. <https://doi.org/10.1007/978-0-387-34708-0>
- Ward, T., & Garety, P. A. (2019). Fast and slow thinking in distressing delusions: A review of the literature and implications for targeted therapy. *Schizophrenia Research*, 203, 80–87. <https://doi.org/10.1016/j.schres.2017.08.045>
- Watanabe, S., Taniguchi, T., & Sugihara, M. (2021). Functional outcomes and subjective recovery of jumping to conclusions in schizophrenia. *Schizophrenia Research: Cognition*, 26(August), 100212. <https://doi.org/10.1016/j.scog.2021.100212>
- Wellstein, K. V., Diaconescu, A. O., Bischof, M., Rüesch, A., Paolini, G., Aponte, E. A., Ullrich, J., & Stephan, K. E. (2020). Inflexible social inference in individuals with subclinical persecutory delusional tendencies. *Schizophrenia Research*, 215, 344–351. <https://doi.org/10.1016/j.schres.2019.08.031>
- Westermann, S., Cavelti, M., Heibach, E., & Caspar, F. (2015). Motive-oriented therapeutic relationship building for patients diagnosed with schizophrenia. *Frontiers in Psychology*, 6. <https://doi.org/10.3389/fpsyg.2015.01294>
- Westhoff, M. L. S., Ladwig, J., Heck, J., Schülke, R., Groh, A., Deest, M., Bleich, S., Frieling, H., & Jahn, K. (2021). Early Detection and Prevention of Schizophrenic Psychosis—A Review. *Brain Sciences*, 12(1), 11. <https://doi.org/10.3390/brainsci12010011>
- Wigman, J. T. W., Van Nierop, M., Vollebergh, W. A. M., Lieb, R., Beesdo-Baum, K., Wittchen, H. U., & Van Os, J. (2012). Evidence that psychotic symptoms are prevalent in disorders of anxiety and depression, impacting on illness onset, risk, and severity - Implications for diagnosis and ultra-high risk research. *Schizophrenia Bulletin*, 38(2), 247–257. <https://doi.org/10.1093/schbul/sbr196>
- Williams, D. (2018). Hierarchical Bayesian models of delusion. *Consciousness and Cognition*, December 2017, 0–1. <https://doi.org/10.1016/j.concog.2018.03.003>

- Winship, I. R., Dursun, S. M., Baker, G. B., Balista, P. A., Kandratavicius, L., Maia-de-Oliveira, J. P., Hallak, J., & Howland, J. G. (2019). An Overview of Animal Models Related to Schizophrenia. *Canadian Journal of Psychiatry*, 64(1), 5–17. <https://doi.org/10.1177/0706743718773728>
- Wittgenstein, L. (1980). *Culture and Value / Vermischte Bemerkungen* (G. H. von Wright & H. Nyman (Eds.); Vol. 2). Basil Blackwell Oxford. <https://doi.org/10.1111/j.1467-9205.1982.tb00022.x>
- Woodward, T. S., Buchy, L., Moritz, S., & Liotti, M. (2007). A bias against disconfirmatory evidence is associated with delusion proneness in a nonclinical sample. *Schizophrenia Bulletin*, 33(4), 1023–1028. <https://doi.org/10.1093/schbul/sbm013>
- Woodward, T. S., Moritz, S., Cuttler, C., & Whitman, J. C. (2006). The contribution of a cognitive bias against disconfirmatory evidence (BADE) to delusions in schizophrenia. *Journal of Clinical and Experimental Neuropsychology*, 28(4), 605–617. <https://doi.org/10.1080/13803390590949511>
- Woodward, T. S., Moritz, S., Menon, M., & Klinge, R. (2008). Belief inflexibility in schizophrenia. *Cognitive Neuropsychiatry*, 13(3), 267–277. <https://doi.org/10.1080/13546800802099033>
- Woodward, T. S., Munz, M., Leclerc, C., & Lecomte, T. (2009). Change in delusions is associated with change in “jumping to conclusions.” *Psychiatry Research*, 170(2–3), 124–127. <https://doi.org/10.1016/j.psychres.2008.10.020>
- Yang, A. C., & Tsai, S. J. (2017). New targets for schizophrenia treatment beyond the dopamine hypothesis. *International Journal of Molecular Sciences*, 18(8). <https://doi.org/10.3390/ijms18081689>
- Yay, A., Pries, L., Ferrara, M., & Rutten, B. P. F. (2022). Gender differences in the association between environment and psychosis. *Schizophrenia Research*, 243(May), 120–137. <https://doi.org/10.1016/j.schres.2022.02.039>
- Zamanpoor, M. (2020). Schizophrenia in a genomic era: A review from the pathogenesis, genetic and environmental etiology to diagnosis and treatment insights. *Psychiatric Genetics*, 1–9. <https://doi.org/10.1097/YPG.0000000000000245>
- Zamperoni, G., Neill, E., Rossell, S. L., & Tan, E. J. (2021). Delusion-like experiences are related to negative perceptions of self and others in non-clinical individuals. *Psychosis*, 00(00), 1–12. <https://doi.org/10.1080/17522439.2021.1942961>
- Zawadzki, J. A., Woodward, T. S., Sokolowski, H. M., Boon, H. S., Wong, A. H. C., & Menon, M. (2012). Cognitive factors associated with subclinical delusional ideation in the general population. *Psychiatry Research*, 197(3), 345–349. <https://doi.org/10.1016/j.psychres.2012.01.004>
- Zhang, W., Lei, D., Keedy, S. K., Ivleva, E. I., Eum, S., Yao, L., Tamminga, C. A., Clementz, B. A., Keshavan, M. S., Pearlson, G. D., Gershon, E. S., Bishop, J. R., Gong, Q., Lui, S., & Sweeney, J. A. (2020). Brain gray matter network organization in psychotic disorders. *Neuropsychopharmacology*, 45(4), 666–674. <https://doi.org/10.1038/s41386-019-0586-2>

APPENDIX A: ITEMS

Notes, L: Lure; A: Absurd; S: Suspicious; T: True

X) Sample Item

- i. After Evan left his room, Adam shouted at his back and said: “*Couldn’t you find the door handle?*”
- ii. Adam has an important exam tomorrow and finds it hard to concentrate when the door to his room is open.
- iii. Adam’s room is now too noisy.

Why do you think Adam said this to Evan?

- Evan was repairing Adam’s door. (L)
- Evan forgot to close the door of Adam’s room when he left. (T)
- Compared to steel doors, Adam finds wooden doors more aesthetically pleasing. (A)
- Adam thinks sleeping in unlocked rooms is very dangerous. (S)

A) Items belong to the A condition: True option gains plausibility whereas other options get implausible with each new information

1)

- i. Ashley said to her friend Mary, “I can’t act affectionate towards Leo”
- ii. Leo likes to use his scratching post.
- iii. Ashley was bitten badly by a cat when she was three years old.

Why do you think Ashley said this to her friend Mary?

- Ashley’s boyfriend Leo lied to her, and she can not forgive him for it. (L)
- Ashley loves to watch documentaries about wildlife. (A)
- Ashley feels like Leo has been preparing to take revenge against her for a long time. (S)
- Ashley has a phobia of felines. (T)

2)

- i. While they were having dinner on their first date, Laura said to Michael: “Shouldn’t we order desserts already?”
- ii. Michael was being a motormouth the whole night and did not let Laura say a word.
- iii. Laura was blatantly and grumpily checking the time.

Why do you think Laura said this to Michael?

- Laura thinks dessert is the most important indicator of the quality of any restaurant. (A)
 - Laura is bored and wants to end the night as soon as possible. (T)
Laura knows Michael has diabetes, and she wants him to eat too much sugar. (S)
 - Laura wants to stay alone with Michael as soon as their dinner is over. (L)
-

3)

- While they were eating lunch and discussing Victoria's heavy workload, Victoria said to her boss, "I think it's a bit too much."
- Victoria's boss ordered Maria's favorite food for himself.
- Victoria is already full from her meal.

Why do you think Victoria said this to her boss?

- Victoria is resisting some extra food her boss was offering her. (T)
 - The boss is getting too close physically to Victoria. (S)
 - Victoria thinks Hawaiian pizza is a crime against humanity. (A)
 - Victoria's boss wants to give her a present for her hard work, which she finds unethical and does not want to accept. (L)
-

4)

- During dinner, Mark said to his wife Janette, "I really like this blue jacket of mine."
- Mark likes to wear his blue jacket during important meetings, but it is in the laundry basket.
- Mark has an important job interview the next morning.

Why do you think Mark said this to his wife Janette?

- Mark is indirectly asking Janette to wash his blue jacket. (T)
 - Mark is implying that he'd like to be given another blue jacket for his upcoming birthday. (L)
 - Mark thinks his wife only finds him attractive in certain outfits. (S)
 - Mark thinks blue is the warmest color. (A)
-

5)

- Sierra and Allen were alone, and Sierra asked to Allen: "Is it too hot in here, or is it just me?"
- They were driving to their parents' home in their car.
- They had just left Sierra's orthopedist appointment.

Why do you think Sierra asked this to Allen?

- Sierra can't open the window because of her broken arm, and she is trying to hint to Allen to open his window. (T)
- The air conditioner of the bus is broken. (L)

- Sierra likes to wear flipflops, even on a snowy day. (A)
Sierra thinks that Allen wants to torture her. (S)

6)

- After Hunter spent a month with his mother, his friend Tom said to him, “Your mom must have cooked delicious food for you”
- Hunter’s mom is a housewife who cooks delicious meals.
- Hunter needs to buy new clothes in a larger size.

Why do you think Tom said this to Hunter?

- Tom is jealous of the attention Hunter got from his mother. (S)
- Hunter’s mom is a successful chef at a famous restaurant. (L)
- Tom thinks people must avoid packaged foods. (A)
- Hunter gained a few pounds during his visit with his mom. (T)

7)

- In the middle of a discussion about their budget, Kaitlyn said to Alex: “The phone must be giving you much more joy than I do.”
- Alex had used his previous phone until it became completely dysfunctional.
- Alex kept checking his notifications during the conversation and was not paying any attention to Jane.

Why do you think Kaitlyn said this to Alex?

- Kaitlyn thinks we live in a consumer society. (A)
- Kaitlyn feels that Alex doesn’t enjoy her company as much as he used to. (S)
- Kaitlyn wants Alex to stop playing with his phone and focus on her. (T)
- Kaitlyn is complaining that Alex is a nerd who loves to spend too much money on new gadgets unnecessarily. (L)

B) Items belong to the B condition: With the second information lure option gains plausibility and other options get implausible, yet true option is revealed with the third information.

1)

- While they were speaking in a recreational room, Jasmine said to Vincent: “You should put your cards on the table now.”
- This was not the first time Vincent had not been trustworthy.
- Yesterday, Jasmine read Vincent’s intimate messages to another woman.

Why do you think Jasmine said this to Vincent?

- Vincent and Jasmine are playing poker, and Jasmine thinks Vincent is cheating. (L)
 - Jasmine wants to hear the harsh reality from Vincent's mouth. (T)
 - Jasmine knows that she is doomed to die alone. (S)
- Vincent thinks they should use red lighting in the recreational room. (A)
-

2)

- i. Christina's chef said to her, "Could you please come to my office for a second?"
- ii. Christina's colleagues have been acting a bit weird in the past week.
- iii. Today is Christina's birthday.

Why do you think Christina's chef said this to her?

- The chef is about to tell Christina that she is fired, and her colleagues already knew this. (L)
 - Christina and the chef have conflicting ideas about automation of the labor force. (A)
 - Christina's colleagues are preparing a surprise party for her in the chef's office. (T)
 - Christina was blamed by her colleagues for a cash shortage, and the chef wants to talk to her about it. (S)
-

3)

- i. While they were eating together, Billy said to his boss George, "I can't take that on. I already have a lot on my plate."
- ii. Billy has started to overeat due to work stress.
- iii. Billy is the worker of the year and his boss is offering him a promotion.

Why do you think Billy said this to his boss George?

- Billy is objecting to his boss's offer to give him a more responsible position in the company. (T)
 - Billy likes angular plates rather than round ones. (A)
 - Billy feels that everybody arounds him thinks he is a failure. (S)
 - The restaurant's serving sizes are pretty big, and Billy is politely refusing the food his boss is offering to him. (L)
-

4)

- i. Jessie said to Maria: "I think we are finished. I no longer want to continue."
- ii. Jessie and Maria have put great effort into something for a long time.
- iii. Jessie wants to see other people.

Why do you think Jessie said this to Maria?

- Jessie thinks they have been overworking on their joint project and that it doesn't require any more work. (L)
- Jessie feels that no matter how hard she tries, Maria sees her as a failure. (S)
- Jessie wants to break up with Maria. (T)

- Jessie and Maria have decided to name their new pet “Quits” after a long search for the best name. (A)
-

5)

- During a team meeting, Abigail asked to her employee Matthew: “Couldn’t you ask anyone besides Madison about the task?”
- Abigail and Matthew need to finish their accounting task within 24 hours.
- Madison works in the IT department.

Why do you think Abigail asked this to her employee Matthew?

- Abigail doesn’t believe in the existence of a glass ceiling that stands in the way of women in the business world. (A)
 - Matthew has wasted time by asking the wrong person his question. (T)
 - Abigail thinks that Madison wants to kick her down the ladder and that Matthew is in on the plan. (S)
 - Abigail is angry that Matthew isn’t treating his job as important enough. (L)
-

6)

- Emily said to her boyfriend John: “I think we should see other people”
- Both of them are unhappy and do not want to believe what they just heard.
- They are leaving John’s doctor’s office, and the doctor gave John bad news.

Why do you think Emily said this to her boyfriend John?

- Emily thinks she and John are not good for each other anymore and wants to break up with him. (L)
 - Emily feels like the entire world is against her and that she cannot rely on anyone but herself. (S)
 - Emily finds recent developments in ophthalmology fascinating. (A)
 - Emily and John would like to seek medical advice from someone else. (T)
-

7)

- Right before leaving the doctor’s office, Lucas asked his doctor, “Is this the best option?”
- Lucas is new to the city and has no relatives there.
- His doctor was explaining him how to get to another doctor’s office that he had referred Lucas to.

Why do you think Lucas asked this to his doctor?

- Lucas was wondering if there was a shorter way to the other hospital. (T)
- Lucas believes his doctor secretly wants to harm him. (S)

- Lucas doesn't want to undergo a risky operation alone. (L)
- Lucas has dementia. (A)

Decision Rating Questions – 1st and 2nd Decision Rating Questions:

Q. You will see more information on the next slide. However, we would like to know if you would have reached a decision already at this point.

- a) Yes, I think the information is sufficient enough to make a decision.
 - b) No, the information is not sufficient to make a decision.
-

Decision Rating Questions – 3rd Decision Rating Question:

Q. We would like to know, if you reached a final decision at this point, indicating that the given information was sufficient.

- a) Yes, I think the information was sufficient to make a decision.
 - b) No, the information was not sufficient to make a decision.
-

Social Competency Question:

Q. How competent do you feel you are during social interactions?

- Very incompetent
 - Somewhat incompetent
 - Neither competent nor incompetent
 - Somewhat competent
 - Very competent
-

Perceived Difficulty Question:

Q. How challenging did you find this item?

- Very challenging
- Somewhat challenging
- Neither challenging nor easy
- Somewhat easy
- Very easy