

**Psychotic-like experiences and psychometric
schizotypy: their relationships with depressive
symptoms and theory of mind in adolescents from
the general population**

Tesis doctoral

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Psychotic-like experiences and schizotypy in adolescence

Para Rodrigo y nuestro hermoso hijo Tomás

Abstract

Individuals who report psychotic-like experiences (PLEs) are at significantly increased risk for clinical psychotic disorders. However, associations between PLEs and non-psychotic disorders indicate that the clinical relevance of PLEs is not limited to psychosis and thus, investigating the role of additional symptoms, such as depression, may improve the capacity to predict risk of developing psychotic disorders. Additionally, studying theory of mind (ToM) abilities, one of the cognitive areas impaired in schizophrenic patients, in adolescents from the general population may contribute to clarify whether ToM deficits are present in at-risk individuals before the onset of the illness and derived impairments. Evidence suggests that ToM impairments are not exclusive of symptomatic patients, and that further understanding of the nature of ToM dysfunction in schizophrenia might be achieved through examination of ToM impairments from the early phases and even before the onset of the illness.

Objectives: this thesis was aimed at (1) examining the presence of both positive and negative PLEs and their association with depressive symptoms in a community sample of adolescents; (2) analysing the presence of subtypes of positive and negative PLEs dimensions in adolescents of the community, and (3) exploring ToM functioning, its association with psychometric schizotypy, PLEs, and depressive symptoms, in a sample of adolescents from the general population.

Method: participants in this cross-sectional study were adolescents aged between 13 and 17 years, attending compulsory secondary education in schools from Barcelona, Spain. To establish the presence of subtypes of positive and negative PLEs, separate principal component factor analyses of the CAPE positive and negative subscales were performed. Multiple linear regression analysis was conducted to examine the association between specific CAPE positive and negative PLE subtypes and depressive symptoms. **Results:** PLEs and psychometric schizotypy dimensions were present in this community sample of adolescents. Four factors of positive symptoms (persecutory ideation, grandiose thinking, first-rank-hallucinatory, and self-referential thinking) and three factors of negative symptoms (social withdrawal, affective flattening, and avolition) emerged from the analysis. Different relationships between subtypes of positive

PLEs and depressive symptoms were found: persecutory ideation and first-rank/hallucinatory experiences related to higher scores on the depressive symptoms scale whilst grandiose thinking related to lower scores on depression. No association with self-referential thinking was found. Associations between subtypes of the negative dimension and depression were also found: social withdrawal and avolition were positively associated with the self-report of depressive symptoms, while affective flattening did not relate to depression. No differences were found in ToM abilities in adolescents with higher global scores on schizotypy or PLEs relative to those with lower global scores. Higher scores on the unusual experiences subscale assessing positive schizotypy and on first-rank experiences were associated with poorer ToM ability, whereas persecutory beliefs were related to better ToM performance. No association was found between ToM and magical thinking or hallucinatory experiences. Negative PLEs or negative schizotypy were not related to ToM abilities. In addition, an association between better mentalising abilities and higher impulsive nonconformity was found.

Conclusions: these findings support the view that not all types of positive and negative PLEs in adolescence are associated with depression and, therefore, may not confer the same vulnerability for psychotic disorders. ToM impairments are not restricted to the acute phase of a psychotic disorder, and may be associated to positive schizotypy and first-rank experiences. These findings constitute evidence indicating that ToM impairments can be identified during adolescence before the onset of any psychotic disease.

Resumen

Las personas que experimentan síntomas pseudopsicóticos (SSP) presentan un riesgo elevado de sufrir trastornos psicóticos. Sin embargo, asociaciones encontradas entre SSP y trastornos no psicóticos sugieren que la relevancia clínica de los SSP no se limita a la psicosis y por lo tanto, investigar el rol de síntomas adicionales tales como la depresión, puede mejorar la capacidad de predecir el riesgo de desarrollar trastornos psicóticos. Asimismo, estudiar las habilidades en teoría de la mente (ToM), área cognitiva que sufre alteraciones en pacientes con esquizofrenia, en adolescentes de la población general, puede contribuir a clarificar si las personas consideradas en riesgo presentan déficits en ToM. La evidencia sugiere que los déficits en ToM no son exclusivos de los pacientes sintomáticos y que una mayor comprensión de la naturaleza de estas alteraciones se puede lograr a través su estudio antes del inicio del trastorno. **Objetivos:** (1) examinar la presencia de SSP positivos y negativos y su asociación con síntomas depresivos en una muestra de adolescentes de la población general; (2) analizar la presencia de subtipos de SSP positivos y negativos, y (3) examinar el funcionamiento de ToM, su asociación con esquizotipia psicométrica, SSP y síntomas depresivos. **Método:** los participantes en este estudio transversal fueron adolescentes con edades entre los 13 y 17 años, estudiantes de secundaria en escuelas de Barcelona, España. Para establecer la presencia de subtipos de SSP positivos y negativos se llevaron a cabo análisis factoriales de las subescalas que evaluaban estos síntomas. La asociación entre los subtipos de síntomas positivos y negativos y los síntomas depresivos se examinó mediante el análisis de regresión múltiple. **Resultados:** Se identificaron dimensiones de SSP y esquizotipia en esta muestra de adolescentes de la población general. Cuatro factores de síntomas positivos (ideación persecutoria, ideación de grandiosidad, experiencias alucinatorias/de primer rango y pensamiento auto-referencial) y tres factores de síntomas negativos (retraimiento social, aplanamiento afectivo y abulia) fueron identificados. Se encontraron relaciones entre los subtipos de síntomas positivos y negativos y síntomas depresivos, así: la ideación persecutoria y las experiencias alucinatorias y de primer rango se asociaron a puntuaciones más altas en síntomas depresivos, mientras que la ideación de grandiosidad se asoció a puntuaciones

más bajas en depresión. No se encontró asociación entre depresión y pensamiento autorreferencial. Se encontraron también asociaciones entre subtipos de síntomas negativos y depresión: retraimiento social y abulia se asociaron positivamente al auto-informe de síntomas depresivos, mientras que el aplanamiento afectivo no se asoció a depresión. No se observaron diferencias en las habilidades de ToM entre los adolescentes con puntuaciones totales más altas en SSP o esquizotipia comparados con los adolescentes con puntuaciones totales más bajas. Las puntuaciones altas en la escala de experiencias inusuales que evalúa esquizotipia positiva, al igual que la subescala de experiencias de primer rango, se asociaron con déficits en ToM, mientras que la ideación persecutoria se asoció a un mejor desempeño en ToM. El desempeño en ToM no se asoció a pensamiento mágico ni a experiencias alucinatorias. Los síntomas negativos y la esquizotipia negativa no se relacionaron con el desempeño en ToM. Un mejor desempeño en ToM se asoció a mayor no-conformidad impulsiva. **Conclusiones:** los hallazgos presentados en esta tesis confirman que no todos los tipos de SSP positivos y negativos se asocian con depresión y por lo tanto, podrían conferir diferente vulnerabilidad a sufrir trastornos psicóticos. Las alteraciones en ToM no se limitan a la fase aguda de un trastorno psicótico, y podrían asociarse a la esquizotipia positiva y a experiencias de primer rango. Estos hallazgos sugieren que es posible identificar alteraciones en ToM durante la adolescencia antes del inicio de cualquier trastorno.

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1. INTRODUCTION

1.1. Psychotic-like experiences and schizotypy

1.1.1. Definition and background

Psychotic-like experiences (PLEs) or subclinical psychotic symptoms describe attenuated or transient forms of the full-blown symptoms expressed by psychotic patients, without reaching the clinical threshold to be considered as a case requiring treatment (Kwapil, Chapman, & Chapman, 1999). Research on PLEs has demonstrated that psychotic symptoms are relatively common among healthy individuals in the general population, as reported in several studies carried out with both adolescents (Lataster et al., 2006; Nishida et al., 2008; Spauwen, Krabbendam, Lieb, Wittchen, & van Os, 2003) and adults (Loewy, Johnson, & Cannon, 2007; Mojtabai, 2006; Scott, Chant, Andrews, & McGrath, 2006; van Os, Hanssen, Bijl, & Ravelli, 2000).

PLEs might be an expression of **schizotypy** (Gooding, Tallent, & Matts, 2005), which has been conceptualized as a non-clinical manifestation of the same underlying biological factors operating in schizophrenia and psychotic spectrum disorders (Claridge, 1994). Schizotypal signs can be examined through quantitative measures, such as psychometric inventories, that identify the psychometric profiles of individuals that might be at high-risk for schizophrenia (Gooding, Matts, & Rollman, 2006; Lenzenweger, 2006). Thus, individuals psychometrically identified as schizotypes show attenuated forms of cognitive and psychological features of schizophrenia (Kwapil, Barrantes-Vidal, & Silvia, 2008).

The association between schizotypy and hallucinatory experiences in the general population was examined by McCreery and Claridge (1996). In this study, “out-of-the-body” experiences, a form of hallucination in which the individual thinks that has the ability to see his own body from the outside, was examined among healthy adults (n = 40, mean age: 41 years). An association between high schizotypy and proneness to develop these hallucinatory experiences was found among the 23 participants who reported them. In addition, the negative association found between anhedonia and schizotypy suggested the presence of

differences in the affective tone of the hallucinatory experiences in normal subjects and in schizophrenic patients, with normal schizotypes having a positive affect and schizophrenics a negative. This finding confirmed the notion of “**happy schizotype**” referring to the fact that schizotypy is not necessarily a “malignant” personality trait (Claridge & Beech, 1995).

It has been recently found by Kline et al. (2012) that schizotypy determines the form in which PLEs are interpreted by the individual. Schizotypy constitutes a personality trait that affects the association between PLEs and associated **distress**. The study conducted by Kline et al. (2012) with college students (n = 355, mean age: 20.1 years) identified that higher levels of distress associated with PLEs were predicted by a greater number of self-reported PLEs. However, the relationship was stronger in individuals low in schizotypy. That is, individuals scoring low in schizotypy found PLEs more disturbing, frightening, or impairing than their peers with higher levels of schizotypy. This implies that given the association between schizotypal traits and risk for psychosis, non-distressing PLEs should not be discarded as clinically irrelevant.

Attempts to establish the structure of schizotypy have been conducted using factor analysis. Those analyses have yielded between two and four components, depending on the content of the scales used; however, there seems to be certain agreement indicating that schizotypy has three components including: **positive schizotypy, cognitive disorganization and negative schizotypy** (Meehl, 1962; Venables & Rector, 2000). In this line, Raine (2006) suggests that the three main factors underlying schizotypal personality include: cognitive-perceptual (magical thinking, unusual perceptual experiences, ideas of reference, paranoid ideation), disorganised (odd/eccentric behaviour, odd speech), and interpersonal features (no close friends, constricted affect, excessive social anxiety).

The majority of schizotypal individuals are not expected to develop a clinical psychosis; however, they are considered to be at risk. They can display schizotypal psychological and behavioural manifestations as a result of this latent personality organization (Lenzenweger, Bennet, & Lilenfeld, 1997; Meehl, 1962). Thus, cognitive and social deficits similar to those found in schizophrenia (Dickey et al., 2005), higher levels of anxiety and depression (Lenzenweger & Loranger, 1989), and neurological signs and physical anomalies (Bollini et al., 2007; Walker, 1994) have all been reported in individuals with schizotypy. Positive

schizotypy has been associated with PLEs (Dickey et al., 2005; Kwapil et al., 2008; Kwapil, Miller, Zinser, Chapman, & Chapman, 1997), anxiety and depression (Lewandowski et al., 2006), and with deficits on verbal fluency in a study carried out with Spanish adolescents (Barrantes-Vidal et al., 2002).

1.1.2. The dimensional view of psychosis

Research on PLEs and schizotypy is based on the dimensional approach to psychopathology, which proposes that psychosis can be better understood in terms of a continuum with the normal experience (Johns & van Os, 2001; Peters, Joseph, & Garety, 1999; van Os et al., 1999; Verdoux & van Os, 2002), that varies among several dimensions of independent but correlated symptoms (Stefanis et al., 2002). This notion of a psychosis continuum implies that the same symptoms that are experienced by patients with psychotic disorders can be measured in non-clinical populations and that having symptoms such as delusions and hallucinations is not necessarily associated with the presence of a disorder. This would be determined by symptom attributes such as intrusiveness, frequency, and psychopathological co-morbidities, as well as by personal and cultural factors such as coping, social acceptability, and the degree of associated impairment (Johns & van Os, 2001). As a consequence, the prevalence of the clinical disorder is low, while the prevalence of symptoms is higher (Stefanis et al., 2002). In this line, Kelleher and Cannon (2011) concluded in their review of the literature on PLEs, that the non-clinical psychotic phenotype represents a valuable population in which to study the aetiology of psychosis with the additional advantages that this phenotype is more prevalent than the clinical phenotype and facilitates research into early neurodevelopmental changes in psychosis.

Two complementary approaches have been used to investigate the dimensionality of psychosis in non-clinical populations. First, the “**quasi-dimensional**” model that takes the abnormal state as the reference point and understands dimensionality as degrees of expression of a disease process, and second, the “**fully dimensional**” perspective that takes normality or health as the reference point. This approach includes the quasi-dimensional model and involves another form of continuity, at the personality level. The connection between these perspectives on dimensionality, is that the personality level (fully-dimensional) may indicate predisposition to a disease, or remain as part of the normal

individual variation (Claridge & Beech, 1995). Psychotic symptoms are defined by the fully-dimensional approach as the severe expression of traits that are present in the general population and can be observed as psychological variations among individuals ranging from the well-adjusted to those individuals who, while showing signs of psychopathology, would not be considered as clinically psychotic (Peters, Joseph, Day, & Garety, 2004).

From a fully-dimensional perspective, schizotypal traits are viewed as part of the normal variation found across human characteristics (Mason & Claridge, 2006). However, higher levels of these traits may impair healthy cognitive, emotional and social functioning (Loughland & Williams, 1997), and are considered to mark a cognitive vulnerability that predisposes towards psychosis. This vulnerability may remain dormant, without manifesting in a psychotic breakdown, unless triggered by adverse physical, social or environmental factors (Claridge, 1994).

Another view defines schizotypy as a latent psychological and personality organization involving a liability for schizophrenia (Lenzenweger, 2006; Meehl, 1962). Meehl (1962) proposed a model in which ‘schizotaxia’, a genetic anomaly in brain functioning, constitutes the basis where other factors will build upon and interact adversely with to increase the risk for the development of schizophrenia. This model, according to Claridge and Beech (1995), represents a different view of dimensionality that combines quasi and fully-dimensional elements, but places schizotypy in the illness domain, defining it as partially expressed schizotaxia, instead of as a fully normal personality dimension.

In Meehl’s model, schizotaxia interacts with the individual’s social learning history giving as a result the personality organisation called schizotypy. If favourable environmental influences and certain individual characteristics (e.g., low anxiety proneness, general resistance to stress) are present, the individual will remain a well-compensated “normal” schizotype, without developing a psychotic disorder. Thus, only a fraction of individuals with schizotypy will develop schizophrenia.

Assessment of non-clinical populations has shown that the presence of psychotic experiences among healthy individuals is relatively common, thus confirming the notion of a continuum of psychosis. In the study carried out by van Os et al. (1999) individuals with symptoms of anxiety and depression had

intermediate scores on most dimensions of psychosis between controls and psychosis patients. Similarly, Hannsen et al. (2003) assessed PLEs in adults from the general population (mean age: 40 years) and with psychotic, mood and anxiety disorders (mean age: 46 years). They found that patients with anxiety and mood disorders had elevated scores on the positive dimension of PLEs, indicating that these disorders have intermediate values in the continuous psychosis phenotype. In addition, psychotic patients showed intermediate scores on depressive symptoms compared to non-patients and mood and anxiety patients, indicating the presence of quantitative differences between psychotic and non-psychotic affective disorders. These results also suggested that the psychosis phenotype may not only involve variation in positive and negative symptomatology, but also in the affective domain. The Dunedin study (Poulton et al., 2000) showed evidence of a clinical continuum between PLEs and psychosis, since children who reported PLEs at age 11 years had an increased risk of schizophreniform disorder at age 26 years.

van Os, Linscott, Myin-Germeys, Delespaul, and Krabbendam (2009) proposed the **psychosis-proneness–persistence–impairment** model of psychosis in which genetic factors interact with environmental stressors to affect the transitory expression of psychosis that can take place during development, thus contributing to an abnormal persistence of the symptoms and increasing their likelihood to become clinically relevant. A complementary model, that further explains the notion of continuity between psychotic experiences and disorder, has been recently developed by Linscott and van Os (2013) and posits that continuity can be understood in three different ways, phenomenological, temporal, and structural (see Table 1), and the psychosis-proneness–persistence–impairment model involves concepts of both phenomenological and temporal continuity.

Table 1. Linscott and van Os' (2013) model of continuity between psychotic experiences and disorder

Type of continuity	Psychotic experiences	Evidence
Phenomenological	Not exclusive to disorder. Independent of disorder	Early expression of schizotypy that involves psychotic experiences is typically transient and relatively common
Temporal/ Persistence	May endure over time	Persist over time. Stressors may act to prolong and exacerbate the severity of schizotypy and psychotic experiences
Structural	Distribution among the general population: <ul style="list-style-type: none"> • Single class of people with or without variation in the expression of the phenotype (structural continuity), or • Two or more classes of people with qualitatively distinguishable phenotypes that may or may not vary quantitatively (discontinuity) 	General population is composed by two classes: one corresponding to a liability class and the other an unaffected complement

1.1.3. Prevalence of PLEs in the general population

The expression of subclinical psychotic symptoms is more prevalent in childhood compared to adulthood, with a decline in the incidence of symptoms in young people followed over time (Kelleher et al., 2012a). The median prevalence of PLEs in **adults** has been estimated in 5% with a median rate for incidence of 3% (van Os et al., 2009). In the case of **child and adolescent** populations, the systematic review by Kelleher et al. (2012a) yielded a median prevalence of 17% for PLEs in children aged 9-12 years and 7.5% for **adolescents** aged 13-18 years. A recent meta-analysis that included adult, children, and adolescent studies indicated a general median estimated prevalence of 7.2% and an annual incidence of 2.5% (Linscott & van Os, 2013). Although PLEs tend to decline with age, 13.6% of a sample of adults aged 53 years endorsed persecutory ideation, 10.3% thought interference, 7.4% strange experiences, and 3.7% hallucinations (Barnett et al., 2012).

Wide variability in prevalence rates has been observed across studies. In general, positive PLEs, such as hallucinations and delusions, are relatively common among healthy adults with prevalence rates ranging between 5% and 35% (Loewy et al., 2007; Mojtabai, 2006; Scott et al., 2006; van Os, Hanssen, Bijl, & Vollebergh, 2001). Variability in prevalence rates in children and adolescent samples is also observed. Thus, while 66% of a sample of children from deprived inner-city London (aged 9-11 years) reported at least one certainly-true PLE (Downs, Cullen, Barragan, & Laurens, 2013), 14.5% of the 11 year-old children from the Dunedin study reported these experiences, and 19.6% of 12-year-old children from a nationally representative twin birth cohort from Great Britain reported PLE. Other studies report prevalence rates of PLEs in children and adolescents ranging from 6% to 59% (Bartels-Velthuis, Jenner, van de Willinge, van Os, & Wiersma, 2010; Dhossche, Ferdinand, van der Ende, Hofstra, & Verhulst, 2002; Lataster et al., 2006; Laurens et al., 2007; Nishida et al., 2008; Scott et al., 2009; Yoshizumi, Murase., Honjo, Kaneko, & Murakami, 2004) with a decline observed from early adolescence (21% from 11 to 13 years old) to mid-adolescence (7% from 13 to 16 years old) found in the study conducted by Kelleher et al. (2012b).

1.1.4. Measurement of PLEs and schizotypy

Prevalence and individual differences in schizotypy and PLEs have been measured through self-report questionnaires and interviews. Although it has been pointed out that questionnaires may increase the risk of overestimating the true prevalence of psychotic symptoms in the population relative to clinical interviews (Kelleher et al., 2012a), evidence indicates that self-report questionnaires and clinical interviews are equally accurate to detect PLEs (Kelleher, Harley, Murtagh, & Cannon, 2011). A recent review that included both self-report and interview-based studies (Linscott & van Os, 2013) suggested that data obtained from both assessment methodologies may be equally accurate and reliable. Additionally, Linscott and van Os (2013) posited that the difference between self-report and interview may not be valid in many studies using interviews that function in a similar way than self-reports. An example of this type of measures is represented by the **Composite International Diagnostic Interview CIDI** (Smeets & Dingemans, 1993) a structured interview designed by the World Health Organisation (WHO) to be used by trained interviewers who are not clinicians, in which the questions are read by the interviewer and the answers given by participants are audio recorded.

An example of the questionnaires used to measure PLEs in the general population is the **Peters Delusions Inventory PDI** (Peters, Joseph, & Garety, 1999), a self-report scale that assesses delusional ideation in the normal population. PDI items were designed based on the Present State Examination PSE and was adapted into a format appropriate for the normal population by adding an “as if” to the question, or deviating more from the original question. The 40 items of the scale assesses a wide range of delusional ideation along with three dimensions: distress, preoccupation and belief strength. The PDI includes 8 categories, (1) delusions of control; (2) misinterpretations, misidentifications, and delusions of reference; (3) delusions of persecution; (4) expansive delusions; (5) delusions concerning various types of influence and primary delusions; (6) other delusions; (7) simple delusions based on guilt, depersonalisation, hypochondriasis; (8) thought reading, insertion echo, and broadcasting.

A shorter version of the PDI (21 items) was developed by Peters et al. (2004). The PDI-21 has shown the same validity and reliability as the long version

and might be useful for the screening of large samples. This measure was used as a template to develop another scale for the assessment of PLEs, the **Community Assessment of Psychic Experiences CAPE** (Stefanis et al., 2002; <http://cape42.homestead.com>). The CAPE scale was designed to assess self-reports of psychotic-like symptoms during the lifetime in affective and non-affective domains. The CAPE was developed from a dimensional approach. Therefore, it measures on the general population the same symptoms observed in patients with clinical disorders (Konings, Bak, Hanssen, Van Os, & Krabbendam, 2006). The CAPE includes 42 items that assess frequency and distress associated to PLEs. This scale has shown good validity and reliability and includes dimensions of positive and negative psychotic experiences as well as depressive symptoms. The final version of the scale includes two items assessing auditory hallucinations, 14 for negative symptoms and 8 for depressive symptoms, in addition to the items from the PDI-21 (Konings et al., 2006).

Studies on schizotypy have used questionnaires such as the **Raine's Schizotypal Personality Scale SPQ** (Raine, 1991), a self-report scale of 74 items based on DSM-III-R criteria for schizotypal personality disorder that contains nine subscales assessing schizotypal traits, namely, (1) ideas of reference; (2) excessive social anxiety; (3) odd beliefs or magical thinking; (4) unusual perceptual experiences; (5) odd or eccentric behaviour; (6) no close friends; (7) odd speech; (8) constricted affect; and (9) suspiciousness. Another measure frequently used to study of schizotypy is the **Oxford-Liverpool Inventory of Feelings and Experiences O- LIFE** (Mason, Claridge, & Jackson, 1995), a four-scale questionnaire for measuring psychosis-proneness in the normal population. It was developed based on the dimensional approach and examines traits rather than symptom features. The O-LIFE includes four factors: positive schizotypy, cognitive disorganization, negative schizotypy and asocial behaviour. These factors correspond to the subscales named: unusual experiences, cognitive disorganization, introvertive anhedonia, and impulsive nonconformity. The unusual experiences scale describes perceptual aberrations, magical thinking and hallucinations. This scale is related to positive symptoms of psychosis and assesses the trait of positive schizotypy. The cognitive disorganization scale examines attention and concentration difficulties, as well as problems in decision-making and social anxiety. The introvertive anhedonia scale evaluates lack of

enjoyment from social and psychical activities and avoidance of intimacy. This scale reflects attenuated forms of negative symptoms also labelled negative schizotypy or schizoid temperament. Finally, the impulsive nonconformity dimension evaluates forms of impulsive, antisocial and eccentric behaviour that might suggest a lack of self-control (Mason & Claridge, 2006).

Schizotypy scales have differed in their scope and item content. Thus, measures with a wide coverage such as the SPQ, as well as others with a narrower, more specific scope are used in schizotypy studies. The Chapman Psychosis-Proneness Scales, that include the Perceptual Aberration (Chapman et al., 1978), the Magical Ideation (Eckblad, Chapman, & Chapman, 1983), the revised Physical Anhedonia (Chapman, Chapman & Raulin, 1976), and the revised Social Anhedonia scales (Eckblad, Chapman, Chapman, & Mishlove, 1982), represent examples of these latter measures.

1.1.5. PLEs as putative antecedents of psychotic and non-psychotic disorders

PLEs in children and adolescents have been found to be associated with the presence of psychopathology and to constitute a putative antecedent for the development of psychotic spectrum disorders (Laurens et al., 2007; Poulton et al., 2000; Welham et al., 2009). An association between PLEs in childhood and **psychotic disorders** in adulthood was evidenced in the Dunedin (New Zealand) study (Poulton et al., 2000), where participants with the highest scores on PLEs at age 11 were 16 times more likely to develop a schizophreniform disorder at age 26. In this study, a cohort of 761 children was followed up to observe whether delusional beliefs and hallucinatory experiences at age 11 years could precede a schizophrenic outcome 15 years later. Self-report of psychotic symptoms in childhood and the development of schizophreniform disorder at age 26 showed a strong correlation. Thus, 2% of the control group (with no symptoms at age 11 years), 9.5% of the children with weak symptoms (those who answered 'yes, likely' to one of the assessment questions) and 25% of children with strong symptoms (those answering 'yes, definitely' to one question or 'yes, likely' to two questions) fulfilled diagnostic criteria for the schizophreniform disorder at age 26 years.

Associations between PLEs in adolescence and later psychotic outcomes have been identified in other studies. Welham et al. (2009) found that the report of

hallucinatory experiences at age 14 years increased the likelihood to present a **non-affective psychosis** at age 21 years. In that group of adolescents ($n = 3801$), males had a fivefold increased risk and female adolescents had a twofold increased risk. Chapman, Chapman, Kwapil, Eckblad, and Zinser (1994) found that PLEs in late adolescents with schizotypy ($n = 508$, mean age 20 years) predicted the development of **later psychosis** by age 30 years, and therefore constitute valid indicators of serious psychopathology that may develop into psychosis. Dominguez, Wichers, Lieb, Wittchen, and van Os (2011) also found that the report of PLEs in adolescence (mean age: 15.08 years) related to later development of a clinically relevant psychosis. In this study, 40% of participants who reported PLEs at baseline went on to develop psychosis eight years later. Yet, other evidence suggests that PLEs in the general population may not be a specific antecedent of psychotic disorders. Dhossche et al. (2002) reported that self-report of hallucinatory experiences in adolescence (11-18 years; $n = 783$) increased the risk for a diagnosis of **depressive disorders and substance abuse** in young adulthood but not for psychotic spectrum disorders. Presence of PLEs has also been associated with violent behaviours in adults (Mojtabai, 2006), lower quality of life (Svirskis et al., 2007) and to interpersonal problems such as bullying or physically assaulting others in adolescence (Nishida et al., 2008).

Depression has been associated with positive and negative symptoms of psychosis in clinical samples (Rosen, Miller, D'Andrea, McGlashan, & Woods, 2006), in the adult general population (Stefanis et al., 2002), and to positive PLEs in adolescents (Nishida et al., 2008; Polanczyk et al., 2010). However, as Yung et al. (2006) found, not all types of PLEs are equally associated to depression. They identified bizarre experiences and persecutory ideation as the strongest predictors of higher levels of distress, mood disorders and poor functioning among adolescents and young adults (aged 15-24 years, $n = 150$) without psychotic disorders. Therefore, this kind of PLEs may increase the risk to develop a psychotic disorder. On the contrary, magical thinking experiences were not related to depression or poor functioning, suggesting that those experiences are benign, unless they are experienced with distress. In another study, Yung et al. (2007) examined the influence of depression on PLEs in a sample of 149 non-psychotic adolescents and young adults at two time-points: baseline and six months later. This study revealed that individuals whose depression had remitted at follow-up

had significantly lower PLE scores than those who continued depressed. Particularly, persecutory ideation and bizarre experiences were reduced when depression decreased, suggesting that the presence of depression should be taken into account for determining the outcome of PLEs.

1.1.6. Outcomes of PLEs and factors related to persistence

Longitudinal research indicates that the most likely outcome of PLEs is **discontinuity**. For instance, Hanssen, Bak, Bijl, Vollebergh, and van Os (2005) examined the incidence and outcome of PLEs over two years in healthy adults. They found an incidence rate of 2% after one year and a persistence rate of 8% after two years. Discontinuity was associated with the occurrence of a **single PLE** whereas persistence was associated with multiple experiences. Another longitudinal study, in which 372 participants aged 20-21 years were followed over 20 years, also revealed that most symptoms tend to decline with age (Rössler et al., 2007). However, the clinical relevance of PLEs was highlighted in this study, as persisting high levels of symptoms over 20 years were associated with the report of more difficulties in life (relationships, careers, problems with police) and with functional impairment.

The finding that PLEs decline with age suggests that these experiences are transient for many individuals (Chapman et al., 1994). Younger people have been found to score higher on delusional symptoms, such as, persecution, thought disturbance, grandiosity, and paranormal beliefs (Verdoux et al., 1998). Schizotypal features have also been found to decrease during transition from adolescence to adulthood. For example, Fossati, Raine, Carretta, Leonardi, and Maffei (2003) compared a sample of high school (mean age: 16.43 years) and university students (mean age: 21.93 years), and found that adolescents reported significantly more ideas of reference, unusual perceptual experiences, odd or eccentric behaviour, odd speech, and suspiciousness, than young adults. This study suggested that cultural and physiological changes occurring during the transition from adolescence to adulthood might be increasing manifestation of schizotypal features.

Research focused on the association between psychotic symptoms in adolescence and non-psychotic diagnoses has evidenced the clinical relevance of PLEs even in the absence of a psychotic outcome. Furthermore, it has been made

clear that the relationship between PLEs and psychopathology in adolescence becomes stronger with increasing age, as shown in the study conducted by Kelleher et al. (2012b) with early-adolescents aged 11–13 years and mid-adolescents aged 13–16 years. This study evidenced higher rates of diagnosable psychiatric disorders (80%) among mid-adolescents with PLEs compared to early-adolescents (57%). These findings revealing that the majority of adolescents with psychotic symptoms had a diagnosable psychiatric disorder indicated that PLEs may index a high **risk for multiple psychopathologies** and although they may constitute a part of the normal spectrum of experience in childhood, are expected to discontinue during the course of development.

In this line, Downs et al. (2013) suggested that transitory PLEs during middle childhood may constitute innocuous experiences whereas **persisting PLEs** can contribute to the development of later **internalising and externalising** disorders. This prospective study examined the association between persistence of PLEs and psychopathology in children (n = 8099; mean age: 10.4 years) over two years, and revealed a threefold increased risk of developing internalising psychopathology at follow-up among children with persisting PLEs (39%) compared to children without PLEs. Additionally, a twofold increased risk compared to children with remitting PLEs was found. Regarding externalising psychopathology, children with persisting PLEs, had a twofold increased risk to present this type of psychopathology compared to children with remitting PLEs and without PLEs at baseline. Furthermore, **longer periods of persistence** have been associated with higher risk of developing associated impairment in the longitudinal cohort study carried out by Dominguez et al. (2011) over 8.4 years with a group of 845 adolescents from the community (mean age at baseline: 15.08 years).

Persistence and incidence of auditory vocal hallucinations were studied by Bartels-Velthuis, van de Willige, Jenner, van Os, and Wiersma (2011) in their 5-year follow-up of 337 children (mean age: 13.1 years). In this study, 76% of the children with auditory vocal hallucinations at age 7-8 years no longer heard voices at the age of 12-13 years. Persistence was associated with greater severity of auditory vocal hallucinations at baseline. At follow-up, incident auditory vocal hallucinations were associated with the greatest level of severity, leading to conclude that incident auditory vocal hallucinations in later childhood may be

indicative of more severe underlying pathology. Hearing more than one voice as well as attributing voices to an external source, such as deceased family members, ghosts, or spirits, discriminated between persistence and remission of baseline auditory vocal hallucinations.

Factors that may contribute to the continuity or persistence of PLEs have been studied. **Victimization** has been found to increase the likelihood of having persistent PLEs, as showed by Mackie, Castellanos-Ryan, and Conrod (2011). They examined trajectories of PLEs and risk factors predicting trajectory group membership over an 18-month period in a group of 407 adolescents (mean age: 14 years and seven months), at four time-points spaced by 6 months. Three types of trajectories were found. First, the **low class** represented by the majority of the group (84%) and characterised for having low levels of PLEs at all time-points. Second, the **persistent class** represented by the 9% of the group and demonstrating an initial increase followed by a slight decrease in PLEs. This group of adolescents reported higher levels of anxiety and depression, as well as more frequent victimization compared to the low class. Adolescents following this trajectory reported increasing alcohol, cigarette and occasional drug use. Third, an **increasing class** (7%) with moderate PLEs at baseline followed by subsequent increases was identified. This group had higher scores on sensation-seeking and a greater likelihood to report smoking cigarettes than adolescents in the low class. They also showed an increasing prevalence of substance use in the absence of any emotional difficulties.

Exposure to continuous environmental risk factors such as cannabis, trauma, and urbanicity have been identified as strong predictors of persistence of PLEs, as shown by the three-year follow up by Cougnard et al. (2007). **Use of cannabis** at age 20-21 has particularly been associated with persistence of PLEs involving delusions of control, auditory hallucinations, thought-broadcasting, and thought-intrusion, while **early social adversity** (e.g., neglect and punishment in childhood and youth) has been related to persistence of PLEs addressing social and interpersonal deficiencies with reduced capacity for close relationships, ideas of reference, odd beliefs, and suspiciousness or paranoid ideation (Rössler et al., 2007).

1.1.7. Risk-factors associated to PLEs

An aetiological continuity between subclinical and clinical phenotypes has been suggested by the meta-analysis conducted by van Os et al. (2009) which implies that PLEs share the same risk factors associated with psychotic disorders. This conclusion is consistent with that reached by Kelleher and Cannon's (2011) review, where risk factors for schizophrenia were examined among individuals reporting PLEs, revealing a number of similarities between clinical and non-clinical populations.

Demographic, social, personality, genetic and familial factors, comorbidity with other psychopathologies, adverse childhood experiences, and developmental impairments have been associated with the presence of PLEs in community samples.

1.1.7.1. Demographic and social risk factors

PLEs have been associated with risk factors including low educational level, single marital status, and urbanicity (Scott et al., 2006; Stefanis et al., 2004; van Os et al., 2001). Regarding **urbanicity**, exposure to a birth, upbringing, or residence in urban areas, increases the risk for psychotic disorders. As suggested by van Os et al. (2001), who identified an increase in psychotic and psychotic-like symptoms related to the level of urbanicity, environmental factors associated with urban life might be making individuals more vulnerable to the development of psychotic states. This is also the case for children. Polanczyk et al. (2010) found that children with psychotic symptoms were more likely to live in an urban environment and to come from disadvantaged families.

Single **marital status** has been associated with the presence of PLEs whereas being married or in couple relationships relates to a decrease in the self-report of psychotic symptoms (Mojtabai, 2006). It has been hypothesized that the particular personality traits of individuals presenting PLEs (schizotypal, borderline, paranoid) may affect their likelihood to form stable relationships. However, it may also be that the distress associated with social isolation constitutes a possible contributor to the development of PLEs (Scott et al., 2006).

Migrant and **ethnic minority groups** have shown an increased incidence of schizophrenia (McGrath et al., 2004). This trend has been observed particularly

among African-Caribbean migrants to the UK (Fearon et al. 2006). The prevalence of psychotic symptoms in the general population has also been found to vary among minority groups. For instance, Laurens, West, Murray, and Hodgins (2008) found that 9- to 12-year-old children of African-Caribbean ethnicity experienced elevated rates of at least one PLE, higher total PLE scores, and a greater prevalence of putative antecedents of schizophrenia, relative to white British children.

Sex differences in schizophrenia have been reported and indicate that the incidence of schizophrenia is higher in men than in women (McGrath et al., 2004). Similarly, differences in the expression of psychotic symptoms in schizophrenia have been described in healthy adults. Evidence indicates that males report more negative PLEs, whilst females endorse more positive PLEs (Maric, Krabbendam, Vollebergh, de Graaf, & van Os, 2003; Scott et al., 2008; van Os et al., 2000), although other evidence (Scott et al., 2006) found no evidence of sex differences related to delusional ideation. Negative schizotypal traits have been reported as more prevalent in males, while cognitive disorganisation (Mason & Claridge, 2006; Raine, 1992) and positive schizotypy are more frequent in women (Bora & Baysan Arabaci, 2009; Raine, 1992). However, no sex differences in positive schizotypy were reported in the meta-analysis conducted by Miettunen and Jääskeläinen (2010).

Sex differences in PLEs have also been reported from earlier developmental stages. In a study on healthy children aged 9-12 years, boys presented significantly more positive PLEs than girls (Laurens et al., 2007). Yet, other studies indicate that PLEs are equally distributed across both boys and girls (Bartels-Velthuis et al., 2010).

1.1.7.2. Trauma and adverse childhood experiences

The study conducted by Polanczyk et al. (2010) showed **home-rearing** risk factors for PLEs, in which children with psychotic symptoms had mothers who showed more negative expressed emotion toward them, lived in more chaotic households, and were more likely to have been physically maltreated. In another study, adolescents aged 13-17 years, living in a blended or sole parent family were more likely to report visual or auditory hallucinations (Scott et al., 2009). **Stressful and traumatic experiences**, such as major life changes (van Os et al.,

2009), bullying, and unwanted sexual experiences (Lataster et al., 2006) also increased the risk for developing PLEs in adolescents.

1.1.7.3. Personality traits

The role of personality variables on the development of psychotic symptoms has been investigated. Krabbendam et al. (2002) carried out a three-year prospective study that examined the association between **neuroticism** and the development of psychotic symptoms in a sample of 3929 individuals in the general population. This study revealed a positive association between neuroticism at baseline and the presence of psychotic symptoms three years later, and suggested the presence of cognitive processes mediating the association between neuroticism or anxiety proneness and psychosis. In the case of delusional beliefs, those cognitive processes may act by preventing the individual from perceiving contrasting information, thus contributing to confirm these delusional beliefs and leading to a sense of uncontrollability that makes the individual vulnerable to perceive certain events or experiences as stressful. This model indicates that examination of anxiety symptoms such as uncontrollability beliefs may be valuable in the early treatment of psychosis. In line with these findings, the study conducted by Morrison and Wells (2007) revealed an association between social worry and delusional ideation, suggesting similarities and overlapped processes between social anxiety and persecutory ideation.

1.1.7.4. Genetic and familial risk factors

The hypothesis that children who report PLEs are characterized by the same risk factors and correlates of adult schizophrenia was tested by Polanczyk et al. (2010) in a prospective study that assessed a birth cohort of 2232 twelve-year-olds (1116 families with same-sex twins) followed up since 5 years of age. This study suggested a **genetic and familial** influence for PLEs and showed greater correlation for PLEs among monozygotic twins, indicating that children with these symptoms were more likely to have mothers with psychotic disorders and family members with attempted or completed suicide.

1.1.7.5. Comorbid psychopathology and substance use

Antisocial behaviour, depressive symptoms, anxiety symptoms, and self-harm or suicidal behaviour have been found among 12-year-old children who reported psychotic symptoms (Polanczyk et al., 2010). This study also revealed that twelve-year-olds with PLEs had more externalizing behaviour problems (antisocial, inattentive, and hyperactive behaviours) at 5 years of age. The meta-analysis conducted by van Os et al. (2009) indicated an association between use of cannabis, alcohol, or other psychoactive drugs and a higher prevalence of PLEs.

1.1.7.6. Neurocognitive deficits

Cognitive impairments have been observed in unaffected relatives of schizophrenia patients including attention, executive function, speed of information processing, social cognition, general intelligence, and working, verbal, and visual memory (Keshavan et al., 2010). Similarly, individuals at clinical high risk for psychosis show deficits in cognitive domains such as general intelligence, executive function, verbal and visual memory, verbal fluency, attention and working memory, and social cognition (Fusar-Poli et al., 2012). Individuals with psychometric schizotypy or schizotypal personality disorder often show neurocognitive deficits, suggesting that these deficits are a key feature of schizophrenia (Jahshan & Sergi, 2007).

Childhood cognitive function and PLEs in adulthood have been associated in the study conducted by Barnett et al. (2012). This study revealed lower childhood cognitive scores at ages 8, 11, and 15 years among individuals with clinically relevant psychotic symptoms at age 36 years and PLEs at age 53 years. This study also evidenced lower childhood cognitive scores among adults with both PLEs and general psychopathology. These results raised the possibility of a common pathophysiology of PLEs and clinically relevant psychosis and suggested a neurodevelopmental origin for both.

Furthermore, significant impairments in neuromotor development, receptive language, intelligence, and emotional development in a cohort of children from as young as three years were associated with self-report of PLEs at age 11 years and with later diagnosis of schizophreniform disorder at 26 years of age (Cannon et al., 2002), which indicated that a psychotic illness process may

begin in childhood and PLEs during this developmental stage may constitute part of that process.

Lower birth weights for their gestational age and multiple perinatal complications were found among children with PLEs in the study by Polanczyk et al. (2010). They also found that twelve-year-old children who reported PLEs exhibited cognitive deficits that included significantly **lower IQ and impaired theory of mind**.

1.2. Theory of mind (ToM)

1.2.1. Definition and background

As seen previously, research on the vulnerability to psychosis from a dimensional perspective involves the study of cognitive, psychological, and neurological features of psychosis in the general population which helps to improve the understanding of the risk factors of psychosis. Impaired theory of mind (ToM) represents a manifestation of schizophrenia that can lead to severe social behavioural abnormalities and therefore to a diminished social competence (Brüne, 2005a). Healthy individuals reporting PLEs have also been found to present impaired ToM, although its role as a risk marker of psychosis has not been unequivocally determined.

The concept of theory of mind (ToM), first described by Premack and Woodruff (1978), and also referred to as ‘mindreading’ (Brüne & Bodenstein, 2005), ‘mentalising’ (Langdon & Coltheart, 1999), or “social understanding” (Luke & Banerjee, 2013) defines the ability to infer mental states such as beliefs, wishes, or intentions of other people in order to understand and predict their behaviour. ToM ability involves setting aside one’s own perspective, attributing a mental state to the other person, and inferring the likely content of their mental state (Baron-Cohen, 2003). These processes are of critical importance for the establishment of social, affective, and communicative relationships (Perner, Frith, Leslie, & Leekam, 1989).

ToM constitutes an aspect of social cognition, term that refers to the cognitive processes that underlie social interactions, including perceiving, interpreting, and generating responses to the intentions, dispositions, and behaviours of others (Green et al., 2008). ToM is considered to be at the basis of

the ability to deceive, cooperate, empathise, and to read other's body language (Gallagher & Frith, 2003). Having ToM involves recognizing that other people have minds different from one's own (Frith, 1992) and that they are agents whose behaviour is determined by their goals (Gallagher & Frith, 2003).

This ability is acquired by children by the age of three to four years, when children are able to distinguish between their own and other's beliefs and knowledge of the world, and it was thought to continue to develop until around 11 years (Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999). However, evidence that ToM development continues during adolescence, particularly the development of abilities to infer affective mental states, has been found (Vetter, Altgassen, Philips, Mahy, & Kliegel, 2013), and results suggesting changes in neural functioning relative to ToM from adolescence to adulthood have emerged (Blakemore, 2008).

Cross-cultural studies as well as research on the developmental trajectories of ToM acquisition during infancy and childhood suggest that, although this cognitive ability is to some extent innate, social environment has a substantial impact on its development (Brüne & Brüne-Cohrs, 2006). Particularly, quality of parent-child relationships, secure attachment, and cooperative interactions with parents and siblings have been found to facilitate ToM development (Carpendale & Lewis, 2004). In contrast, experiences of child maltreatment have been associated with poorer performance in ToM tasks (Luke & Banerjee, 2013).

Sex differences in ToM development have been identified, with higher scores on ToM tasks among girls relative to boys (Bosacki & Astington, 1999). Similarly, Baron-Cohen (2003) found that by the age of three years, young girls are already ahead of boys in their ability to infer people's thoughts or intentions. Furthermore, adult women in the general population have been reported to score significantly higher in the ToM paradigm, the 'Reading the Mind in the Eyes' test, than adult males (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001).

ToM has been described as a multidimensional process. Shamay-Tsoory, Harari, Aharon-Peretz, and Levkovitz (2010) proposed that ToM includes cognitive and emotional aspects. In this model, "cognitive ToM" concerns the ability to infer other people's mental states, and "affective ToM" refers to the capacity to make inferences regarding other people's emotional states. Cognitive ToM is equivalent to the cognitive aspects of empathy and also a prerequisite for affective ToM, which requires the integration of emotional and cognitive aspects

of empathy to be fully functional. Moreover, a distinction between “explicit” and “implicit” ToM has also been postulated (Tager-Flusberg, 2007). Explicit ToM describes cognitive-linguistic aspects assessed by the false-belief task (Wimmer & Perner, 1983), in which the child is required to have the ability to distinguish between the world as it really is and also consider the possibility that an individual might have a misrepresentation of it (Tager-Flusberg, 2007). Implicit ToM refers to attention and perceptual aspects involving direct implicit judgment of mental states based on information available in faces, voices, and body language (Sprung, 2010). Evidence supporting the view of ToM as a multidimensional process has been found. The functional independence of cognitive from affective ToM has been reported by Kalbe et al. (2010), and selective impairments in affective but not in cognitive ToM in participants with psychopathy (Shamay-Tsoory et al., 2010) and schizophrenia (Shamay-Tsoory et al., 2007) have also been identified.

Three main theoretical approaches to explain the cognitive organisation of ToM have been proposed. First, the **modular theory** posits that the theory of mind mechanism processes information restricted exclusively to social inference, similar to other domain-specific cognitive capacities represented in the brain that process only a certain class of information. In this model, ToM development mainly depends on neurological maturation of the brain structures involved and although experience may stimulate the action of the ToM mechanism, it does not determine its configuration (Brüne, 2005b; Brüne & Brüne-Cohrs, 2006).

The theory-theory perspective or meta-representational theory-theory suggests that different levels of representational skills are gradually acquired during development, beginning with primary representations of the self as an acting agent. Then, after the second year of age, secondary representation emerges along with the ability to distinguish between reality and hypothetical situations. This non-modular model suggests that meta-representational skills are not necessarily restricted to the execution of ToM (Brüne, 2005b; Langdon & Coltheart, 2001).

Finally, the **simulation theory** states that ToM relates to the ability to imaginatively project oneself into someone else’s situation. In this theory, experience is crucial for the development of ToM skills (Langdon & Coltheart, 2001).

1.2.2. Assessment of Theory of Mind

ToM has been recognised as a multidimensional construct (Shamay-Tsoory et al., 2010; Tager-Flusberg, 2007). Accordingly, measures of ToM assess different aspects and mental states, as well as the developmental progression of ToM abilities. The review by Sprung (2010) indicates three relevant aspects measured by ToM assessments. First, measures can assess “**explicit**” versus “**implicit**” ToM. Whereas typically developing children pass tasks that assess implicit aspects of ToM, such as versions of the false-belief task (eye-gaze task, in which the child has to look at the correct place) before passing explicit questions (cognitive-linguistic aspects), autistic children tend to pass explicit before implicit tasks (Ruffman, Garnham, & Rideout, 2001). Second, assessments may vary in the “**type of mental states**” measured. ToM impairments can be general or specific to some type of mental states, such as desires, beliefs, knowledge, emotions, or intentions (Sprung, 2010). It has been found a selective impairment to specific types of mental states in children with autism; they can develop some understanding of desire and emotion, but not belief and other cognitive states (Tager-Flusberg, 2007). Third, measures also involve reasoning about “**own**” or “**other mental states**”, aspect than can be dissociated in clinical disorders, such as schizophrenia. Sprung (2010) points out that reasoning about own and other mental states has been associated with different symptoms as follows: (1) problems to understand own mental states have been associated with cognitive and communication symptoms, (2) problems understanding other’s mental states have been associated with social dysfunction, and (3) problems coordinating reasoning about one’s own versus others’ mental states have been associated with delusions.

Examples of frequently used tasks to test ToM abilities are the **false-belief** and the **deception task** (Baron-Cohen, Leslie, & Frith, 1985; Corcoran, Cahill, & Frith, 1997; Wimmer & Perner, 1983). First order false-belief task assesses the understanding that individuals can act based on beliefs that misrepresent reality. In this task, a character (Sally) puts an object in one place of a room before leaving it. Another character (Anne) enters the room during Sally’s absence and moves the object to another location. The participant is asked where Sally will look for the object when she returns. To evidence knowledge about Sally having a

belief different from the actual situation the participant must answer that Sally will look for the object in the original location. In second order tasks the subject has to infer the false-beliefs of one character about the false-beliefs of a second character.

In first order **deception tasks**, one character gives wrong information to another character to achieve a specific goal. The ability to recognise the character goal as well as the effect on other's belief generated by the wrong information is assessed. Second order deception tasks involve characters ignoring the wrong information because they know that the character giving the information is trying to deceive them (Harrington, Siegert, & McClure, 2005).

Tasks that require pragmatic comprehension of speech are also used to test ToM abilities. These measures assess the ability to infer real intentions behind indirect speech statements. Irony and hinting tasks as well as metaphors and speech maxims are examples of this type of measures that assess explicit cognitive-linguistic aspects of ToM. The **Hinting Task** ToM assessment includes stories that examine the understanding of faux pas, double bluffs, mistakes, and white lies, and typically involve considering the mental states and related behaviours of multiple characters (Corcoran, Mercer, & Frith, 1995; Langdon & Coltheart, 2004). Another measure of this type is the **Strange Stories test** (Happé, 1994). This test contains stories about everyday situations where people say things they do not mean literally. There are 12 types of story, comprising lie, white lie, joke, pretend, misunderstanding, persuade, appearance/reality, figure of speech, sarcasm, forget, double bluff, and contrary emotions. As pointed out by Sprung (2010), these measures assess understanding of various mental states in others and have been used to investigate the association between ToM and cognitive and communication symptoms in autism (Happé, 1994), and schizophrenia (Corcoran et al., 1995).

Other measures, such as the **Reading the Mind in the Eyes** test (Baron-Cohen et al., 2001) do not fit within these categories. This test includes pictures of eyes and based on this visual information, the participant has to recognise the mental state that the person is experiencing. This measure does not require coordination of multiple perspectives or integration of mental states with behaviours (Bull, Phillips, & Conway, 2008). Critics against the Eyes test state that it could be measuring emotion recognition abilities or empathy rather than

ToM (Sprung, Schothorst, Vos, Hox, & van Engeland, 2007). However, it has been pointed out that this measure is especially sensitive to implicit non-linguistic aspects of ToM, and useful to study the association between implicit aspects of ToM and deficits in social functioning (Sprung, 2010).

Moreover, it has also been recognised that executive processes are necessary for both simpler ToM tasks of understanding emotions from visual stimuli and for complex social understanding that requires taking into account multiple perspectives, inhibition of self- knowledge and consideration of beliefs in relation to subsequent emotions or actions as in the Stories Tasks and other complex ToM assessments such as the false belief understanding (Bull et al., 2008).

1.2.3. Theory of Mind and Psychopathology

Research in ToM was initially aimed at documenting the developmental course of ToM abilities through measures such as the false-belief (Wimmer & Perner, 1983). Research started to focus on different psychopathologies and clinical conditions after it was established that ToM was impaired in autism (Sprung, 2010). Several disorders, such as schizophrenia (Brüne & Bodenstein, 2005; Corcoran et al., 1995; Marjoram et al., 2005), depression (Lee, Harkness, Sabbagh, & Jacobson. 2005; Wang, Wang, Chen, Zhu, & Wang, 2008), autism (Baron-Cohen et al., 1985; Baron-Cohen, 1995), or psychopathy (Shamay-Tsoory et al., 2010) have been found to involve impairments of ToM functioning. Deficits in ToM include (1) inability to represent mental states which characterises autism; (2) representational understanding of mental states but impaired ability to apply this understanding as in Asperger's syndrome and negative symptom schizophrenia; (3) representational understanding of mental states, but abnormal attribution of these mental states as observed in delusional and paranoid schizophrenia, and (4) representational understanding of the mind of others, but impaired self as in schizophrenic patients with passivity phenomena (Abu-Akel, 2003).

1.2.3.1. ToM in autism

Impaired ToM has been found to be severely impaired in autism (Baron-Cohen et al., 1985; Baron-Cohen, 1995; Happé, 1994; Perner et al., 1989), which

might explain the abnormalities in social development, communication, and pretend play observed in children with this disorder (Baron-Cohen, 1995). Brüne and Brüne-Cohrs (2006) in their review of the ToM literature explain that autistic children are severely impaired in their ability to appreciate mental states of others; they engage in stereotyped behaviours, actively avoid eye contact or close body contact, and fail to establish emotional relationships. It has also been determined that impaired ToM is independent of general intelligence and other cognitive capacities, and thus it is not a problem of attention or general intelligence.

1.2.3.2. ToM impairment in schizophrenia

ToM impairments have also been studied in adults with schizophrenia (Brüne & Bodenstein, 2005; Corcoran et al., 1995; Marjoram et al. 2005). The relationship between ToM impairments and schizophrenia was first proposed by Frith (1992), who suggested that schizophrenia could be understood as a disorder of the representation of mental states or meta-representation. According to Frith, meta-representational mechanisms handle information concerning three domains: mental states of others, mental states of the self, and goals or desired outcomes in the real world. These domains correspond to the three types of cognitive impairment underlying the signs and symptoms of schizophrenia, as follows: first, impaired awareness of the intentions of others results in persecutory delusions and delusions of reference. Second, lack of awareness of the own intentions relates to absence of self-monitoring and produces abnormalities in the experience of actions; and third, the lack of awareness of goals generates poverty of will which in turn leads to negative and positive behavioural abnormalities.

Frith's model proposes that both patients with schizophrenia and autism have impairments in ToM ability. However, in autism the deficiency is present from birth, and ToM would have never become fully operational, while in schizophrenia, this mechanism functions adequately until the onset of the psychotic disorder, when different ToM impairments emerge according to the core symptoms of the illness.

Frith (1992) referred to the observable symptoms (positive and negative) of schizophrenia as **behavioural signs**. Patients with negative (e.g. poverty of speech, social withdrawal, or flat affect) or positive (e.g. incoherent or inappropriate speech) behavioural signs were posited to show severe ToM

impairment similar to that observed in autism, characterised by an inability to represent mental states. Patients with positive symptoms, particularly paranoid, such as persecutory delusions, delusions of reference, or hearing voices, but without behavioural signs, should present milder deficits relative to patients with behavioural signs, as they preserve the ability to represent mental states, but make errors in the process (Pickup & Frith, 2001).

This theory involves the notion that ToM deficits in schizophrenia occur along a continuum of severity, with patients with behavioural signs showing greater impairment of ToM abilities, and patients with paranoid symptoms but without behavioural signs presenting lesser impairments than patients with behavioural signs. These patients are presumed to still have ToM ability, although they may make errors in their mental state attributions (Harrington et al., 2005)

In this model, remitted patients without current signs or symptoms are expected to score as well as healthy controls on ToM tasks. Several studies have found evidence supporting this notion of **impaired ToM as a state** restricted to a symptomatic phase (Corcoran et al., 1995; Marjoram, 2006). Pousa et al. (2008) found intact ToM in a sample of patients with remitted schizophrenia, and Kelemen, Kéri, Must, Benedek, and Janka (2004) observed similar performance on the Eyes Test in relatives of patients with schizophrenia and in controls without history of psychiatric disorders in their families. Subtle ToM deficits have been shown by patients with delusional disorders (Bömmner & Brüne, 2006), and in patients with first-episode schizophrenia (Kettle, O'Brien-Simpson, & Allen, 2008).

A different approach, the **trait account**, suggests the possibility that ToM impairments are not restricted to the acute phase of the disorder, and proposes that impaired ToM constitutes an underlying trait that can be identified before the onset of the disease. Support for this notion is provided by Janssen, Krabbendam, Jolles, and van Os (2003) who examined ToM performance in patients with a diagnosis of psychosis, their non-psychotic first degree relatives, and healthy controls. They observed poorer performance in the patient group compared to their relatives, and poorer performance in the relatives compared to controls. Further evidence supporting the trait account was provided by the meta-analysis conducted by Sprong et al. (2007) where significant impairments were observed in remitted patients, indicating that ToM reflects an underlying trait deficit. Data

from another meta-analysis (Bora, Yucel, & Pantelis, 2009) including 36 studies on ToM deficits in schizophrenia, also showed significant ToM impairments in remitted patients relative to healthy controls and a less pronounced but still significant impairments when compared to symptomatic patients suggesting that they might constitute trait deficits.

ToM impairment has been recently found to be equally severe among first-episode and chronic schizophrenia, suggesting that ToM is impaired from the beginning of the illness in schizophrenia and thus, are not derived from the illness progression, chronicity, or long-term pharmacotherapy (Bora & Pantelis, 2013). Marjoram et al. (2006) found that subjects with current symptoms performed less well on self-monitoring tasks. This study raised the possibility of an additive combination of the two accounts, in which people with psychosis-proneness would be impaired on ToM tests throughout their lives, and this impairment may become more pronounced during psychotic symptoms.

As postulated by Abu-Akel (1999), patients with positive symptoms of schizophrenia, particularly those with paranoid and delusional symptoms, might present ToM failures as a consequence of a hypertrophy of ToM resulting in inaccurate inferences about other's mental states. These observations led to propose the possibility of a **hyper-theory-of-mind**, term describing the tendency to over-attribute knowledge and other mental states to others.

1.2.3.3. ToM in individuals at genetic or clinical high risk for psychosis

Unaffected relatives of schizophrenia patients and individuals at ultra-high risk have been found to present ToM impairments that are intermediate to healthy controls and first episode psychosis patients (Bora & Pantelis, 2013). Other evidence has also shown impaired ToM ability among young adults at ultra-high-risk for psychosis (Chung, Kang, Shin, Yoo, & Kwon, 2008) and in relatives of patients with schizophrenia (Irani et al., 2006), suggesting that ToM impairments may be candidate endophenotypes for schizophrenia. Similarly, a sample of patients with remitted schizophrenia showed poorer performance on a ToM task than their first-degree relatives, and these relatives performed worse than healthy controls (Janssen et al., 2003).

1.2.3.4. ToM in psychometric schizotypy and PLEs

Mixed results concerning the association between ToM impairments in individuals with psychometrically identified schizotypy have been reported, which might be related to the multiple types of assessments of ToM and schizotypy that have been used. Pickup (2006) found that higher positive schizotypy, as measured by the Oxford-Liverpool Inventory of Feelings and Experiences O-LIFE (Mason et al., 1995), among 62 normal adults aged between 18 and 46 years was associated with lower scores in the Happé's Strange Stories task (Happé, 1994). The study by Langdon and Coltheart (1999) also revealed that higher schizotypy, assessed with the Schizotypal Personality Scale SPQ (Raine, 1991) related to a worse performance on a false-belief task. However, this study yielded conflicting results regarding the dimension of schizotypy associated with ToM performance. Thus, negative schizotypy was associated with lower scores on the false-belief task in one of the experiments, while cognitive perceptual disturbances and disorganisation were related to poorer ToM performance in a different experimental condition.

Henry, Bailey, and Rendell (2008) found that both positive and negative schizotypy were associated with a reduced ToM ability as measured by the Reading the Mind in the Eyes test (Baron-Cohen et al., 2001). Gooding and Pflum (2011), used the Hinting task and the Reading the Mind in the Eyes test to measure ToM, and indicated that ToM impairments were associated with positive schizotypy, as measured by the Perceptual Aberration (Chapman, Chapman & Raulin, 1978) and Magical Ideation (Eckblad, Chapman, & Chapman, 1983) scales. These results were confirmed in the study by Pflum, Gooding, and White (2013) in which individuals scoring high in positive schizotypy experienced increased difficulties to infer the intentions of others' from indirect speech, such as hints, relative to participants who scored high in negative schizotypy and to controls.

Contrasting evidence indicating no association between schizotypy and performance in ToM has also been found. For instance, Jahshan and Sergi (2007) and, Fernyhough, Jones, Whittle, Waterhouse, and Bentall (2008), reported similar ToM scores among high and low schizotypes. However, methodological limitations that might have been related to these results have been identified in

these studies. In the study by Jahshan and Sergi (2007) results might have been affected by the use of a ToM measure developed to assess social cognitive deficits in patients with brain injury, while in the case of the study by Fernyhough et al. (2008) no time limit was given to respondents during the ToM assessments that were administered online, unlike other studies in which participants are instructed to give immediate responses to the ToM tests in the presence of an examiner. Fyfe, Williams, Mason, and Pickup (2008) also found no differences in ToM accuracy between high and low schizotypes, and identified a weak association between higher delusional ideation and lower ToM accuracy. This study suggested that hyper-theory-of-mind may contribute to formation of delusional ideation.

ToM in high-risk young adults (with at least two first or second degree relatives with schizophrenia), who reported current or past PLEs, was studied by Marjoram et al. (2006). Results showed poorer ToM performance among participants with current PLEs relative to individuals whose symptoms occurred in the past, and suggested that schizotypal individuals may have impaired ToM abilities throughout their lives and that this impairment may become more pronounced when experiencing psychotic-like symptoms.

2. RELEVANCE OF THE STUDY OF THE ASSOCIATION BETWEEN PLEs, PSYCHOMETRIC SCHIZOTYPY, DEPRESSIVE SYMPTOMS, AND TOM IN ADOLESCENTS FROM THE COMMUNITY

It has been pointed out that studying psychotic symptoms in non-clinical populations may better contribute to understand the risk factors and processes involved in the development of psychotic disorders, than research focused exclusively on patients suffering from psychosis (Verdoux & van Os, 2002). The occasional presence of these experiences in the normal population offers an opportunity for the study of such processes without the disadvantages derived from their study in psychotic patients; namely, effects of medication, hospitalization, and difficulties of communication (McCreery & Claridge, 1996). Moreover, healthy individuals who report psychotic symptoms have also been demonstrated to share a wide range of risk factors with psychosis patients; which has led to suggest that research with non-clinical population who report PLEs provides a unique high-risk paradigm for studying the developmental trajectory to psychosis (Kelleher & Cannon, 2011).

Research on the long-term outcomes of PLEs suggests that individuals who report these experiences are at significantly increased risk of clinical psychotic disorders (e.g., Poulton et al., 2000). However, associations between PLEs and non-psychotic disorders (e.g., Dhossche et al., 2002) indicate that the clinical relevance of PLEs is not limited to psychosis. Kelleher et al. (2012b) concluded that PLEs are prevalent in a wide range of non-psychotic psychopathologies, and although PLES are reported more commonly in early than in middle adolescence, they become increasingly predictive of diagnosable psychopathology with increasing age.

It has also been found that the majority of adolescents who report PLEs or schizotypal traits do not go on to develop a psychotic illness (Kwapil et al., 1997; Welham et al., 2009). Thus, the study of PLEs and psychometric schizotypy in association with other deficits and risk factors observed in schizophrenic patients might further clarify the processes involved in the development of the disease and provide additional factors to identify individuals at high-risk for schizophrenia and spectrum disorders. Moreover, investigating the role of additional symptoms

such as depression, which has been found to increase the risk for psychotic symptoms (Verdoux et al., 1999; Yung et al., 2006) and psychotic disorders (Yung et al., 2003), and to contribute to persisting PLEs, improve the capacity to predict risk of developing psychotic disorders.

Studying theory of mind (ToM) abilities, one of the cognitive aspects impaired in schizophrenic patients, in the adolescent population may potentially contribute to clarify whether ToM deficits are present in at-risk individuals before the onset of the illness and derived impairments. Thus, research on this association may help to establish whether ToM impairments represent a trait indicator of risk for psychosis and an additional risk factor shared by individuals with schizotypy, PLEs, and schizophrenia.

Although ToM impairments have been identified in schizophrenia (e.g., Bora et al., 2009; Corcoran et al., 1995, 1997; Langdon & Coltheart, 1999), the possibility that performance on ToM tasks might be affected by factors related to the illness, such as cognitive deficits or greater severity of the illness, has been suggested by researchers (e.g., Gooding & Pflum, 2011; Pickup, 2006). In this context, the study of ToM in individuals from the general population who present schizotypal traits or PLEs has emerged as an opportunity to overcome the difficulties derived from the study of ToM in patients with schizophrenia. Evidence suggests that ToM impairments are not exclusive of symptomatic patients (Bora et al., 2009; Harrington et al., 2005; Sprong et al., 2007), and that further understanding of the nature of ToM dysfunction in schizophrenia might be achieved through examination of ToM impairments from the early phases and even before the onset of the illness.

Several studies (e.g., Gooding & Pflum, 2011; Pickup, 2006; Pflum, et al., 2013) suggest that ToM impairments might be identified in individuals with schizotypal traits; however, contrasting evidence has been also found (Fernyhough et al., 2008; Fyfe et al., 2008; Jashan & Sergi, 2007). PLEs constitute a manifestation of schizotypy or psychosis-proneness that has been associated with social, cognitive and emotional impairments. Given that ToM is a cognitive ability crucial for successful social interactions (Brüne, 2005a), it is likely that individuals reporting PLEs or schizotypy, will also display some impairment in their ToM abilities.

Additionally, research on ToM and its association with schizotypy and PLEs has been focused on young-adult and adult populations, and there is no information available regarding whether ToM functioning is associated with the presence of schizotypal traits or PLEs at earlier stages. As aforementioned, PLEs are more prevalent in younger individuals, and both the report of PLEs and the identification of schizotypal traits in children and adolescents have been associated with significant developmental impairments in neuromotor, language, cognitive, emotional, and interpersonal domains as well as with the development of later onset of psychotic spectrum disorders (Cannon et al., 2002; Chapman et al., 1994; Poulton et al., 2000). Thus, ToM abilities may also be impaired among adolescents reporting PLEs or scoring high in schizotypy.

Gooding and Pflum (2011) suggested that mixed findings yielded by studies on the association between ToM, PLEs, and schizotypy might be partially explained by the multidimensionality of schizotypy. Accordingly, analysis of total schizotypy or PLE scores may not be a sufficiently sensitive metric, especially if different aspects of schizotypy are differentially related to ToM performance. They identified that studies examining dimensions of schizotypy separately tend to provide evidence supporting the association between ToM and specific aspects of positive schizotypy, namely, unusual experiences, and subclinical delusions.

Moreover, specific dimensions of positive symptoms such as bizarre experiences or persecutory ideation have been related to increased levels of distress, depression, and poor functioning, which may also increase the risk to develop psychotic disorders (Yung et al., 2006). Information on the association of subtypes of negative symptoms with depressive symptoms in adolescents is lacking, as well as on the relations between subtypes of positive symptoms and ToM functioning. Thus, an approach involving subtypes of psychotic experiences may better capture specific relationships between schizotypy, PLEs, depression, and ToM.

3. OBJECTIVES AND HYPOTHESIS

3.1. Objectives

- a. To examine the presence of both positive and negative PLEs and their association with depressive symptoms in a community sample of adolescents.
- b. To analyse the presence of subtypes of positive and negative PLEs dimensions in adolescents of the community.
- c. To examine ToM functioning, its association with psychometric schizotypy, PLEs, and depressive symptoms, in a group of adolescents from the general population.

3.2. Hypotheses

- a. PLEs and subgroups of positive and negative symptoms will be identified in a community sample of adolescents.
- b. Different patterns of associations will be observed between the identified subtypes of PLEs and depressive symptoms.
- c. Lack of association between ToM ability and the negative dimensions of schizotypy and PLEs will be identified.
- d. A negative association between ToM abilities and the positive dimensions of schizotypy and PLEs will be observed.
- e. A negative association between depressive symptoms and ToM performance will be detected.

4. METHOD AND RESULTS (published works)

The results and methodological aspects of this thesis are presented in two research articles published in peer-reviewed journals with impact factor. These articles were aimed at addressing the objectives and hypothesis proposed. Additionally, a book chapter with theoretical work that is partially contained in the overview conducted in the introduction is included in Annex I.

Detailed description of the participants' characteristics, measures to assess ToM, PLEs, and schizotypy, and the statistical analyses is provided in the articles.

Article 1:

Barragan, M., Laurens, K.R., Navarro, J.B., and Obiols, J.E. (2011). Psychotic-like experiences and depressive symptoms in a community sample of adolescents. *European Psychiatry* 26, 396-401. doi: 10.1016/j.eurpsy.2010.12.007

Article 2:

Barragan, M., Laurens, K.R., Navarro, J.B., and Obiols, J.E. (2011). "Theory of Mind", psychotic-like experiences and psychometric schizotypy in adolescents from the general population. *Psychiatry Research* 186: 225-231. doi: 10.1016/j.psychres.2010.07.051

Additional work (Annex I):

Book Chapter:

Barragan, M. and Obiols, J.O. (2013). Síntomas pseudo-psicóticos en la población general. In: Obiols, J.E. and Barrantes-Vidal, N. (Coordinadores). *Signos de riesgo y detección precoz de psicosis*. (In press) Barcelona, Spain: Síntesis

Additional work and collaborations that are not included in this thesis:

Article 3:

Obiols, J.E., Barragán, M., Vicens, J., and Navarro J.B. (2008). Síntomas pseudo-psicóticos en adolescentes de la población general. *Revista de Psicopatología y Psicología Clínica* 13, 205-217

Article 4:

Downs, J.M., Cullen, A., Barragan, M., and Laurens, K.R. (2013). Persisting psychotic-like experiences are associated with both externalizing and internalizing psychopathology in a longitudinal general population child cohort. *Schizophrenia Research* 144, 99-104. doi:10.1016/j.schres.2012.12.009

Article 1

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Original article

Psychotic-like experiences and depressive symptoms in a community sample of adolescents

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ABSTRACT

Purpose: Studies of psychotic-like experiences (PLEs) within community samples of adolescents have explored predominantly positive experiences. There is a paucity of research examining the prevalence and correlates of negative PLEs, and whether particular subtypes of negative PLEs can be identified among the general population of adolescents. This study examined the association of both positive and negative PLEs with depressive symptoms, including detailed analysis of subtypes of positive and negative psychosis dimensions.

Method: A community sample of 777 adolescents (50.9% girls; mean age 14.4 years) completed a questionnaire assessing positive and negative PLEs and depressive symptoms.

Results: Principal component factor analysis identified four factors of positive symptoms (persecutory ideation, grandiose thinking, first-rank/hallucinatory experiences and self-referential thinking), and three factors of negative symptoms (social withdrawal, affective flattening, and avolition). Depressive symptoms were associated positively with persecutory ideation, first-rank/hallucinatory experiences, social withdrawal, and avolition, whereas grandiose thinking related negatively with depressive symptoms. Neither self-referential thinking nor affective flattening related to self-reported depression.

Conclusions: These findings support the view that not all types of positive and negative PLEs in adolescence are associated with depression and, therefore, they may not confer the same vulnerability for psychotic disorders.

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1. Introduction

Late adolescence and early adulthood constitute critical periods for the emergence of psychotic disorders [34]. Subtle cognitive or perceptual abnormalities can be detected from early developmental stages, and may distinguish individuals at risk for psychosis. Poulton et al. [25] found that psychotic symptoms reported at age 11 years were associated with schizophreniform disorder at age 26 years. Other longitudinal studies conducted with children, adolescents, and adults [3,4,35] also indicate an association between psychotic-like experiences (PLEs) and later development of psychoses. Positive PLEs, such as hallucinations and delusions, are relatively common among healthy adults [21,23,26,30,31], and also among children and adolescents, with prevalence rates

ranging from 9 to 59% [2,16–18,24]. Yoshizumi et al. [36] reported 21% of children (aged 11–12 years old) experiencing hallucinations. Other studies yield prevalence rates of hallucinatory experiences of between 6 and 8.4% [6,27]. Hallucinatory experiences present by age 14 years have also been associated with later onset of depression and substance abuse [6].

Depression increases the risk for psychotic symptoms [33,37] and psychotic disorders [39], and the study of the associations between depressive symptoms and PLEs has improved the understanding of the role of depressive symptomatology in the onset of psychosis. Van Rossum et al. [32] reported that depressive or manic symptoms were associated with positive psychotic experiences in adolescents and young adults from the community. Yung et al. [38] and Armando et al. [1] indicated that specific subtypes of positive PLEs have stronger associations with depression, distress, poor functioning, and to the onset of a psychotic disorder, than other subtypes in adolescents and young adults. Bizarre experiences (e.g., thoughts in head not your own; thoughts being taken away

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from you) and persecutory ideation (e.g., people drop hints or say things with double meaning; people look at you oddly because of your appearance) related particularly to increased depression [1]. Those findings, along with evidence that the majority of subjects who experience PLEs never develop psychoses [9,31], suggest that identifying subtypes of PLEs which relate to factors such as distress and depression may improve the capacity to predict risk of developing psychotic disorders.

Negative symptoms have been found to predict positive symptoms and functional impairment in adolescents and young adults from the community [7]. In addition, negative schizotypal features, particularly social anhedonia, have been identified as putative antecedents of psychotic disorders [10,11,22]. Associations between negative PLEs and depressive symptoms have also been reported [29]. However, studies of community samples of adolescents have explored predominantly positive PLEs without examining the prevalence or correlates of negative PLEs, nor whether particular subtypes of negative PLEs can be identified in adolescents sampled from the community.

Thus, this study examines the presence of both positive and negative PLEs and their association with depressive symptoms in a community sample of adolescents, including detailed analysis of subtypes of positive and negative PLEs dimensions. Following Yung et al. [38], it was anticipated that subgroups of positive symptoms would be identified, and that different patterns of associations would be observed between the identified subscales of PLEs and depressive symptoms. Similar hypotheses were tested regarding the association of negative PLE subtypes with depressive symptoms.

2. Subjects and methods

2.1. Participants and procedure

This cross-sectional study sampled adolescents attending compulsory secondary education in Spain. Fourteen schools from the city of Barcelona, Spain, were selected through stratified sampling to obtain a representative sample of the schools of all city districts. Participants were adolescents ($n = 927$) aged 13 to 17 years (468 girls), selected randomly at each school. The study adopted an opt-out (passive consent) procedure with the adolescents' parents, and a written informed consent procedure with adolescents. Parents received written information about the study, the study opt-out form, and a verbal description of the study during parent meetings conducted by the researchers at each school prior to the assessment session. Adolescents were informed about the study during an information session conducted prior to questionnaire assessment within the classroom. Adolescents provided written informed consent for their participation.

The self-report questionnaire was administered within the classroom setting, with trained psychologists present throughout the session to provide instruction for the questionnaire assessment and to answer adolescents' queries. To avoid potential cultural biases arising from different cultural backgrounds, and to assure Spanish language comprehension, data from 93 foreign adolescents were excluded. Additionally, 57 participants (or their parents) refused to participate. Therefore, the analysis is based on 777 adolescents (83.8% of the original sample; and 93.2% of eligible participants with Spanish as their native language), comprising 396 girls (50.9%) and with a mean age of 14.4 years ($SD = 0.59$). Participants attended public and private schools in 63.7% and 36.3% of the cases, respectively.

The study was approved by the Department of Clinical and Health Psychology (Universidad Autónoma de Barcelona) ethics committee.

2.2. Measures

2.2.1. Psychotic-like experiences and depression

PLEs were assessed using the Spanish version of the Community Assessment of Psychic Experiences (CAPE) [28] (<http://cape42.homestead.com>), a self-report questionnaire that examines positive (20 items) and negative (14 items) psychotic experiences, and depressive symptoms (seven items). The CAPE measures the frequency of occurrence of symptoms using a four-point scale ranging from 1 (never) to 4 (nearly always). A total score on each dimension is derived by summing the scores on each item. Thus, scores on the positive dimension range from 20 to 80 points, on the negative dimension from 14 to 56 points, and on the depressive dimension from 7 to 28 points. The overall total score is obtained by summing the scores on the three dimensions. The scale has established validity and reliability [14,29].

2.3. Data analysis

Analyses were conducted using SPSS 17.0 for Windows. Internal consistency of the CAPE total and its subscales was determined using Cronbach's alpha statistic. A normal distribution was identified in the CAPE negative subscale. The CAPE positive and depressive subscales were slightly positively skewed. Logarithmic transformations were performed on these variables to improve skew levels; however, since results were nearly identical to those obtained with the untransformed variables, this paper reports analyses conducted on untransformed data and using parametric tests.

To establish the presence of subtypes of positive and negative PLEs in the present sample, separate principal component factor analyses with varimax rotation on the CAPE positive and negative subscales were performed. Significant associations between CAPE positive items confirmed that factor analysis was adequate for this dataset. The Kaiser-Meyer-Olkin statistic, which measures sampling adequacy for factor analysis, showed large partial correlations between the items ($KMO = 0.90$). Factor analysis of the CAPE negative dimension also yielded significant associations between items. The Kaiser-Meyer-Olkin statistic showed large partial correlations between the items ($KMO = 0.86$). Bartlett's test of sphericity confirmed that the factor models were appropriate for both factor analyses.

Associations between depressive symptoms and positive and negative PLEs, and between depressive symptoms and the subtypes of positive and negative PLEs, were explored using Pearson correlation. Following Cohen's [5] criteria, the magnitude or effect size of the correlation coefficients is defined as small ($r = 0.10$), medium ($r = 0.30$) and large ($r = 0.50$). Given that depression has been identified as a factor that increases the risk for psychosis, multiple linear regression analysis was performed to examine the association between specific CAPE positive and negative PLE subtypes and the depressive scale.

3. Results

3.1. Descriptive statistics

CAPE total scores ranged from 45 to 143 (mean = 68.3, $SD = 13.4$); positive subscale scores ranged from 21 to 69 (mean = 31.8, $SD = 7.2$); negative subscale scores ranged from 14 to 49 (mean = 23.8, $SD = 5.2$), and CAPE depressive subscale scores ranged from 7 to 27 (mean = 12.7, $SD = 3.7$). Good internal consistency was observed for the CAPE total score (Cronbach's $\alpha = 0.90$), and for each of its subscales (positive 0.83; negative 0.79; and depressive 0.81).

Table 1
Subtypes of positive and negative psychotic-like experiences obtained from principal component factor analysis.

Item No.	CAPE items	Factor Loadings				Prevalence (any positive endorsement) ^a	Prevalence ("nearly always")
		1	2	3	4	%	%
CAPE Positive items							
<i>Factor 1: Persecutory ideation</i>							
2	Hints/double meaning	0.71	-0.05	0.11	0.03	83.3	3.5
22	People look at you oddly	0.63	-0.06	0.22	0.12	62.0	3.7
6	People not what they seem	0.58	0.38	0.00	-0.14	93.0	14
10	Conspiracy against you	0.57	-0.04	0.16	0.37	58.6	2.6
7	Persecuted in some way	0.40	0.23	0.38	-0.04	35.8	2.6
<i>Factor 2: Grandiose thinking</i>							
11	Destined to be very important	-0.20	0.75	0.07	0.15	68.2	10.0
13	Special or unusual person	0.18	0.72	0.18	0.13	66.5	5.5
<i>Factor 3: First-rank/Hallucinatory experiences</i>							
34	Hear voices talking to each other	0.07	0.04	0.77	0.02	20.0	1.0
42	See things other people cannot	0.06	-0.02	0.73	0.04	14.0	1.4
33	Hear voices when you are alone	0.19	0.03	0.69	-0.10	32.0	2.7
28	Other people hear thoughts	0.16	0.18	0.59	0.18	29.3	1.2
30	Thoughts being echoed back	0.21	0.10	0.57	0.12	46.0	3.2
41	Double replaced acquaintance	0.02	0.10	0.50	0.12	11.6	1.0
31	Control of some force or power	0.12	0.16	0.50	0.10	18.3	2.1
15	Telepathy	0.08	0.35	0.50	-0.23	42.0	4.4
26	Thoughts are not your own	0.08	-0.10	0.46	0.32	20.3	0.5
20	Witchcraft, voodoo or the occult	0.23	0.26	0.46	-0.45	51.6	14.0
24	Thoughts taken away	0.16	0.12	0.45	0.23	31.0	1.2
<i>Factor 4: Self-referential thinking</i>							
5	Special messages through TV	0.17	0.06	0.27	0.57	19.0	1.2
17	Thoughts influenced by devices	0.06	0.26	0.08	0.57	34.4	3.3
CAPE Negative items							
<i>Factor 1: Social withdrawal</i>							
4	Not much of a talker with others	0.71	0.12	0.03		55.6	5.5
3	Not a very animated person	0.69	0.11	0.10		46.6	2.0
29	Lacking in spontaneity	0.42	0.12	0.31		57.0	2.0
<i>Factor 2: Affective flattening</i>							
27	Feelings lack in intensity	0.00	0.74	0.27		39.0	1.3
32	Emotions are blunted	0.20	0.72	0.20		38.0	1.4
8	No emotions at important events	0.17	0.70	0.04		57.3	4.2
<i>Factor 3: Avolition</i>							
36	Never get things done	0.07	0.13	0.71		75.0	3.0
35	Neglecting appearance/hygiene	0.20	0.13	0.62		53.5	2.7
18	Lacking in motivation	0.04	0.17	0.60		83.0	5.0
21	Lacking in energy	0.26	-0.01	0.59		66.5	1.2
25	Spending days doing nothing	-0.11	0.25	0.59		69.0	4.0
23	Mind is empty	0.22	0.14	0.46		31.3	0.9
37	Few hobbies or interests	0.30	0.03	0.40		44.7	2.4
16	No interest to be with others	0.22	0.25	0.33		52.8	0.9

Factor loadings ≥ 0.40 are indicated in bold font; CAPE: community assessment of psychic experiences; No.: number.

^a Endorsement of 'sometimes', 'often', or 'nearly always' on each item.

3.2. Endorsement of positive and negative PLEs

Table 1 presents the prevalence of each CAPE item, showing both the frequency of presentation of any positive response ('sometimes', 'often', or 'nearly always') and the prevalence of highly frequent responses ('nearly always'). All participants endorsed at least one positive item of the CAPE, and 98.3% (764) endorsed at least one negative item. Additionally, 39% of the adolescents reported at least one positive PLE 'nearly always', and 21% reported at least one negative PLE with this frequency. Among the positive items, those assessing persecutory ideation had the highest prevalence, followed by items measuring grandiose thinking. Auditory hallucinations (hearing voices and hearing voices

talking) were reported at least sometimes by 34.7% and 'nearly always' by 2.8% of the adolescents. Among the negative items, those assessing avolition were most commonly reported (97% of adolescents reported at least one experience of avolition), although a minority reported having those experiences 'nearly always' (8.1%).

3.3. Subtypes of positive PLEs

Principal component factor analysis revealed four factors: persecutory ideation, grandiose thinking, first-rank/hallucinatory experiences and self-referential thinking (Table 1). These subscales explained 48% of the variance and were significantly intercorrelated (Table 2). These associations were generally small-to-medium in

Table 2
Pearson correlations between CAPE positive and negative subscales.

	CAPE Positive	CAPE Negative	CAPE Positive subscales				CAPE Negative subscales		
			PI	GT	FR/HE	SRT	SW	AF	Av
Positive	1	0.53^a	0.73^a	0.49 ^a	0.91^a	0.46 ^a	0.27 ^a	0.36 ^a	0.54^a
Negative		1	0.54^a	0.14 ^a	0.44 ^a	0.30 ^a	0.67^a	0.70^a	0.90^a
PI			1	0.20 ^a	0.49 ^a	0.26 ^a	0.33 ^a	0.33 ^a	0.53^a
GT				1	0.29 ^a	0.21 ^a	0.00	0.13 ^a	0.16 ^a
FR/HE					1	0.29 ^a	0.20 ^a	0.29 ^a	0.44 ^a
SRT						1	0.21 ^a	0.19 ^a	0.28 ^a
SW							1	0.32 ^a	0.43 ^a
AF								1	0.46 ^a

CAPE: community assessment of psychic experiences; PI: persecutory ideation; GT: grandiose thinking; FR/HE: first-rank/hallucinatory experiences; SRT: self-referential thinking; SW: social withdrawal; AF: affective flattening; Av: avolition. Associations ≥ 0.50 are indicated in bold font.

^a Correlation is significant at the 0.01 level (2-tailed).

magnitude with grandiose thinking associated most weakly with the other CAPE positive subscales.

3.4. Subtypes of negative PLEs

Principal component factor analysis identified three factors: social withdrawal, affective flattening, and avolition were identified through principal component factor analysis (Table 1). This model explained 43% of the variance and all subscales showed significant correlations of medium magnitude (Table 2).

3.5. Association of the CAPE positive and negative subscales with depressive symptoms

To analyse the associations between the identified subscales of positive and negative PLEs and depressive symptoms, a Multiple Linear Regression analysis was performed using CAPE positive and negative subscales as independent variables, controlling for age (in years) and sex. Of the positive dimensions, persecutory ideation ($B = 0.46$, 95% CI 0.36 to 0.56; $P < 0.0005$) and first-rank/hallucinatory experiences ($B = 0.09$, 95% CI 0.04 to 0.14; $P < 0.0005$) were positively associated with the endorsement of depressive symptoms, whereas grandiose thinking was negatively associated with depressive symptoms ($B = -0.22$, 95% CI -0.35 to -0.09 ; $P = 0.001$). Self-referential thinking was not associated with depression ($B = -0.04$, 95% CI -0.23 to 0.15; $P = 0.68$). Among the negative dimensions, social withdrawal ($B = 0.17$, 95% CI 0.04 to 0.31; $P = 0.01$) and avolition ($B = 0.40$, 95% CI 0.33 to 0.48; $P < 0.0005$) were both associated positively with depressive symptoms, whereas affective flattening was unrelated to these symptoms ($B = 0.02$, 95% CI -0.11 to 0.15; $P = 0.75$).

4. Discussion

This study explored positive and negative PLE dimensions in a community sample of adolescents. Although a majority of adolescents reported PLEs, CAPE prevalence data indicated that report of highly frequent PLEs was less common, with 39% and 21% of the participants endorsing at least one positive or negative experience ‘nearly always’, respectively. The endorsement rate of positive PLEs was higher than that obtained in some studies [24], but comparable to that reported by Yung et al. [38], who also administered the CAPE positive scale in a sample of high-school students aged 13–17 years. This suggests that differences in the measures used to assess PLEs may explain variations in positive PLE prevalence rates across studies.

Although the clinical relevance of the negative features has been established [7,10], to our knowledge, an exhaustive examination of negative symptoms of psychosis had not been carried out in a general population sample of adolescents. To

thoroughly characterise the nature of PLEs and their correlates in adolescence, this study examined whether subtypes of positive and negative PLEs could be observed, and tested their associations with depressive symptoms. Using principal component factor analyses, four subtypes of positive PLEs and three of negative PLEs were identified in the present study. The positive dimension of the CAPE has been factor-analysed by several authors to derive particular subtypes of positive symptoms, with different studies obtaining models comprising three [37] or four factors [1,28,38]. Slight discrepancies in the item configuration of the CAPE positive factors have been found across studies, including the present one, which may be associated with differences across populations. A strength of the present study was the recruitment of a general population sample from which only 6% of adolescents refused consent to complete questionnaires. This is substantially lower than the rates reported in previous samples (e.g., 18.2% [38]), and thus, arguably provides a more robust model of the structure of positive and negative PLE subtypes characterising adolescents. Having brief face-to-face contact with large groups of students prior to conducting research assessments may increase response rates in adolescents [19]. Likewise, adopting a passive consent (opt-out) procedure with the adolescents’ parents within the context of an information session conducted in the school setting is likely to have contributed to the high participation rates achieved in the present study.

As expected, the subtypes of positive symptoms showed distinct relationships with depressive symptoms, implying that different aspects of the positive dimension contribute to the presence of depressive symptoms. Persecutory ideation and first-rank/hallucinatory experiences were positively associated with depression. Grandiose thinking was negatively related to depression, and no association with self-referential thinking was found. Despite the slightly different factor configurations reported across studies, the associations of depression with persecutory ideation and first-rank/hallucinatory experiences are in line with the results obtained by Armando et al. [1] in a community sample of adolescents and young adults, who suggested that these groups of symptoms may be more invasive and distressing for the subject than grandiose thinking and self-referential thinking. Krabbendam et al. [15] found that depressive symptoms in individuals with hallucinatory experiences increased the likelihood of developing a psychosis, and posited that depression or affective dysregulation could be intrinsic to the process of psychosis.

The negative subscales of social withdrawal and avolition were associated (positively) with self-report of depressive symptoms, while affective flattening was not. Previous research indicates that social anhedonia relates to depression [20], and to increased risk for psychoses [12], whereas contrasting evidence indicates that negative symptoms are not usually accompanied by depression [13]. Present results indicate that some types of negative

symptoms are associated with depressive symptoms in adolescents from the community. The presence of depression may act as an amplifier of the negative features and may indicate a greater risk of developing a psychotic disorder. The observed associations of social withdrawal and avolition with depression might also be indicative of risk for a different disorder (e.g., affective disorders) and not necessarily of an increased risk for psychosis. In contrast, depression did not relate with affective flattening. Previous evidence indicates that negative features of schizotypy involve decreased emotionality and difficulties identifying emotional states [13,20]. Häfner et al. [8] suggested that affective flattening and lack of depressive symptoms were related to reduced emotional responsiveness, which, in turn, was associated with a poorer prognosis in patients with schizophrenia. Thus, affective flattening in adolescence, even in the absence of associations with depression, may represent an important indicator of risk for psychosis.

The present results should be interpreted in the light of several limitations. The long-term evolution of PLEs and depressive symptoms in this sample of adolescents could not be elucidated due to the cross-sectional design of the study. Future research should include the assessment of the long-term course of positive and negative symptoms. Additionally, depressive symptoms and PLEs were assessed using self-report questionnaires only, conferring a risk that adolescents misinterpreted the PLE items. This study did not assess whether the positive endorsement of PLEs is associated with the presence of clinical disorders (rather than depressive symptoms). However, the CAPE was designed for the assessment of individuals from the community, and evidence indicates that it constitutes a valid measure of psychotic experiences in the general population [14,29].

5. Conclusion

The present findings indicate a high prevalence of PLEs in adolescents from the community, reinforcing the notion of a continuum of psychosis in the general population. Four subtypes of positive and three of negative PLEs were identified through principal component factor analysis. Depressive symptoms were positively associated with persecutory ideation, first-rank/hallucinatory experiences, social withdrawal, and avolition, whereas grandiose thinking related negatively with depressive symptoms. Self-referential thinking and affective flattening did not contribute to self-reported depressive symptoms. These findings support the view that not all types of positive and negative PLEs in adolescence are associated with depression and, therefore, may not confer the same vulnerability for psychotic disorders. This study suggests a complex interplay between emotional factors and psychotic-like experiences in adolescents from the community, implying that affective symptoms in adolescents should be measured concurrently with the assessment of PLEs. Since PLEs are not specific risk factors for psychosis, further examination of PLEs together with additional risk factors is required.

Conflict of interest statement

None.

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'Theory of Mind', psychotic-like experiences and psychometric schizotypy in adolescents from the general population

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ABSTRACT

This study examined 'Theory of Mind' (ToM) functioning, its association with psychometric schizotypy and with self-reported psychotic-like experiences (PLEs) and depressive symptoms, in a community sample of adolescents. Seventy-two adolescents (mean age 14.51 years) from Barcelona, Spain, completed questionnaires assessing PLEs, depressive symptoms, and schizotypy. A verbal ToM task and a vocabulary test were administered. The effect of symptomatology, vocabulary ability, age, and gender on task performance was explored. Neither total score on schizotypy nor PLEs were associated with ToM performance. A significant effect of vocabulary on adolescent's performance of both ToM and control stories was found. ToM showed significant negative associations with positive schizotypy, and with one cluster of positive PLEs: first-rank experiences. Positive significant associations between ToM and persecutory delusions and the impulsive aspects of schizotypy were found. Depressive symptoms did not affect ToM performance. Positive schizotypal traits and first-rank symptoms are associated with ToM deficits in adolescents. Results support the trait-(versus state-) dependent notion of ToM impairments in schizophrenia. ToM may be a developmental impairment associated with positive schizotypy and PLEs.

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1. Introduction

Theory of Mind (ToM), 'mindreading' or 'mentalising' constitutes the ability to infer mental states of other people in order to understand and predict their behaviour (Premack and Woodruff, 1978). ToM is an aspect of social cognition underlying the ability to deceive, cooperate or empathize (Gallagher and Frith, 2003), is associated with social-interaction and general vocabulary skills (Bosacki and Astington, 1999), and is acquired by around the age of four years (Baron-Cohen et al., 1999). ToM deficits have been reported in adults with schizophrenia (Corcoran et al., 1995; Brüne and Bodenstein, 2005; Marjoram et al., 2005; Bömmers and Brüne, 2006; Marjoram et al., 2006; Kettle et al., 2008), in children and adolescents with autism (Baron-Cohen et al., 1985; Perner et al., 1989; Happé, 1994; Baron-Cohen, 1995), and in adults with depression (Lee et al., 2005; Wang et al., 2008). Controversy remains concerning the possibility that ToM impairments constitute specific state-dependent deficits restricted to the symptomatic phase of schizophrenia, as proposed by Frith (1992), or an

underlying trait identifiable before the onset of the disease. Intact ToM in patients with remitted schizophrenia (Pousa et al., 2008), and in unaffected adult relatives (mean age 48 years) of patients with schizophrenia (Kelemen et al., 2004), constitutes evidence supporting the state notion. Support for the trait account is provided by contrasting evidence from two meta-analyses indicating ToM deficits in remitted patients (Sprong et al., 2007; Bora et al., 2009). Moreover, Janssen et al. (2003) observed poorer ToM performance in non-psychotic adult relatives (mean age 38 years old) of patients with psychosis compared to controls, and Anselmetti et al. (2009) found impaired ToM functioning in non-psychotic parents of patients with schizophrenia.

Clinical factors, such as severity of illness or antipsychotic medication, constitute possible confounders in determining the aetiology of ToM impairments in schizophrenia (Pickup, 2006). To overcome these inherent difficulties in studying ToM in patients, mentalising abilities among healthy individuals with schizotypal traits have been investigated. Schizotypy constitutes a non-clinical manifestation of the same biological factors operating in schizophrenia and psychotic spectrum disorders (Claridge, 1994). ToM impairments are present in adults with schizotypy (Langdon and Coltheart, 1999), particularly those experiencing positive symptoms (Langdon and Coltheart, 2004). Pickup (2006) reported poorer ToM in adults presenting higher scores on the unusual experiences subscale of the Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE)

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questionnaire, a self-report measure of schizotypal characteristics in healthy individuals (Mason et al., 1995). However, lack of association between mentalising abilities and psychometric schizotypy has also been reported (Jahshan and Sergi, 2007; Femyhough et al., 2008).

Individuals with schizotypy also present psychotic-like experiences (PLEs; Kwapił et al., 1997; Dickey et al., 2005). PLEs in children and adolescents constitute a putative antecedent for the development of psychotic disorders (Poulton et al., 2000; Cannon et al., 2002; Laurens et al., 2007, 2008; Welham et al., 2009). There is a paucity of studies of the association between PLEs and mentalising abilities in non-clinical samples and in adolescents. Marjoram et al. (2006) suggested that ToM deficits may be present throughout the life-span of schizotypal individuals, and become more pronounced when experiencing PLEs. Another study indicated impaired ToM in young adults at ultra-high-risk for psychosis who reported attenuated positive psychotic symptoms (Chung et al., 2008). Yet, other evidence indicates a lack of association between persecutory ideation and ToM (Femyhough et al., 2008). Although mixed results on the association between ToM, schizotypy, and PLEs have been reported, evidence suggests that impaired mentalising is not exclusive to symptomatic patients (Pickup, 2006; Bora et al., 2009), and further understanding of the nature of ToM dysfunction in schizophrenia might be achieved via examining ToM from the early phases, and even before the onset, of the illness. As psychotic symptoms are distributed on a continuum within the general population (van Os et al., 2000; Verdoux and van Os, 2002), examining the relationship between ToM and PLEs and schizotypy in a community sample of adolescents, prior to the emergence of psychotic disorders, may provide important information regarding the aetiology of ToM deficits in schizophrenia.

Accordingly, the aim of this study was to examine ToM functioning, its association with psychometric schizotypy and with self-reported PLEs and depressive symptoms, in a group of adolescents. As far as we know, this is the first study examining ToM functioning and its relations with schizotypal traits and PLEs in adolescents. Given evidence that ToM deficits are associated with the positive features of schizotypy in adults (Langdon and Coltheart, 2004; Pickup, 2006), it was hypothesised that adolescents with higher levels of positive schizotypy and positive PLEs would present poorer performance on a verbal ToM task. By contrast, following Pickup (2006), we anticipated a lack of association between ToM ability and the negative dimensions of PLEs and schizotypy, as well as with the total PLE and schizotypy scores. In accordance with the findings of Lee et al. (2005) and Wang et al. (2008) in adult samples, it was predicted that self-reported depressive symptoms would be associated with poorer ToM in adolescents. The effect of vocabulary ability, age, and gender on ToM functioning was also examined. A positive association between vocabulary ability and ToM performance was expected based on previous findings (Bosacki and Astington, 1999). Previous research also suggested that girls would report higher ToM scores (Bosacki and Astington, 1999) and higher scores on the positive dimensions of PLE and schizotypy, whereas boys' ToM were expected to score higher on the negative dimensions (Mason and Claridge, 2006; Scott et al., 2008). Based on the findings of Scott et al. (2009) in a sample of adolescents (13–17 years old), similar levels of PLEs and schizotypy were expected across the age range included in the present sample.

2. Methods

2.1. Participants and procedure

This cross-sectional study examined 72 adolescents (33 girls) aged between 13 and 16 years (mean = 14.51, S.D. = 0.63 years). Participants were selected randomly from a larger sample ($n = 777$) of students attending compulsory secondary education in six schools from Barcelona, Spain. Schools were selected via stratified sampling to form a representative sample of the schools from all city districts. Questionnaires assessing PLEs and schizotypy were administered by trained psychologists to the main sample ($n = 777$) in the classroom. The ToM task and vocabulary scale were administered individually to the sub-sample of 72 adolescents by a trained psychologist in a quiet

room of the school. Written informed consent was obtained from participants, as well as authorisation from their parents. This study was approved by the Department of Clinical and Health Psychology (Universidad Autónoma de Barcelona) ethics committee.

2.2. Measures

2.2.1. Psychotic-like experiences and depressive symptoms

PLEs were assessed using the Spanish version of the Community Assessment of Psychic Experiences (CAPE) (Stefanis et al., 2002; <http://cape42.homestead.com>), a self-report of psychotic experiences that examines positive (20 items) and negative (14 items) psychotic symptoms, and depressive symptoms (7 items). The CAPE measures the frequency of occurrence of symptoms using a four-point scale ranging from 1 (never) to 4 (nearly always). A total score on each dimension is derived by summing the scores on each item. Thus, scores on the positive dimension range from 20 to 80 points, from 14 to 56 on the negative dimension, and from 7 to 28 on the depressive dimension. The overall total score results from adding up the scores of the three dimensions. The scale has established validity and reliability (Stefanis et al., 2002; Konings et al., 2006).

2.2.2. Psychometric schizotypy

Schizotypy was measured with the Oxford-liverpool Inventory of Feelings and Experiences (O-LIFE) (Mason et al., 1995), a self-report questionnaire designed for the assessment of schizotypy or psychosis-proneness in the general population. The O-LIFE comprises 125 yes/no items and four subscales. The Unusual Experiences (UnEx) scale (30 items) measures the positive dimension of psychosis and describes perceptual aberrations, magical thinking and hallucinatory experiences. The Cognitive Disorganization (CogDis) scale (24 items) assesses thought disorder and disorganised aspects of psychosis, and includes items that examine attention/concentration difficulties, problems in decision-making, and social anxiety. The Introverted Anhedonia (IntAnh) scale (27 items) measures attenuated forms of negative symptoms of psychosis: lack of enjoyment from social contact and physical activities, coupled with avoidance of emotional and physical intimacy that could reflect the schizoid temperament. The Impulsive Nonconformity (ImpNon) scale (22 items) measures forms of impulsive, antisocial and eccentric behaviour that suggest lack of self-control (Mason et al., 1995; Mason and Claridge, 2006). The O-LIFE was translated into Spanish by Barrantes-Vidal (1997), and has been used previously to assess schizotypy in Spanish samples (Medina et al., 2007; Caparrós et al., 2008).

2.2.3. 'Theory of Mind' (ToM)

ToM was assessed using the Strange Stories task (Happé, 1994). This verbal task was translated and adapted into Spanish by Pousa (2002), and comprises 16 short passages, with stories of two types: ToM and control stories, each followed by a test question. The eight ToM stories involve double bluff, mistakes, persuasion, and white lies. The test question following these stories requires an inference about the character's thoughts, feelings, and intentions. The control story condition also comprises eight stories involving people. Although the test question for these stories requires inferences to be made, the mental state of the characters is not relevant. During test administration, a practice story was first given to participants and then they were presented with the 16 stories, alternating ToM with control stories. Adolescents were asked to read the stories to themselves until they considered that they had understood them. Then they were instructed to turn the page to read the test question and give an answer to the examiner. Time taken from the beginning of the reading until the answer was initiated, was recorded. Answers were scored 0, 1 or 2, with 0 being given to an incorrect answer, 1 to a partial or implicit answer, and 2 for a full and explicitly correct answer. Total score was computed as the sum of the scores on each answer.

2.2.4. Vocabulary ability

Since studies have shown that ToM measures are often language dependent (Bosacki and Astington, 1999), language ability was measured using the vocabulary subtest from the Wechsler Intelligence Scale for Children (WISC-R; Wechsler, 1995). This subtest indexes language development, verbal conceptualisation and comprehension, and semantic understanding, by requesting oral definitions for 32 vocabulary items. Scores of 0, 1, or 2 are assigned to each item according to the accuracy of the definition provided.

2.3. Statistical analyses

Analyses were conducted using SPSS 16.0 for Windows (SPSS, Chicago, IL, USA). Internal consistency of the O-LIFE and CAPE total and subscale scores was determined using Cronbach's alpha statistic. Normal distributions were identified in ToM tasks, control stories reading time, the O-LIFE subscales, the CAPE positive and negative subscales, and vocabulary scores. Following Miles and Shevlin (2001) a logarithmic transformation was performed on ToM stories reading time and the CAPE depressive subscale as they were slightly positively skewed.

Within the total sample, differences on the scores of both story type (ToM, control) and story reading times were examined using paired *t*-tests. Effect size (ES) estimates were indicated by Cohen's *d*, which was calculated by dividing the difference between the mean scores of ToM/control stories or story reading times by the pooled standard deviation. Cohen's (1992) criteria to define a small (0.20), medium (0.50) and large

(0.80) effect, were used. To explore the underlying association between story type, PLEs, schizotypy, and age, Pearson correlations were performed. Associations between gender and the variables under investigation were examined using point biserial correlation. Following Cohen's (1992) criteria, the magnitude or effect size of the correlation coefficients is defined as small ($r=0.10$), medium ($r=0.30$) and large ($r=0.50$).

One-way analysis of variance (ANOVA) was performed to explore gender and age differences on schizotypy, PLEs, depressive symptoms and ToM/control performance, applying a Bonferroni correction for multiple comparisons. Partial eta squared (η^2) estimate of the effect size was calculated for each comparison. Two age-groups were formed by splitting the sample into a younger group, comprising participants aged 13–14 years ($n=39$, 15 girls), and an older group of adolescents aged 15–16 years ($n=33$, 18 girls).

The associations between the subscales on the schizotypy and PLE measures (i.e., O-LIFE and CAPE) and performance on ToM and control stories were examined using Multiple Linear Regression analyses. Separate regressions were performed for each dependent variable, namely ToM and control stories. Age, gender, and vocabulary ability were entered in the regressions in order to adjust for their effects.

3. Results

Table 1 presents descriptive statistics for each measure. Good internal consistency coefficients were observed for the CAPE and the O-LIFE subscales.

3.1. Performance on ToM and control tasks

Paired *t*-tests indicated that time required to solve control stories was significantly longer than that required to solve the ToM stories ($t(69) = 5.31$, $p < 0.0005$, $d = 0.44$). The mean scores on ToM and control stories did not differ significantly ($t(71) = -0.81$, $p = 0.42$, $d = -0.10$), indicating that adolescents found them equally difficult.

3.2. Correlations between task performance, questionnaire, and demographic measures

Correlational analysis (see Table 2) indicated a significant association between vocabulary score and ToM and control stories and accounted for 10% and 14% of the variance, respectively. Control stories were moderately significantly correlated with cognitive disorganisation and Introverted Anhedonia, and with the negative and depressive subscales of the CAPE. No association was found between ToM scores and the CAPE/O-LIFE subscales. Age (as a continuous variable) did not correlate with any questionnaire or story measure. One-way ANOVA testing for age-group differences also indicated comparable results between younger and older adolescents. Point biserial correlations revealed a significant association between gender and cognitive disorganisation ($r = -0.47$, $p < 0.0005$), that accounted for 22% of the

variance, with girls scoring higher than boys. This association remained significant after controlling for age entered as a continuous measure.

Gender differences on ToM and control stories were examined using ANOVA. Girls had comparable mean ToM scores to boys [$F(1, 70) = 0.44$, $p = 0.51$, $\eta^2 = 0.01$]. The analysis yielded no gender differences in control story performance [$F(1, 70) = 0.59$, $p = 0.44$, $\eta^2 = 0.01$], or in vocabulary scores [$F(1, 70) = 0.02$; $p = 0.90$, $\eta^2 = 0.00$]. Girls showed significantly higher scores on the O-LIFE cognitive disorganisation subscale relative to boys [$F(1, 70) = 19.75$; $p < 0.0005$, $\eta^2 = 0.22$]. Only the CAPE depressive subscale yielded a significant gender difference [$F(1, 70) = 9.86$; $p = 0.002$, $\eta^2 = 0.12$], with girls reporting significantly more depressive items.

3.3. Median split analysis by total schizotypy and by total PLEs score

In order to compare the current data directly with the findings of Pickup (2006) and Langdon and Coltheart (1999), total scores on the O-LIFE and the CAPE were split by the median to form two groups of 36 adolescents with high versus low total schizotypy and high versus low total PLE score respectively. Separate ANOVAs for O-LIFE total score and for CAPE total score were performed to examine whether there were differences on ToM performance between the two groups of high–low total schizotypy and high–low total PLE score. Two-way mixed ANOVAs were carried out, with two levels on the between-subjects factor of group (high/low schizotypy as measured by the O-LIFE, and high/low total PLEs as measured by the CAPE) and two levels on the repeated factor of story type (ToM, control). The main effect of the group was not significant either for the O-LIFE total [$F(1, 70) = 1.12$; $p = 0.29$, $\eta^2 = 0.02$] or for the CAPE total [$F(1, 70) = 2.02$; $p = 0.16$, $\eta^2 = 0.03$] scores, indicating that adolescents with higher levels of schizotypy or PLEs did not differ on their performance on the stories relative to adolescents with lower levels of schizotypy or PLEs. The analysis also showed a non-significant effect of story type both on the O-LIFE total [$F(1, 70) = 0.66$; $p = 0.42$, $\eta^2 = 0.01$] and the CAPE total [$F(1, 70) = 0.65$; $p = 0.42$, $\eta^2 = 0.01$] scores, indicating similar performance on both story types. The interaction between story type and group (high/low schizotypy, high/low PLEs) was non-significant [O-LIFE $F(1, 70) = 2.14$; $p = 0.15$, $\eta^2 = 0.03$; CAPE $F(1, 70) = 1.10$; $p = 0.30$, $\eta^2 = 0.01$].

The effect of vocabulary on ToM performance was examined using analysis of covariance (ANCOVA) entering vocabulary score as a covariate. The between-subjects effects revealed a significant effect of vocabulary on adolescent's performance on ToM and control stories, both when entered as a covariate between total O-LIFE and ToM/control stories [$F(1, 68) = 15.59$; $p < 0.0005$, $\eta^2 = 0.19$], and between total CAPE and ToM/control stories [$F(1, 68) = 14.84$; $p < 0.0005$, $\eta^2 = 0.18$].

Table 1

Descriptive statistics on the study variables for the total sample and by gender and Cronbach's alpha for the questionnaire scales.

Scale	Whole sample ($N=72$)			Girls ($N=33$)		Boys ($N=39$)		Cronbach's Alpha
	Mean (S.D.)	Median	Range	Mean (S.D.)	Range	Mean (S.D.)	Range	
ToM Stories	11.77 (2.71)	12.42	3–16	12.00 (3.05)	3–16	11.78 (2.07)	6–15	n/a
Control Stories	11.43 (2.85)	12.00	3–16	11.16 (2.95)	3–16	11.89 (2.41)	7–16	n/a
ToM Time	27.22 (6.73)	26.57	19–49	26.84 (7.54)	20–48	27.11 (6.14)	19–49	n/a
Control Time	31.12 (7.77)	29.19	20–54	31.04 (8.99)	20–54	31.28 (6.76)	20–49	n/a
O-LIFE UnEx	10.89(6.21)	10.00	0–26	12.24 (5.29)	4–25	9.74 (6.76)	0–26	0.86
O-LIFE CogDis	12.08 (5.22)	12.00	0–23	14.73 (3.69)	8–23	9.85 (5.31)	0–21	0.83
O-LIFE IntAnh	6.99 (3.51)	6.00	3–17	7.09 (3.86)	3–17	6.90 (3.23)	3–15	0.71
O-LIFE ImpNon	8.24 (3.86)	7.50	2–17	8.18 (3.61)	2–15	8.28 (4.10)	2–17	0.72
O-LIFE Total	38.19(13.97)	36.50	12–65	42.24(11.76)	22–65	34.77 (14.89)	12–62	0.92
CAPE positive	31.56 (6.80)	28.50	23–51	31.82 (6.91)	24–51	29.26 (5.93)	23–48	0.82
CAPE negative	24.49 (6.19)	23.00	14–40	26.03 (6.25)	15–40	23.18 (5.91)	14–36	0.84
CAPE depressive	12.30 (4.07)	12.00	7–26	13.73 (4.49)	9–26	11.13 (3.24)	7–21	0.84
CAPE total	68.87(15.03)	64.50	48–112	72.18(15.63)	52–112	64.05 (12.88)	48–93	0.90
Vocabulary	35.92 (7.66)	37.00	17–55	35.79 (8.85)	17–55	36.03 (6.56)	23–51	n/a

O-LIFE = Oxford-Liverpool Inventory of Psychic Experiences; UnEx = Unusual Experiences; CogDis = cognitive disorganisation; IntAnh = Introverted Anhedonia; ImpNon = Impulsive Nonconformity; CAPE = Community Assessment of Psychic Experiences.

Table 2
Pearson correlations between O-LIFE, CAPE subscales, story type, and vocabulary score.

	O-LIFE CogDis	O-LIFE IntAnh	O-LIFE ImpNon	CAPE Positive	CAPE Negative	CAPE Depressive	ToM Stories	Control Stories	Vocabulary
O-LIFE UnEx	0.62 ^a	0.13	0.51 ^a	0.80 ^a	0.54 ^a	0.57 ^a	-0.22	-0.28 ^b	-0.20
O-LIFE CogDis	1	0.30 ^b	0.39 ^a	0.64 ^a	0.67 ^a	0.73 ^a	-0.07	0.34 ^a	-0.21
O-LIFE IntAnh		1	0.20	0.11	0.48 ^a	0.35 ^a	-0.10	0.30 ^b	-0.15
O-LIFE ImpNon			1	0.39 ^a	0.41 ^a	0.33 ^b	0.10	-0.25 ^b	0.07
CAPE positive				1	0.61 ^a	0.61 ^a	-0.06	-0.16	-0.19
CAPE negative					1	0.74 ^a	-0.04	0.35 ^a	-0.12
CAPE depressive						1	-0.09	0.41 ^a	-0.32 ^a
ToM stories							1	0.44 ^a	0.38 ^a
Control stories								1	0.34 ^a
Vocabulary									1

O-LIFE = Oxford-Liverpool Inventory of Psychic Experiences; UnEx = Unusual Experiences; CogDis = cognitive disorganisation; IntAnh = Introvertive Anhedonia; ImpNon = Impulsive Nonconformity; CAPE = Community Assessment of Psychic Experiences.

^a Correlation is significant at the 0.01 level (2-tailed).

^b Correlation is significant at the 0.05 level (2-tailed).

3.4. Association between schizotypy, PLEs and ‘Theory of Mind’

Separate multiple linear regressions were performed to examine the effect of the O-LIFE and the CAPE subscales on ToM and control stories, respectively (Table 3). As significant correlations between the subscales of the O-LIFE and CAPE were observed, particularly between positive schizotypal traits and PLEs (Table 2), some degree of collinearity was present in the data. This was anticipated, since both questionnaires examine, from different perspectives, psychotic expressions. Further analysis of the tolerance levels and variance inflation factor (VIF) indicated a lack of substantive multicollinearity. Also, the pattern of results remained stable when separate multiple regressions were performed for the CAPE and the O-LIFE subscales. Durbin–Watson scores were adequate for both regression analyses and there was no evidence of a significant influence of outliers.

The regression analysis revealed a significant effect of vocabulary ability on ToM and control stories. Neither gender nor age-group was significantly associated with ToM. Results indicated a significant positive relationship between the Impulsive Nonconformity subscale and ToM, whereby, higher scorers in the scale evidenced better ToM abilities, whereas scorers on the unusual experiences subscale were

significantly negatively associated with ToM story performance. However, results showed a lack of association with the positive dimension of the CAPE, even when this questionnaire was examined in a separate regression. The O-LIFE unusual experiences subscale measures magical thinking, hallucinations and unusual perceptual aberrations, without asking about persecutory delusions, whereas the CAPE positive subscale includes 7 items on delusional experiences. Thus, to test whether contradictory results stemmed from this difference, and to further analyse the effect of specific positive symptoms on ToM ability, the CAPE positive dimension was dissociated into four subscales, as distinguished by Yung et al. (2009) in a community sample of adolescents: first-rank experiences (6 items; e.g., have you ever felt as if the thoughts in your head are being taken away from you?), hallucinatory experiences (3 items; e.g., have you ever heard voices talking to each other when you were alone?), persecutory delusions (7 items; e.g., have you ever felt as if things in magazines or on TV were written especially for you?), and magical thinking (4 items; e.g., have you ever thought that people can communicate telepathically?). Separate multiple linear regressions were performed to examine the effect of these subscales on ToM and control stories, controlling for age-group, gender, and vocabulary

Table 3
Linear multiple regression of schizotypy and PLEs on story type.

	ToM stories	Control stories
R ²	0.29	0.32
F (10, 60)	2.43; p = 0.01	2.83; p = 0.01
B (95% IC); p		
Age-group	-1.01 (-2.16 to -0.14); p = 0.08	-0.45 (-1.60 to 0.73); p = 0.45
Gender	-0.48 (-1.86 to 0.90); p = 0.49	0.31 (-1.10 to 1.71); p = 0.66
Vocabulary	0.10 (0.02 to 0.18); p = 0.01	0.10 (0.01 to 0.18); p = 0.02
O-LIFE UnEx	-0.22 (-0.39 to -0.05); p = 0.01	-0.51 (-0.22 to 0.12); p = 0.55
O-LIFE CogDis	0.05 (-0.14 to 0.25); p = 0.56	0.03 (-0.16 to 0.23); p = 0.73
O-LIFE IntAnh	-0.08 (-0.27 to 0.11); p = 0.34	-0.74 (-0.26 to 0.12); p = 0.45
O-LIFE ImpNon	0.19 (0.01 to 0.37); p = 0.03	-0.10 (-0.28 to 0.08); p = 0.27
CAPE positive	0.12 (-0.04 to 0.28); p = 0.15	0.14 (-0.2 to 0.30); p = 0.09
CAPE negative	-0.01 (-0.17 to 0.16); p = 0.93	-0.08 (-0.24 to 0.09); p = 0.35
CAPE depressive	-0.00 (-3.43 to 3.43); p = 0.99	-2.45 (-5.92 to 1.03); p = 0.16
<i>CAPE positive subscale split into four dimensions</i>		
R ²	0.31	0.19
F (7, 63) ^a	4.15; p = 0.001	2.20; p = 0.05
B (95% IC); p		
Vocabulary	0.12 (0.04 to 0.19); p = 0.003	0.12 (0.03 to 0.20); p = 0.01
Magical thinking	0.09 (-0.15 to 0.34); p = 0.43	-0.01 (-0.26 to 0.29); p = 0.93
Hallucinatory experiences	-0.06 (-0.59 to 0.47); p = 0.82	0.21 (-0.38 to 0.81); p = 0.47
First-rank experiences	-0.38 (-0.67 to -0.09); p = 0.01	-0.31 (-0.64 to 0.01); p = 0.06
Persecutory delusions	0.30 (0.06 to 0.55); p = 0.02	0.09 (-0.19 to 0.37); p = 0.53

O-LIFE = Oxford-Liverpool Inventory of Psychic Experiences; UnEx = Unusual Experiences; CogDis = cognitive disorganisation; IntAnh = Introvertive Anhedonia; ImpNon = Impulsive Nonconformity; CAPE = Community Assessment of Psychic Experiences.

Significant results (p < 0.05) are indicated in bold.

^a Controlling for age-group and gender.

scores (Table 3). A negative association between first-rank experiences and ToM stories, and a positive significant association between ToM and persecutory delusions were found.

Partial correlation analyses, with the other CAPE and O-LIFE dimensions, age-group, gender and vocabulary variables held constant, confirmed the findings obtained using multiple regression, revealing a negative significant association between unusual experiences and ToM ($r=0.27$, $p=0.03$) that accounted for 7% of the variance, and a positive significant association between Impulsive Nonconformity and ToM ($r=-0.32$, $p=0.01$) that accounted for 10% of the variance.

3.5. Association between schizotypy, PLEs and story reading time

The effect of schizotypy and PLEs on reading times was also examined using multiple linear regression. ToM and control stories reading times were not associated with vocabulary, schizotypy, PLEs or depressive symptoms.

4. Discussion

This study is the first to examine ToM functioning and its association with psychometric schizotypy, PLEs and depressive symptoms in adolescents from the general population. As expected, adolescents with higher scores on total schizotypy and total PLEs were not impaired in their ability to mentalise compared to those with scores below the median. Further, poorer ToM scores did not relate to negative PLEs or negative schizotypal traits. Rather, ToM performance related to positive schizotypy and PLEs, consistent with the hypothesis that adolescents with higher levels of positive schizotypy and positive PLEs would present poorer performance on a verbal ToM task. The analysis of two scales measuring positive schizotypy and positive PLEs and their association with ToM ability, initially revealed contradictory results, as positive schizotypy showed a negative association with ToM performance, while positive PLEs (i.e., CAPE positive) did not. Further analysis of the CAPE positive dimension, split into the four clusters distinguished by Yung et al. (2009), showed that specific positive PLEs related to ToM performance. First-rank experiences were associated with poorer ToM, whereas persecutory beliefs were related to better ToM performance. No association was found between ToM and magical thinking or hallucinatory experiences.

The observed relationship between poorer ToM performance in participants with higher scores on positive schizotypy and first-rank experiences measured by the CAPE is in line with previous findings in adult samples (Langdon and Coltheart, 2004; Pickup, 2006). Previous research has indicated a strong association between cognitive-perceptual schizotypal traits and poor recognition of irony among undergraduate students (Langdon and Coltheart, 2004). The O-LIFE unusual experiences subscale, which was negatively associated with ToM, assesses mainly perceptual abnormalities but not persecutory beliefs. The positive association between persecutory beliefs and ToM indicates that these experiences are not associated with a deficit in mentalising for this sample of adolescents. This is consistent with the findings of Abu-Akel and Bailey (2000), who claimed that not all psychiatric or developmental disorders associated with ToM impairment, can be described in terms of diminished capacity to represent mental states. Moreover, Walston et al. (2000) indicated that male adults with persecutory delusions, but without other detectable pathologies, scored highly on ToM tasks and attributed complex and contextually appropriate mental states, thus concluding that persecutory delusions require an intact mentalising ability. This is compatible with the performance observed in the present sample of adolescents. However, Pickup and Frith (2001) reported lower ToM scores in patients with paranoid symptoms compared to controls. These contradictory findings may stem from differing sample characteristics. This study focused on adolescents from the community, whereas Pickup

and Frith examined patients with schizophrenia who might have had cognitive deficits affecting their performance on ToM tasks.

Higher scores on the Impulsive Nonconformity subscale, which measures impulsive, antisocial, and eccentric behaviour, were significantly associated with better mentalising abilities. These results are consistent with ToM being a required ability for successfully deceiving (Gallagher and Frith, 2003) cheating, or manipulating others (Brüne, 2005), and suggest that this trend may be observable from adolescence.

While the regression analysis (and confirmatory partial correlation analyses) revealed several significant associations between PLEs, schizotypy, and ToM performance, simple Pearson correlation analyses did not. Regression analysis (and partial correlation analysis) assesses the association of ToM with particular PLE and schizotypy dimensions while removing or controlling the effects of the other variables, and may thus constitute a more sensitive appropriate approach to detecting underlying relationships existing between ToM and psychometric schizotypy and PLEs.

The finding that vocabulary score was significantly associated with ToM and control stories is contrary to previous results obtained from non-clinical adults (Pickup, 2006) where verbal IQ did not predict ToM functioning. However, evidence from a preadolescent sample (mean age 11 years, 9 months), indicated a relation between ToM and language ability (Bosacki and Astington, 1999), and data from clinical samples suggested that ToM performance is closely related to language ability (Brüne, 2005; Pousa et al., 2008). The present analyses indicate that ToM, as measured by a verbal task, is associated not only with specific dimensions of PLEs and schizotypal traits, but also with verbal ability, in adolescents from the general population.

We obtained no evidence supporting the hypothesis that depressive symptoms contribute to ToM deficits. Depressive experiences among this sample of adolescents did not affect ToM performance. As studies indicating a significant relationship between depression and ToM have been conducted with clinically depressed patients (Lee et al., 2005; Wang et al., 2008), it may be that ToM impairments associated with depression are state-dependent and occur only during symptomatic phases of the illness.

Neither age nor gender affected significantly ToM performance in this sample of adolescents. Although girls scored higher on the positive dimensions of schizotypy (O-LIFE unusual experiences and cognitive disorganisation) and PLEs (CAPE positive), gender differences were significant only for the cognitive disorganisation subscale. Contrary to evidence obtained from adult samples (Raine, 1992), negative dimensions of schizotypy and PLEs were equally distributed across genders.

Results should be interpreted in the light of several limitations. First, analyses were performed on a relatively small sample that allows us to detect only medium to large effects. Further associations might be elicited in a larger sample. However, the associations observed are consistent with existing literature in adult samples and suggest that ToM impairments are identifiable from early developmental stages and are associated with specific positive features. Second, the cross-sectional design of this study can offer no insight into the long-term evolution of PLEs, schizotypal traits, and their association with ToM. PLEs tend to decrease with age, and the effect on ToM of remission of positive PLEs or of decrease in schizotypal features remains unknown. Further studies are needed to establish the longitudinal course of psychotic features and the associated evolution of ToM impairments. Future studies should also incorporate verbal and non-verbal tests of ToM ability in adolescents to further clarify the nature of ToM impairments from early developmental stages.

The present findings suggest that positive schizotypal traits, as well as first-rank symptoms, are associated with ToM deficits in adolescents. These results support the trait-dependent notion of ToM impairments in schizophrenia, and provide further evidence of the presence of ToM impairments among individuals with sub-clinical experiences and traits, but without a clinical diagnosis. Thus, ToM

might be a developmental impairment associated with positive dimensions of schizotypy and PLEs. Present findings also indicate that adolescents who self-reported persecutory beliefs and schizotypal traits of impulsivity and antisocial behaviour present adequate ToM abilities.

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5. DISCUSSION

The aim of this thesis was threefold. First, it was aimed at exploring the presence of positive and negative psychotic-like experiences (PLEs) and their association with depressive symptoms in a community sample of 777 adolescents. Second, it aimed at examining ToM functioning, its association with psychometric schizotypy and with self-reported PLEs and depressive symptoms, in a subgroup of 72 adolescents selected from the main group. Finally, in order to thoroughly characterise the nature of PLEs and their correlates in adolescence, this thesis examined whether subtypes of positive and negative PLEs could be observed.

As previously mentioned, PLEs and schizotypal manifestations have been widely documented in the general population. However, research on adolescent samples has focused predominantly on positive symptoms, whilst negative symptoms and their associations with depressive symptoms have remained unexplored. In a similar way, although ToM deficits have been identified in schizotypal individuals, information on ToM functioning in adolescents who report PLEs and schizotypal features is scarce. It has also been highlighted that examining ToM abilities in the adolescent population can help to further clarify whether ToM deficits are present in at-risk individuals before the onset of the illness, and to improve early detection and intervention processes. Accordingly, this study was intended to examine these relationships and thus make a contribution to the understanding of psychosis.

In general, results from this study confirmed that PLEs and psychometric schizotypy dimensions are relatively common during adolescence. Our findings indicated the presence of different subtypes of positive and negative PLEs that had distinct relationships with depressive symptoms in a community sample of adolescents (see article 1: Barragan, Laurens, Navarro, & Obiols, 2011a). Moreover, results revealed that positive schizotypy and specific subtypes of positive PLEs had different effects on ToM abilities, implying that studying subtypes of PLEs instead of or in addition to global scores provides information on the particular associations that may not be captured by global measures (see article 2: Barragan, Laurens, Navarro, & Obiols, 2011b). Specific results related to the objectives of the study and their implications are discussed in this section.

First, positive and negative psychotic-like experiences (PLEs), and depressive symptoms, were measured with the Community Assessment of Psychic Experiences CAPE (Stefanis et al., 2002), and the possible presence of subtypes of PLEs was examined through factor analysis. Four factors of positive symptoms (persecutory ideation, grandiose thinking, first-rank-hallucinatory, and self-referential thinking) and three factors of negative symptoms (social withdrawal, affective flattening, and avolition) emerged (Barragan et al., 2011a). As expected, multiple regression analysis yielded different relationships between subtypes of positive PLEs and depressive symptoms. Thus, persecutory ideation and first-rank/hallucinatory experiences were associated with higher scores on the depressive symptoms scale whilst grandiose thinking was associated with lower scores on depression. No association with self-referential thinking was found.

Similarly, multiple regression analysis yielded specific associations between subtypes of the negative dimension and depression. Social withdrawal and avolition were positively associated with the self-report of depressive symptoms, while affective flattening did not relate to depression (Barragán et al., 2011a). Thus, in line with previous findings that related social anhedonia and depression (Lewandowski et al., 2006), our results indicated that some aspects of negative symptoms and depression were associated. However, conflicting evidence has also showed that negative symptoms are not usually accompanied by depression (Kerns, 2006) since they involve decreased emotionality and difficulties identifying emotional states (Kerns, 2006; Lewandowski et al., 2006).

In this respect, this study confirms that aspects of negative schizotypy involving affective flattening and therefore, a likely impaired ability to identify emotional states, such as depressive experiences, do not relate to depressive symptoms, which would be in line with Kerns (2006) and Lewandowski et al. (2006). In sum, our results revealed an association between specific aspects of negative schizotypy including social withdrawal and avolition with depressive features, which suggests that adolescents with negative symptoms characterised by affective flattening and those characterised by social withdrawal and avolition symptoms might be at a different level of risk for psychosis or general psychopathology.

Overall, these findings support the view that not all types of positive and negative PLEs in adolescence are associated with depression and, therefore, may

not confer the same vulnerability for psychotic disorders. Thus, a complex interplay between emotional factors and psychotic-like experiences in adolescents from the community is evidenced, which imply that assessment of PLEs in adolescents should comprehend a concurrent measurement of affective symptoms in order to better identify individuals at-risk for psychoses or other psychopathologies and provide opportunities for an early intervention (Barragan et al., 2011a). The influence of depression on PLEs in adolescents and young adults has been established by Yung et al. (2007), who found that PLEs scores decreased significantly among individuals whose depression had remitted at follow-up relative to individuals who continued depressed, indicating that the presence of depression also contributes to determining the outcome of PLEs, which evidence the relevance of an early intervention in depression to also improve the outcomes of PLEs.

This thesis was also aimed at examining the associations between PLEs, psychometric schizotypy, and ToM performance (Barragan et al., 2011b). Psychometric schizotypy was measured with the Oxford-Liverpool Inventory of Feelings and Experiences O-LIFE (Mason et al., 1995) and ToM abilities with the Happé Stories task (Happé, 1994). As expected, no differences were found in ToM abilities in adolescents with higher global scores on schizotypy or PLEs relative to those with lower global scores. Similarly, negative PLEs or negative schizotypy were not related to mentalising abilities.

This study revealed an association between better mentalising abilities and higher scores on the O-LIFE impulsive nonconformity subscale that measures impulsive, antisocial, and eccentric behaviour. These results are in line with evidence obtained from adult samples indicating that ToM represents a required ability for successfully deceiving (Gallagher & Frith, 2003), cheating, or manipulating others (Brüne, 2005), and suggests that this trend may be observable from adolescence (Barragan et al., 2011b). However, considering that ToM is a multidimensional construct that includes cognitive and emotional aspects (Shamay-Tsoory et al., 2010; Tager-Flusberg, 2007) these results may not necessarily imply that adolescents with better cognitive ToM functioning and high impulsive nonconformity have also intact emotional ToM abilities. Shamay-Tsoory et al. (2010) found that individuals with psychopathy were impaired in affective ToM but not in cognitive ToM. Thus, it is likely that the measure used in

this study, the Happé Strange Stories task (Happé, 1994), which assesses the cognitive-explicit aspects of ToM had not captured deficits occurring in emotional ToM. Accordingly, future research lines should include the exploration of both emotional and cognitive aspects of ToM relative to schizotypal features in adolescents in order to better reflect the multidimensionality of ToM abilities and schizotypy.

Consistent with the hypothesis that, adolescents with higher positive schizotypy and positive PLEs would present poorer performance on a verbal ToM task, the multiple regression analysis conducted in this study, yielded higher scores on the unusual experiences subscale (positive schizotypy) associated with poorer ToM ability. However, initial examination of the positive schizotypy and the CAPE positive scale in association with ToM abilities revealed contradictory results since no association between ToM performance and the positive dimension of the CAPE was observed. Further analysis consisting in splitting the CAPE positive dimension into four subscales (first-rank experiences, hallucinatory experiences, persecutory ideation, and magical thinking), and in introducing these subscales in the multiple regression analysis, revealed otherwise. Thus, first-rank experiences were associated with poorer ToM, whereas persecutory beliefs were related to better ToM performance. No association was found between ToM and magical thinking or hallucinatory experiences (Barragan et al., 2011b).

Our findings indicating a relationship between poorer ToM performance in participants with higher scores on positive schizotypy and first-rank experiences measured by the CAPE are in line with the evidence obtained by Gooding and Pflum (2011), Langdon and Coltheart (2004), Pflum et al. (2013), and Pickup (2006), all reporting higher positive schizotypy in adults with increased ToM difficulties. Thus, results from this thesis add up to evidence suggesting the possibility that ToM impairments are not restricted to the acute phase of the disorder, but rather that impaired ToM constitutes an underlying trait that can be identified during adolescence before the onset of the disease.

Based on evidence suggesting that ToM abilities are associated with positive schizotypy, we hypothesised that neither negative PLEs nor negative schizotypy would relate to mentalising abilities. The results obtained confirmed this hypothesis (Barragan et al., 2011b). However, evidence showing that negative schizotypy in adults is also related to a reduced ToM ability, as measured by the

Reading the Mind in the Eyes test (Baron-Cohen et al., 2001), has been reported (Henry et al., 2008). According to Sprung (2010), the Reading the Mind in the Eyes test is a measure especially sensitive to emotional or implicit non-linguistic aspects of ToM. This evidence suggests that assessing emotional aspects of ToM might open the possibility to identify specific relationships with subtypes of negative schizotypy. As proposed in Frith's model (1992), schizophrenia patients who present negative behavioural symptoms such as poverty of speech, social withdrawal, or flat affect are expected to show severe ToM impairments. Thus, in line with the dimensional view of psychosis, it is likely that individuals from the general population with higher levels of negative PLEs and negative schizotypy may present deficits in emotional aspects of ToM. Since the subtypes of negative symptoms identified in this thesis, namely, social withdrawal, avolition, and affective flattening were not studied in association with ToM performance and only global negative PLEs scores were examined in this case, a future line of investigation should examine the associations between both emotional and cognitive facets of ToM, and the identified subtypes of negative symptoms.

This study revealed a positive association between persecutory beliefs and ToM performance, indicating that these experiences are not associated with a deficit in mentalising for this community sample of adolescents (Barragan et al., 2011b). This result is consistent with the findings of Abu-Akel and Bailey (2000), who postulated that not all psychiatric or developmental disorders associated with ToM impairment can be described in terms of diminished capacity to represent mental states, and may constitute supporting evidence for the concept of hyper-theory-of-mind (Abu-Akel, 1999) consisting in a tendency to over-attribute knowledge and other mental states to others, thus making inaccurate inferences about their mental states. This over-attribution of mental states has been proposed to be present particularly in patients with paranoid and delusional symptoms. Conflicting evidence found by Pickup and Frith (2001) indicated poorer ToM performance in patients with paranoid symptoms. However, Pickup and Frith (2001) examined patients with schizophrenia who might have had cognitive deficits affecting their performance on ToM tasks, whilst our study was conducted with adolescents from the community, and thus, contradictory findings may stem from differing sample characteristics.

As for the exploration of the relationship between depressive symptoms and ToM abilities, this study yielded no evidence supporting the hypothesis that depressive symptoms contribute to ToM deficits. Depressive experiences among this sample of adolescents did not affect ToM performance. Studies indicating a significant relationship between depression and ToM have been conducted with clinically depressed patients (Lee et al., 2005; Wang et al., 2008) thus, it may be that ToM impairments associated with depression are state-dependent and occur only during symptomatic phases of the illness (Barragan et al., 2011b). It might also be that subclinical depressive symptoms are associated with impairments in emotional aspects of ToM that are not measured by the Happé Strange Stories test (1994). The study conducted by Lee et al. (2005) with depressed women assessed ToM ability with the Reading the Mind in the Eyes test, and the study by Wang et al. (2008) included assessments of both emotional and cognitive aspects of ToM. Future research on the association of ToM abilities and depressive symptoms in adolescents from the community should incorporate measures to explore both types of ToM in order to better establish whether emotional ToM abilities are affected by depressive symptoms even at a sub-clinical level.

It has been established that PLEs constitute a risk factor for psychosis (Chapman, et al., 1994; Dominguez et al., 2011; Poulton et al., 2000; Welham et al., 2009) and other clinical disorders (Dhossche et al., 2002). Additionally, an increased risk to develop internalising and externalising psychopathology in children who report PLEs persisting over time (Downs et al., 2013), as well as an increased risk to develop a clinically relevant psychotic disorder among adolescents with long-term PLEs (Dominguez et al., 2011), have been identified. Moreover, findings by Kelleher et al. (2012b) revealed that 80% of mid-adolescents aged 13–16 years who report PLEs also evidenced diagnosable psychiatric disorders. All this evidence implies that PLEs in adolescence are clinically relevant and therefore, prevention and early treatment of psychosis and even other psychopathologies should include detection and intervention in cases of PLEs, particularly in those cases in which persistence has also been detected. It has been postulated that improving ToM abilities through training techniques may have a positive effect on PLEs outcome (Sprung, 2010) which may also open new possibilities to develop intervention strategies in cases of PLEs. Future lines of research should include longitudinal assessments of PLEs and psychometric

schizotypy together with the measurement and examination of the effects of specific interventions on other associated factors such as emotional symptomatology and ToM.

As far as we know, results presented in this thesis constitute the first attempt to thoroughly examine both positive and negative PLEs and their associations with depressive symptoms in adolescents from the general population, and to explore ToM functioning and its relations with schizotypal traits, depressive symptoms, and PLEs in adolescents. The identification of specific associations of subtypes of PLEs with depressive symptoms and ToM, suggests that this approach may better inform on the relationships between specific subdimensions rather than studying global scores of positive and negative PLEs.

6. LIMITATIONS

This thesis examined associations between PLEs, schizotypy, depressive symptoms, and ToM in a community sample of adolescents. The findings here exposed should be interpreted in the light of several limitations.

The cross-sectional design of this study implies that the long-term outcomes of PLEs, schizotypal features, depressive symptoms, as well as the evolution of ToM have not been studied in this sample of adolescents.

Depressive symptoms, schizotypy, and PLEs were assessed using self-report questionnaires only, conferring a risk that adolescents misinterpreted the PLEs items. In addition, the presence of clinical disorders associated to the endorsement of PLEs, or schizotypal features, was not assessed in this study.

Measures assessing the emotional aspects of ToM were not included in this study. Thus, conclusions regarding mentalising abilities are limited to the understanding of the cognitive aspects of this construct.

7. CONCLUSIONS

- PLEs and psychometric schizotypy dimensions are relatively common during adolescence, and subtypes of positive and negative PLEs can be identified in adolescents from the general population.
- Persecutory ideation and first-rank/hallucinatory experiences in this study related to higher scores on the depressive symptoms scale, whilst grandiose thinking were associated with lower scores on depressive symptoms in adolescents from the general population.
- Specific associations can be identified between subtypes of the negative dimension (social withdrawal, affective flattening, and avolition) and depression. Thus, social withdrawal and avolition may be associated with the self-report of depressive symptoms, while symptoms reflecting affective flattening might not relate to depression.
- Not all types of positive and negative PLEs in adolescence are associated with depression and may not involve the same vulnerability for psychotic disorders. This implies that assessment of PLEs in adolescents should include the measurement of affective symptoms.
- Subtypes of positive PLEs have different effects on ToM abilities. This implies that studying subtypes of PLEs instead of global scores of positive and negative symptoms may better inform on particular associations with depression and ToM than studying global measures.
- Positive schizotypy and first-rank experiences relate to poorer ToM ability, whereas persecutory beliefs relate to better ToM performance. Other types of positive PLEs, namely, magical thinking, and hallucinatory experiences, as well as negative PLEs and negative schizotypy may not have an effect on ToM abilities in adolescents.
- ToM impairments are not restricted to the acute phase of a psychotic disorder, and were associated to positive schizotypy and first-rank

experiences. These findings constitute evidence indicating that ToM impairments can be identified during adolescence before the onset of any disease.

- Given that persecutory beliefs related to better ToM performance, these experiences may not be associated with a deficit in ToM and constitute evidence indicating that not all psychiatric or developmental disorders associated with ToM impairment involve a diminished capacity to represent mental states.
- Subclinical depressive experiences are not related to deficits in ToM performance. More research is needed to determine whether other aspects of ToM not studied in this thesis might be affected in individuals from the community with symptoms of depression.

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9. ANNEX 1

Book Chapter:

Barragan, M. and Obiols, J.O. (2013). Síntomas pseudo-psicóticos en la población general. In: Obiols, J.E. and Barrantes-Vidal, N. (Coordinadores). *Signos de riesgo y detección precoz de psicosis*. (In press) Barcelona, Spain: Síntesis

7

Síntomas pseudo-psicóticos en la población general

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7.1. Síntomas pseudo-psicóticos

Los síntomas pseudo-psicóticos (SSP)¹ o síntomas psicóticos subclínicos hacen referencia a formas atenuadas o transitorias de los síntomas que experimentan los pacientes con trastornos psicóticos, pero que no alcanzan el umbral clínico para ser considerados como casos que requieren tratamiento (Kwapil et al., 1999). Su presencia ha sido ampliamente documentada en la población general, tanto en adolescentes (Nishida et al., 2008; Lataster et al., 2006; Spauwen et al., 2003) como en adultos (Loewy et al., 2007; Mojtabai, 2006; van Os et al., 2000; Scott et al., 2006). Tradicionalmente, los síntomas psicóticos eran estudiados exclusivamente en pacientes con trastornos psicóticos; sin embargo, sabemos actualmente que la investigación de dichas experiencias en poblaciones no clínicas permite obtener información dirigida a comprender los factores de riesgo y los procesos involucrados en el desarrollo de trastornos psicóticos. Algunos investigadores consideran que la presencia ocasional de SSP

¹ Se ha optado por esta traducción del término inglés habitual de *psychotic-like symptoms*

en la población general ofrece una oportunidad para estudiar estos procesos sin las desventajas derivadas de su estudio en pacientes psicóticos, donde los efectos de la medicación, la hospitalización y las dificultades de comunicación pueden dificultar la interpretación de los hallazgos de los estudios (McCreery y Claridge, 1996).

El estudio de los SSP se deriva de la noción de “continuo psicótico” en la cual se plantea que el fenotipo o las manifestaciones de tipo psicótico se expresan en grados o niveles que se encuentran por debajo de su manifestación clínica. Desde esta perspectiva, la psicosis es entendida como un continuo de variación en distintas dimensiones de síntomas independientes pero a la vez correlacionados. Así, se ha encontrado que los individuos de la población general presentan tres dimensiones de síntomas: positivos, negativos y depresivos; donde los síntomas psicóticos positivos y negativos se asocian a síntomas depresivos, de la misma manera que ocurre en pacientes psicóticos (Stefanis et al., 2002). De este modo, la noción de continuo implica que los mismos síntomas observados en pacientes con trastornos psicóticos pueden ser observados y estudiados en poblaciones no clínicas (van Os et al., 2009) y además, significa que experimentar síntomas como delirios o alucinaciones no se relaciona necesariamente con la presencia de un trastorno. Esto último dependerá de factores como la intrusividad, la frecuencia, la duración de los síntomas y la comorbilidad o presencia simultánea de otras psicopatologías, al igual que de factores sociales y personales como la capacidad de afrontamiento, tolerancia social y el grado de deterioro asociado (Johns y van Os, 2001). Así, aunque la prevalencia o porcentaje de la población con un trastorno clínico propiamente dicho es bajo, la prevalencia de SSP es mucho más alta, lo que significa que el estudio de estos síntomas tiene una ventaja adicional que se traduce en una mayor población susceptible de ser estudiada. En consecuencia, los SSP constituyen un valioso campo para la exploración de la etiología de la psicosis y la exploración temprana de cambios neuroevolutivos relacionados con la psicosis (Kelleher y Cannon, 2011).

Los SSP pueden ser una manifestación de propensión a la psicosis o esquizotípia (Gooding et al., 2005), concepto que hace referencia a una organización psicológica y de la personalidad que involucra una vulnerabilidad a la psicosis (Lenzenweger, 2006; Meehl, 1962). Para algunos investigadores, los rasgos esquizotípicos forman parte de la variabilidad normal que se encuentra en todas las características humanas (Mason y Claridge, 2006), aunque niveles altos en estos rasgos pueden afectar el adecuado funcionamiento cognitivo, emocional y funcional del individuo (Loughland y Williams, 1997). La vulnerabilidad a la psicosis puede permanecer inactiva, sin manifestarse en la forma de un episodio o de un trastorno psicótico, a menos que sea activada por factores físicos, sociales o ambientales adversos (Claridge, 1994). Así, la mayor parte de los individuos con esquizotípia nunca desarrolla trastornos psicóticos (Meehl, 1962), lo que significa

que no es posible predecir un trastorno psicótico a partir de la presencia de puntuaciones altas en evaluaciones de esquizotipia. Sin embargo, las personas con esquizotipia presentan una propensión a diferentes trastornos del espectro esquizofrénico (Gooding et al., 2005) y otras alteraciones. Por ejemplo, se han detectado asociaciones entre esquizotipia y déficits en la fluidez verbal en adolescentes (Barrantes-Vidal et al., 2002) y con la presencia de ansiedad y depresión (Lewandowski et al., 2006).

7.2. Factores de riesgo de los SSP

7.2.1. Edad y género

Algunas características demográficas asociadas a la esquizofrenia han sido también observadas en individuos con SSP. La edad ha sido uno de los factores identificados tanto en personas con trastornos psicóticos como con SSP. Así, la adolescencia tardía y la adultez temprana han sido caracterizadas como periodos evolutivos críticos para la aparición de trastornos psicóticos (Walker y Bollini, 2002). Un patrón equivalente ha sido observado en el caso de los SSP. Estos síntomas son generalmente experimentados por jóvenes y la evidencia indica que la prevalencia de estos síntomas en la población general se reduce en el transcurso de la infancia a la adultez, de modo que los SSP persistentes más allá de esta etapa del desarrollo se limitan a un pequeño porcentaje de la población. En aquellos casos en que persisten, tienden a generar deterioro social y del funcionamiento general (Rössler et al., 2007). Una investigación de los SSP en la niñez media, entre los 9 y los 11 años de edad (Laurens et al., 2007), reveló un incremento en el auto-informe de alucinaciones visuales en niños de 11 a 12 años de edad comparado con los niños de menor edad (9 a 10 años). La figura 7.1 adaptada de van Os et al. (2009) ilustra el patrón normal de evolución de los SSP transitorios, al igual que otros tipos de evolución donde los síntomas persisten y llegan a dar paso a un trastorno psicótico.

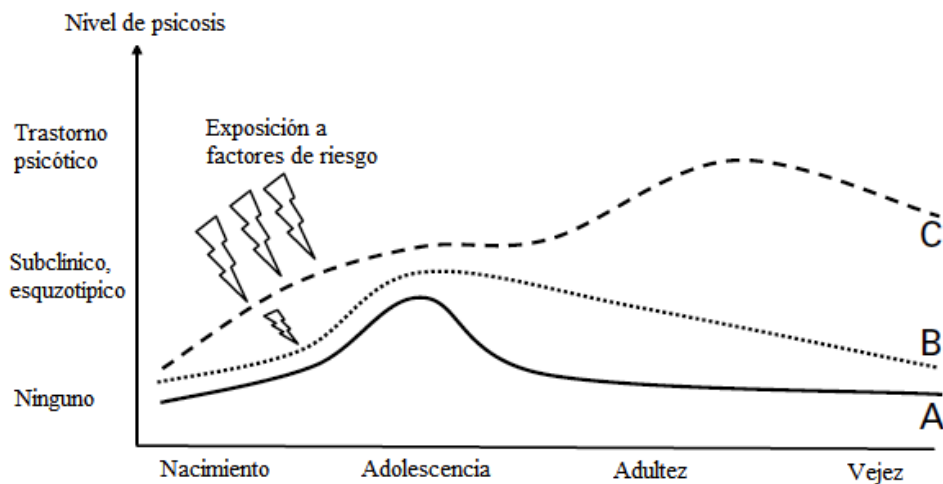


Figura 7.1. Activación e inicio de un trastorno psicótico. La persona A tiene manifestaciones psicóticas transitorias 'normales' en su adolescencia. La persona B tiene manifestaciones similares pero más prolongadas debido a una exposición ambiental moderada (factores de riesgo). La persona C, después de experimentar una persistencia más prolongada debido a una exposición ambiental repetida y severa, desarrolla un trastorno psicótico con deterioro significativo. Figura tomada de van Os et al. (2009).

Por otro lado, se han identificado diferencias de género en la expresión de los síntomas psicóticos en pacientes con esquizofrenia (Grossman et al., 2008; Cotton et al., 2009) y en adultos que experimentan SSP y rasgos de personalidad esquizotípicos, donde los hombres, por lo general, refieren más síntomas negativos y las mujeres más síntomas positivos (Maric et al., 2003; Scott et al., 2008). Resultados preliminares obtenidos por nuestro grupo en una muestra de 770 adolescentes de la población general, indican la presencia de diferencias de género en esquizotipia, donde las adolescentes obtuvieron puntuaciones más altas en esquizotipia positiva y desorganizada, mientras los adolescentes (hombres) obtuvieron puntuaciones significativamente más altas en las dimensiones negativas e impulsivas de esquizotipia (Barragan et al., artículo en preparación). Algunas diferencias de género en la expresión de SSP también han sido detectadas desde etapas más tempranas del desarrollo. Por ejemplo, un estudio en el que se evaluaron niños de la población general con edades comprendidas entre los 9 y los 12 años, indicó que los niños presentaban significativamente más síntomas positivos que las niñas (Laurens et al., 2007). Sin embargo, otros estudios muestran una distribución equitativa de los SSP entre géneros. Por ejemplo, el estudio de Bartels-Velthuis et al. (2010), no arrojó diferencias de género asociadas a alucinaciones auditivas en niños de 7 y 8 años de edad. Las

investigaciones llevadas a cabo por Yoshizumi et al. (2004), con niños de la población general de 11 y 12 años de edad o la de Scott et al. (2009), con adolescentes entre los 13 y 17 años de edad tampoco mostraron diferencias de género relativas a la manifestación de alucinaciones, de tal forma que el género es una variable demográfica cuya influencia en la manifestación de los SSP no ha sido completamente determinada y requiere aún mayor investigación.

La edad también afecta las diferencias de género asociadas a las expresiones psicóticas en adultos (Bora y Arabaci, 2009) y adolescentes (Spauwen et al. 2003) que indica un inicio más temprano en la manifestación de SSP en los hombres comparado con las mujeres.

7.2.2. Pertenencia a minorías

La pertenencia a minorías étnicas o grupos migrantes es otra variable ambiental asociada a la presencia de trastornos psicóticos (Fearon et al., 2006). Esta asociación también ha sido observada en adultos británicos de la población general de origen africano-caribeño, grupo que en el estudio de Johns et al. (2002) tenía una probabilidad 2.5 veces mayor de experimentar SSP que la población británica blanca. Asimismo, en el estudio de Laurens et al. (2008) esta tendencia fue observada desde la niñez (9-11 años). Allí se encontró que los niños británicos de etnia africana-caribeña experimentaban SSP con mayor frecuencia que los niños británicos blancos.

7.2.3. Otros factores ambientales

Otros factores ambientales relacionados con la presencia de SSP incluyen bajo nivel educativo y baja calidad de vida (van Os et al., 2000). La residencia en centros urbanos también ha sido asociada a los SSP y a los trastornos psicóticos (Scott et al., 2006), de manera que las personas residentes en entornos urbanos, con una mayor densidad de población, tienden a mostrar un incremento en la prevalencia de SSP en escalas que evalúan la presencia de creencias extrañas/pensamiento mágico y en pruebas dirigidas a detectar esquizotipia (Stefanis et al., 2004).

Los resultados del meta-análisis llevado a cabo por van Os et al. (2009) mostraron que la exposición a cannabis, alcohol u otras sustancias psicoactivas estaba asociada a una alta prevalencia de experiencias psicóticas subclínicas. Este

estudio evidenció además que las experiencias traumáticas o estresantes predecían niveles elevados de SSP.

7.2.4. Factores familiares y herencia

El estudio prospectivo de Polanczyk et al. (2010), reveló que los SSP en niños tenían un componente familiar y hereditario. A partir del seguimiento a 2232 gemelos (de 1116 familias) desde los 5 hasta los 12 años de edad, se encontraron mayores asociaciones entre gemelos monocigóticos que entre gemelos dicigóticos, lo que sugirió una influencia genética para la manifestación de SSP. Asimismo, las madres de los niños con síntomas psicóticos tenían una mayor probabilidad de presentar trastornos del espectro psicótico y mayores niveles de emoción expresada negativa. En las familias de estos niños se encontraron más personas ingresadas en unidades psiquiátricas, al igual que con intentos de suicidio o suicidio consumado.

7.2.5. Alteraciones cognitivas

Algunas alteraciones cognitivas presentes en los pacientes con esquizofrenia también han sido detectadas en parientes no afectados por la enfermedad. Por ejemplo, en el estudio de Keshavan et al. (2010) se identificaron déficits en atención, función ejecutiva, velocidad en el procesamiento de la información, cognición social, inteligencia general, al igual que en memoria de trabajo, verbal y visual en esta población.

Las personas con esquizotipia y SSP también pueden presentar alteraciones cognitivas. El estudio de Barnett et al. (2012) evidenció una relación entre el funcionamiento cognitivo en la niñez y la presencia de SSP en la adultez. En esta investigación, los adultos con síntomas psicóticos relevantes a la edad de 36 años o que experimentaron SSP a la edad de 53 años obtuvieron puntuaciones más bajas en evaluaciones de habilidades cognitivas a los 8, 11 y 15 años de edad. Otro estudio mostró alteraciones significativas en el desarrollo neuromotor, lenguaje receptivo, inteligencia y desarrollo emocional en una cohorte de niños evaluados desde los 3 años de edad que refirieron SSP a la edad de 11 años y que recibieron un diagnóstico de trastornos esquizofreniforme a la edad de 26 años (Cannon et al., 2002). Estos resultados sugieren que el proceso que culmina con el desarrollo de un trastorno psicótico puede empezar temprano en la infancia y los SSP la niñez al parecer constituyen signos de este proceso.

En el ámbito de la cognición social, la evidencia más sólida de alteraciones en personas que experimentan SSP ha sido encontrada en lo relativo

a la 'teoría de la mente' (ToM). El concepto de 'teoría de la mente' (ToM) o mentalización (Premack y Woodruff, 1978), hace alusión a un aspecto de la cognición social que involucra la habilidad para atribuir estados mentales, tales como, creencias, deseos o intenciones a otras personas con el fin de comprender y predecir su comportamiento. Tener ToM implica reconocer que las otras personas tienen mentes diferentes de la propia (Frith, 1992) y que los otros son agentes cuyo comportamiento está determinado por sus propios objetivos (Gallagher y Frith, 2003). La investigación en el tema, ha evidenciado la presencia de alteraciones en ToM en parientes en primer grado de pacientes con un diagnóstico de psicosis y en personas que experimentan SSP o rasgos esquizotípicos. Asimismo, se han descrito déficits en ToM en adultos con esquizofrenia (Corcoran et al., 1995), en niños y adolescentes con autismo (Baron-Cohen et al., 1985; Happè, 1994) y en adultos con depresión (Lee et al. 2005; Wang et al., 2008).

La relación entre SSP y déficits en la teoría de la mente (ToM) ha sido documentada. Langdon y Coltheart (1999) encontraron déficits en ToM en individuos de la población general con rasgos esquizotípicos y comportamientos asociales. Pickup (2006) evaluó los niveles de esquizotipia y la ToM en 62 personas adultas de la población general y encontró déficits en ToM en las personas con puntuaciones más altas en la dimensión de esquizotipia que evalúa síntomas positivos.

Nuestro grupo de investigación ha estudiado la asociación entre ToM, SSP y esquizotipia en 72 adolescentes de 13 a 16 años de edad de la población general española (Barragán et al., 2011a) y ha encontrado algunas características del funcionamiento de la ToM en los jóvenes que referían mayor sintomatología positiva. Los resultados mostraron un desempeño más bajo en la evaluación de ToM en los adolescentes con puntuaciones más altas en algunos SSP positivos, en particular, en síntomas de primer orden (por ejemplo, robo del pensamiento) y en síntomas de esquizotipia positiva. Por el contrario, otro tipo de SSP positivos; las ideas persecutorias, se relacionaron con un adecuado funcionamiento en ToM. Este último resultado sugiere, en el caso de los adolescentes de la población general, que no todos los trastornos psiquiátricos o del desarrollo asociados a alteraciones en ToM pueden ser descritos en términos de una capacidad disminuida para representar estados mentales, replicando así los resultados que habían sido previamente obtenidos en muestras de población adulta (Abu-Akel y Bailey, 2000).

Investigaciones que han evaluado ToM en adultos con ideación persecutoria pero sin otras patologías, han arrojado puntuaciones altas en las evaluaciones de ToM, al igual que atribuciones complejas y adecuadas de estados

mentales, concluyendo que la ideación persecutoria es un síntoma que requiere una capacidad de mentalización intacta (Walston et al., 2000). Al respecto, se ha planteado que algunos individuos, como por ejemplo los pacientes con esquizofrenia con predominio de síntomas positivos, podrían tener alteraciones en la ToM derivadas de la tendencia a sobre-atribuir conocimiento a los demás, lo que a su vez, llevaría a hacer inferencias desacertadas acerca de los estados mentales de los otros. Esta alteración se ha denominado “hiper-mentalización” o “hiper-teoría de la mente” y podría ser causada por una incapacidad para detener la generación de hipótesis sobre los estados mentales de los demás, que puede afectar el número o el contenido de las representaciones generadas (Abu-Akel, 1999).

7.3. Evolución de los SSP y factores asociados a su persistencia o remisión

Ya se ha mencionado que los SSP tienden a reducirse y a remitir en la adultez; sin embargo, existe un porcentaje de la población que continúa experimentando de manera persistente estos síntomas. Estas personas se encontrarían en un mayor riesgo de desarrollar diferentes psicopatologías o bien de sufrir deterioro en su funcionamiento general. Algunos investigadores han buscado identificar los factores que podrían influir en el curso de los SSP. Por ejemplo, Hanssen et al. (2005), examinaron la incidencia y evolución de los SSP en un periodo de dos años, en personas sin antecedentes de SSP. Al cabo de un año, el 2% de las personas evaluadas desarrolló SSP y después de dos años el 8% de este grupo de personas continuaba experimentando síntomas. Los investigadores encontraron que los SSP persistían en mayor medida en las personas con múltiples síntomas (13,3%) que en las personas que sólo referían uno sólo (6,9%), en cuyo caso los síntomas tendían a desaparecer. Este estudio sugirió que la evolución más probable de los SSP es la remisión y aquellos que persisten tienen una mayor probabilidad de continuar como experiencias subclínicas, sin dar paso a trastornos psicóticos.

Una reciente investigación siguió la trayectoria de los SSP en niños de 9 a 11 años de edad en un periodo de dos años (Downs et al., 2013), y reveló que los niños con síntomas persistentes tenían un riesgo dos veces mayor de desarrollar psicopatología internalizante (por ejemplo, síntomas emocionales) y externalizante (problemas de conducta, hiperactividad), que los niños sin antecedentes de SSP y que aquellos cuyos síntomas remitieron en el curso del estudio. A partir de estos hallazgos se concluyó que los SSP persistentes durante la niñez media pueden contribuir al desarrollo de trastornos internalizantes y externalizantes, mientras que los SSP transitorios, limitados en el tiempo, pueden

constituir experiencias inocuas que no se asocian a un aumento en el riesgo de presentar patologías.

La trayectoria o evolución de los SSP ha sido estudiada por Mackie et al. (2010), quienes identificaron tres tipos de trayectoria, al igual que algunos factores de riesgo que predecían el tipo de trayectoria que seguirían los SSP en un grupo de adolescentes (promedio de 14.7 años de edad) durante un periodo de 18 meses. Los tres tipos de evolución de los SSP identificados en este estudio fueron denominados: persistente, en aumento y baja. En la trayectoria persistente, los adolescentes presentaban un mayor número de SSP al inicio del estudio, seguido por un aumento en los síntomas y un leve descenso al final del estudio. Los SSP en aumento eran experiencias moderadas al inicio del estudio que con el tiempo se incrementaron de manera significativa. Finalmente, en la trayectoria baja, las puntuaciones en SSP se mantuvieron bajas durante los 18 meses de evaluación. Esta investigación también arrojó información sobre los factores de riesgo asociados a cada tipo de trayectoria de los SSP, de tal manera que, en el caso de los adolescentes con una trayectoria persistente, se hicieron evidentes niveles altos de ansiedad, depresión y experiencias de victimización. A su vez, los adolescentes que siguieron esta trayectoria refirieron un consumo creciente de alcohol, tabaco, al igual que un uso ocasional de otras drogas. Por su parte, se identificó como principal factor de riesgo asociado a los SSP en aumento un consumo de sustancias que también siguió una trayectoria creciente durante el transcurso de la investigación, en ausencia de otras dificultades emocionales o de un consumo significativo de alcohol.

7.4. Prevalencia de los síntomas pseudo-psicóticos en la población general

Aproximadamente el 5.3% de los adultos de la población general experimentan SSP, de acuerdo con los resultados del meta-análisis llevado a cabo por van Os et al. (2009). Este porcentaje, en el caso de niños y adolescentes de la población general, se encuentra alrededor del 17% en niños con edades comprendidas entre los 9 y los 12 años y alrededor del 7.5% en adolescentes de 13 a 18 años de edad, según una revisión sistemática de 19 estudios en el tema, llevada a cabo recientemente por Kelleher et al. (2012a).

Las investigaciones que han buscado establecer la prevalencia de SSP han examinado, en su mayoría síntomas positivos, tales como alucinaciones y delirios, y han mostrado que estos síntomas son relativamente comunes en adultos de la población general, con prevalencias que oscilan entre el 5 y el 17% (van Os et al., 2000; Scott et al., 2006; Mojtabai, 2006, ver cuadro 7.1). Investigaciones llevadas

a cabo con niños y adolescentes, han mostrado una amplia variabilidad en las prevalencias de SSP positivos que oscilan entre el 9% y el 66% (Bartels-Velthuis et al., 2010; Downs et al., 2013; Lataster et al., 2010; Laurens et al., 2007; Nishida et al., 2008). Por ejemplo, Yoshizumi et al. (2004) encontraron que un 21% de los niños de 11 y 12 años de edad experimentaban alucinaciones, mientras otros estudios arrojan prevalencias de experiencias alucinatorias más bajas (Dhossche et al., 2002; Scott et al., 2009, ver cuadro 7.1). En el estudio de Barragán et al. (2011b) que evaluó síntomas positivos, negativos y depresivos en adolescentes de la población española, el 39% de los jóvenes refirió experimentar muy frecuentemente (“casi siempre”) al menos un SSP positivo, mientras el 21% refirió al menos un síntoma negativo con esa misma frecuencia. Asimismo, se ha encontrado que entre la adolescencia temprana y media, la prevalencia de SSP presenta una notable reducción; pasando del 21% en adolescentes de 11 a 13 años de edad, al 7% en adolescentes de 13 a 16 años (Kelleher et al., 2012b).

En cuanto a los tipos específicos de SSP descritos en la población general, Mojtabai (2006) encontró que algunos de los síntomas más frecuentes eran: alucinaciones auditivas (2,2%), alucinaciones visuales (2%), ideas de referencia (1,4%), ideación paranoide (1%) y robo de pensamientos (0,8%). Por su parte, Peters et al. (1999) encontraron puntuaciones elevadas en ideación delirante en el 10% de una muestra de adultos de la población general.

Cuadro 7.1. Prevalencia de SSP en la población general

<i>Estudio</i>	<i>Número de participantes</i>	<i>Edad (años)</i>	<i>Prevalencia</i>
<i>Estudios con adultos</i>			
Mojtabai (2006)	38132	Adultos desde los 18 años	5.1% síntomas positivos
Scott et al. (2006)	10641	Adultos desde los 18 años	11,7% síntomas positivos
van Os et al. (2000)	7076	18-64	17.5% síntomas positivos
<i>Estudios con adolescentes y niños</i>			
Downs et al. (2013)	8099	9-12 al inicio del estudio	66% síntomas positivos: alucinaciones, delirios
Kelleher et al. (2012b)	2666	11-16	21% a los 11-13 años de edad 7% a los 13-16 años de edad
Barragán et al. (2011b)	777	13-17	39% síntomas positivos 21% síntomas negativos
Bartels-Velthuis et al. (2010)	3870	7-8	9% alucinaciones auditivas
Lataster et al. (2010)	1290	14	19,1% delirios y alucinaciones
Scott et al. (2009)	1490	13-17	8,4% alucinaciones
Nishida et al. (2008)	4894	12-15	15,2% delirios y alucinaciones

Laurens et al. (2007)	584	9-12	29,9% alucinaciones auditivas	
			28,3% alucinaciones visuales	
Yoshizumi et al. (2004)	761	11-12	21% alucinaciones	
Dhossche et al. (2002)	914	11-18	5% alucinaciones auditivas	
			2% alucinaciones visuales	
Poulton et al. (2000)	761	11	14,7% delirios y alucinaciones	

7.5. Síntomas pseudo-psicóticos como factor de riesgo de psicosis y otros trastornos

La investigación dirigida a estudiar los SSP en adultos y niños de la población general ha evidenciado que estas experiencias representan un factor de riesgo para el desarrollo de trastornos del espectro psicótico. En el estudio de Dunedin, Nueva Zelanda, Poulton et al. (2001) encontraron una relación entre la presencia de SSP a la edad de 11 años y un aumento de 5 a 16 veces en el riesgo de desarrollar un trastorno psicótico a los 26 años de edad; a medida que se incrementaba la intensidad de los síntomas referidos a los 11 años de edad, también aumentaba el porcentaje de participantes con síntomas de esquizofrenia a los 26 años. Estos resultados fueron replicados por Welham et al. (2009) cuyo estudio evidenció que el auto-informe de experiencias alucinatorias a los 14 años de edad incrementaba la probabilidad de presentar un trastorno psicótico a los 21 años de edad.

Los estudios de SSP sugieren asimismo que la relevancia de estas experiencias va más allá de la psicosis. Se han descrito asociaciones entre la presencia de SSP y una disminución en la calidad de vida (Svirkis et al., 2007), malestar emocional y comportamientos violentos (Mojtabai, 2006). Aunque su tendencia es a disminuir con la edad, en los casos en que persisten, existe un mayor riesgo de experimentar deficiencias sociales y en el funcionamiento general (Rössler et al., 2007). De la misma manera, la gente joven que manifiesta SSP se encontraría en un mayor riesgo de presentar otras manifestaciones clínicas, por ejemplo, cumpliendo los criterios para el diagnóstico de trastornos del espectro esquizofrénico de menor severidad como la esquizotipia (Gooding et al., 2005). También tendrían una mayor probabilidad de presentar otras

psicopatologías, como la depresión. En este sentido, en el estudio de Dhossche et al. (2002) el auto-informe de alucinaciones a los 14 años de edad no estuvo asociado con el diagnóstico de trastornos psicóticos; sin embargo, estas experiencias si mostraron una estrecha relación con el desarrollo de trastornos depresivos y abuso de sustancias en la adultez joven. Otros estudios han examinado si la depresión aumenta el riesgo de experimentar estos síntomas y por lo tanto de desarrollar trastornos psicóticos. Por ejemplo, Van Rossum et al. (2009) encontraron que los síntomas de depresión o manía se asociaron con SSP positivos en adolescentes y adultos jóvenes de la población general.

Yung et al. (2006), encontraron que en los casos en que a los SSP se suman síntomas de depresión existe mayor riesgo de desarrollar trastornos psicóticos. En un estudio posterior Yung et al. (2007) examinaron la influencia de la depresión en los SSP en una muestra de 149 adolescentes y adultos jóvenes sin trastornos psicóticos. En esta investigación se evaluó a los participantes en dos ocasiones: al inicio del estudio y seis meses después. Los resultados mostraron una reducción en los SSP en aquellos individuos cuyos síntomas de depresión remitieron a los seis meses de seguimiento, lo que sugirió que la depresión es una variable de gran importancia para el pronóstico de los SSP.

Algunas investigaciones han buscado clarificar aún más la relación entre depresión y síntomas psicóticos y han permitido establecer que no todos los tipos de síntomas psicóticos se relacionan con la presencia de síntomas depresivos. En este sentido, algunos subtipos de síntomas psicóticos positivos, como las experiencias extrañas (por ejemplo, sentir que los pensamientos no pertenecen a uno mismo o que le están siendo arrebatados) y la ideación persecutoria (por ejemplo, creer que las personas lanzan indirectas, o sentir que se es observado por otros de manera extraña) se han relacionado con mayor malestar, síntomas depresivos y pobre funcionamiento (Yung et al., 2009 y Armando et al., 2010). Es decir, este tipo de experiencias psicóticas podrían representar un indicador de riesgo para el desarrollo de un trastorno psicótico y por el contrario, síntomas como el pensamiento mágico, cuya presencia usualmente no se asocia a depresión o pobre funcionamiento, podrían ser benignos, siempre que no sean experimentados con algún grado de malestar. Esta evidencia sugiere que la identificación de SSP asociados a depresión y malestar es una herramienta útil para la detección precoz de personas con SSP que se encuentran en un mayor riesgo de desarrollar trastornos psicóticos.

La relación entre SSP y síntomas depresivos subclínicos también ha sido estudiada en adolescentes de la población general española. En el trabajo llevado a cabo por nuestro grupo (Barragán et al., 2011b) se estudiaron 777 adolescentes de la población general con edades comprendidas entre los 13 y los 17 años y se

encontró una relación entre algunos subtipos de síntomas positivos y síntomas depresivos. Así, la ideación persecutoria y las experiencias alucinatorias y síntomas de primer rango (por ejemplo, creer que otras personas oyen los propios pensamientos) se asociaron a un incremento en los síntomas depresivos, lo que sugiere que este tipo de síntomas pueden llegar a ser más invasivos y generadores de malestar en el individuo que otros síntomas como las ideas de grandiosidad o los pensamientos auto-referenciales.

Los síntomas negativos, por su parte, se han asociado con la presencia de síntomas positivos y con deterioro funcional en adolescentes y adultos jóvenes de la población general (Dominguez et al., 2010). Además, los rasgos esquizotípicos negativos, particularmente la anhedonia social, han sido identificados como posibles antecedentes de trastornos psicóticos (Horan et al., 2007; Gooding et al., 2005). Algunas investigaciones han sugerido que estos síntomas generalmente no se asocian a síntomas depresivos (Kerns, 2006), mientras otras revelan que la depresión se asocia tanto a síntomas positivos como negativos de psicosis, en muestras clínicas (Rosen et al., 2006) y en la población general (Stefanis et al., 2002). Sin embargo, existen pocos estudios que examinen en detalle la relevancia clínica de los síntomas negativos en la población general. El estudio de Barragan et al. (2011b) evidenció que si bien algunas dimensiones de síntomas negativos no guardan relación con los síntomas depresivos, como es el caso de los síntomas que reflejan un aplanamiento afectivo, otros tipos de síntomas negativos como el retraimiento social y la abulia sí se asocian con mayor sintomatología depresiva en adolescentes de la población general. En tales casos, según se planteó en este estudio, la presencia de síntomas depresivos podría actuar como un amplificador de los síntomas negativos y serían un indicador de riesgo de desarrollar trastornos psicóticos o incluso otro tipo de psicopatología. En el caso de los síntomas de aplanamiento afectivo, Kerns (2006) señala que tales síntomas involucran una disminución en la capacidad para experimentar e identificar estados emocionales, lo que junto a la falta de síntomas depresivos, ha sido identificado por otros autores (Häfner et al., 1999) como predictor de un peor pronóstico en pacientes con esquizofrenia. Estas observaciones parecen indicar que el aplanamiento afectivo representa un importante factor de riesgo de desarrollar psicosis.

Cuadro 7.2. Antecedentes, ventajas y hallazgos derivados del estudio de los SSP en la población general

<i>Antecedentes que motivaron estudio de SSP</i>	<i>Ventajas del estudio de los SSP</i>	<i>Hallazgos</i>
<p>Concepción de psicosis como continuo</p> <p>Síntomas no equivalen a presencia de un trastorno, pero si pueden indicar mayor riesgo de desarrollarlo</p> <p>Síntomas positivos y negativos de psicosis pueden ser observados en la población general</p>	<p>Mejorar comprensión de factores de riesgo de psicosis y etiología</p> <p>Evitar sesgos derivados de la investigación con pacientes: efectos medicación, hospitalización</p>	<p>Tienen componente genético y familiar</p> <p>Aparición en niñez, adolescencia, adultez temprana</p> <p>Asociados a alteraciones en procesos cognitivos</p> <p>Factores de riesgo ambientales: Centros urbanos, minorías, bajo nivel educativo, uso de drogas</p> <p>Evolución: tendencia a remitir. Depresión, ansiedad y factores ambientales favorecen persistencia de SSP y aumentar riesgo de psicopatología</p>

7.6. Conclusiones

En esta revisión se han presentado algunos de los hallazgos más relevantes en la investigación sobre las manifestaciones subclínicas de la psicosis (Cuadro 7.2.). Esta línea de investigación, que examina en la población general los síntomas presentes en los pacientes que padecen psicosis, (por ejemplo, alucinaciones, delirios, aplanamiento afectivo, abulia o retraimiento social), ha abierto importantes posibilidades para ampliar la comprensión de los factores de riesgo y los procesos asociados al desarrollo de trastornos psicóticos, al igual que

de los factores de protección con el fin de diseñar e implementar estrategias de prevención e intervención temprana de las psicosis.

El estudio de los SSP se deriva de la visión de la psicosis como un continuo en el que los síntomas psicóticos pueden ser observados en personas sin el trastorno y a la vez implica que la presencia de los síntomas no equivale necesariamente a la presencia de la enfermedad. Las investigaciones revisadas en este capítulo sugieren la validez de la noción de continuo, reflejada entre otras cosas, en numerosos factores de riesgo asociados a la esquizofrenia que han sido también identificados en individuos de la población general con SSP. Los SSP tienen un componente genético y familiar, se manifiestan con más frecuencia en la adolescencia y adultez temprana, aunque estudios recientes identifican su aparición desde la niñez media (8-11 años de edad), se asocian a alteraciones en procesos cognitivos como la teoría de la mente (ToM), y a factores sociodemográficos como la pertenencia a minorías, bajo nivel educativo, residencia en centros urbanos y uso de drogas.

Esta revisión de la investigación sobre los SSP señala que la evolución más probable de los SSP en la población general es la remisión. Sin embargo, factores como la presencia de múltiples SSP, ansiedad, depresión, victimización y consumo de alcohol se han asociado a la persistencia de estos síntomas, lo que a su vez se relaciona con una peor calidad de vida y funcionamiento general. Asimismo, se ha puesto de manifiesto que los SSP constituyen un factor de riesgo de psicosis y otras patologías como depresión y abuso de sustancias. Respecto a la depresión, se ha señalado el importante rol que desempeña en el pronóstico de los SSP. La investigación indica que la presencia simultánea de síntomas depresivos y SSP incrementa el riesgo de desarrollar psicosis, a la vez que una reducción en los síntomas depresivos se traduce en una reducción en los SSP. De allí ha surgido el interés por analizar la asociación entre depresión y SSP con mayor detalle, encontrándose que algunos síntomas positivos, como la ideación persecutoria y las experiencias bizarras y otros síntomas negativos como retraimiento social y abulia, se asocian a un mayor malestar y depresión y por lo tanto pueden ser indicadores de un mayor riesgo de psicosis.

Así, la investigación y los esfuerzos por desarrollar estrategias preventivas y de intervención temprana de los trastornos psicóticos pueden incluir el seguimiento longitudinal de los SSP, dado que su persistencia se asocia a un incremento en el riesgo de psicosis y otras patologías, al igual que la evaluación e intervención sobre otros síntomas y condiciones ambientales que se asocian a la persistencia de los SSP, tales como los síntomas depresivos, exposición a experiencias de victimización o el consumo de sustancias.

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