MINOR PYHSICAL ANOMALIES AND THE SPECIFIC SYMPTOMS OF SCHIZOPHRENIA

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Abstract

Schizophrenia is neurodevelopmental disorder characterized by a three-factor structure consisting of positive, negative, and disorganized symptoms. In addition to the symptoms of the disorder, individuals also present with several cognitive deficits. Individuals diagnosed with schizophrenia have also been observed to have minor physical anomalies (MPAs), which are slight differences in the dermis, cartilaginous, and bone structures. The research connecting these MPAs to symptoms and cognitive deficits is limited. Most studies have examined the total number of MPAs present, and not the severity by which they are expressed, and ratings of symptoms. This research aimed to link the severity-specific MPAs seen in schizophrenia to the severity of specific symptoms and cognition by quantitatively measuring MPAs. This study did not find significant relations between MPA severity and symptom ratings nor cognition. Interesting trends were present for hair whorl placement and the gap between the first and second toes. Post-natal injuries in MPA areas were not assessed. This study used hand tools for the measurement of MPAs and missing data for individuals reduced the sample size for individual tests. The sample size of this study was found to be underpowered to find significant differences if any exist.

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Introduction

Minor Physical Anomalies and Specific Symptoms of Schizophrenia

Schizophrenia is a debilitating disorder that afflicts approximately 1% of the population. This disorder has an onset in early adulthood and affects all facets of an individual's life, including social, occupational, and personal functioning. The neurodevelopmental model of schizophrenia (Weinberger, 1987) posits that both genetic and environmental factors contribute to structural brain changes during the in-utero development of a fetus and continue through life. These contributing factors are believed to predispose an individual to developing schizophrenia. Minor physical anomalies (MPAs) are subtle differences of the head, hands, and feet that have been shown to be biomarkers of neurodevelopment (O'Callaghan et al., 1995; Green, Bracha, Satz, & Christenson, 1994; McGrath, van Os, Hoyos, Jones, Harvey, & Murray, 1995). Previous research has found that people with schizophrenia have increased MPAs (e.g., Lal & Sharma, 1986; McGrath et al., 2002), but MPAs have not been linked to specific symptoms or cognitive deficits in people with schizophrenia.

MPAs on different parts of the body emerge at specific points during embryogenesis and in utero development, which may provide clues as to when development was disrupted. As such, MPAs may serve as a "fossil record" of problems in development (Cheung et al, 2011), meaning they are likely markers of abnormal development occurring during the gestation process. MPAs in schizophrenia are likely due to genetic or teratogenic factors during in utero development. Determining which of the MPAs are more strongly associated with the symptoms and cognitive deficits of schizophrenia, may help to establish a clearer time frame of when a fetus is at risk for developing the disorder. By examining the severity in the expression of MPAs, the associated symptoms, and cognitive deficits, this research can lead us to a better understanding of the

developmental course by pointing to specific in utero developments that predispose individuals to develop schizophrenia.

MPAs are subtle variations in soft tissue, cartilaginous, and bony structures that are the result of a mix of genetic and environmental factors operating prenatally. These physical anomalies are considered biomarkers, as they are not themselves risk factors for the development of schizophrenia rather manifestations of the underlying disease liability (Lenzenweger, 2013, Gottesman & Gould, 2003). They are believed to be due to an interaction of genetics and teratogens during the developmental period when the brain and afflicted areas of the body are developing in tandem. MPAs seen in the face, hands, and feet are more common, but are also present on the head and mouth regions. An impressive body of research has found that MPAs are more common in people with schizophrenia than in the general population (e.g., Aksoy-Poyraz, Poyraz, Turan, & Arikan, 2011; Gualtieri, Adams, Shen, & Loiselle, 1982; Ismail, Cantor-Graae, & McNeil, 2000; Lin et al., 2012; Raedler, Knable, & Weinberger, 1998, O'Callaghan et al, 1995) with some estimates of MPAs being twice as common among people with schizophrenia (Lohr & Flynn, 1993). In addition, longitudinal studies have found that MPAs measured at age 10-13 are a robust predictor of the development of schizophrenia later in life (Golembo-Smith et al., 2012). Some research shows differences in MPAs among non-affective psychosis patients, affective psychosis patients, and healthy controls. First-episode psychosis patients present with differences in overall facial symmetry, symmetry of the orbital landmarks, and lowered Frankfurt lines (craniofacial measurement from the opening of the ear canal to the lower ocular orbit), and affective psychosis participants had lowered eye fissures compared to healthy controls (Lloyd et al., 2008). This research shows differences in MPAs between the first-episode psychosis patients and individuals with affective psychosis. Much of this research has treated MPAs as a

categorical presence or absence variable, as opposed to a continuous variable that takes into account the severity of the expression of MPAs. If MPAs are a marker of neurodevelopment, it is possible that more severe disturbances in neurodevelopment could result in more severe MPAs. Thus, the current research measured MPAs dimensionally to examine whether severity of MPAs is related to the severity of symptoms and cognitive deficits in people with schizophrenia.

Along with the varying physical expression of MPAs, symptoms of schizophrenia also vary among individuals with the disorder. A long line of research suggests that schizophrenia is comprised of three symptom factors: positive, negative, and disorganized (Arndt, Alliger, & Andreasen, 1991; Miller, Arndt, & Andreasen, 1993). Positive symptoms refer to psychosis, characterized by delusions (false fixed beliefs that are resistant to change) and hallucinations (sensory experiences of perception without corresponding stimuli). These symptoms are considered positive symptoms because they are additional experience for the person with schizophrenia that are absent in non-afflicted individuals. Negative symptoms are altered or reduced emotional responses; including blunted affect (a reduction in the expression of emotions), speech deficits, social anhedonia (lack of enjoyment in social situations), and avolition (lack of motivation) (Andreasen, 1982). Negative symptoms are referred to as negative because they represent deficits in functioning when compared to non-afflicted individuals. Disorganized symptoms involve confused thinking that may lead to difficulty communicating (Carson, 2000). Disorganized symptoms include formal thought disorder, bizarre and/or disorganized behavior, and inappropriate affect.

MPAs seen in schizophrenia are due to both genetic and environmental factors beginning at conception and lasting through life. When these genetic factors and teratogens produce brain abnormalities, they also modify other parts of the body, including the head, hands, mouth, face,

and feet. This phenomenon is also seen in Fetal Alcohol Syndrome. The influence of alcohol (a teratogen) on the developing fetus manifests a distinctive pattern of abnormal facial features (Mattson, Schoenfield, & Riley, 2001). Thus, MPAs may serve as an external biomarker for disrupted neurodevelopment. Research shows there are two possible explanations to account for the link between MPA and schizophrenia: genetic abnormalities and retinoid interruption. One genetic syndrome linked to both schizophrenia and MPAs is velocardiofacial syndrome (VCFS). Estimates of 25-37.5% of patients with VCFS have been diagnosed with schizophrenia or schizoaffective disorder (Cohen et al., 1999; Shprintzen, Goldberg, & Golding-Kushner, 1992; Pulver et al., 1994; Murphy Owen, 1997). Many others are thought to meet criteria for schizophrenia but cannot be diagnosed because IQ can be severely diminished in these individuals and self-report of symptoms becomes unreliable (Chow, Bassett, & Weksberg, 1994).

VCFS is a genetic disorder characterized by MPAs, primarily in the facial appearance, and is associated with heart defects and brain abnormalities. Facial MPAs commonly observed in VCFS patients include elongated face, hypertelorism, bulbous nose (Gothelf et al., 1999), cleft palate, and bone abnormalities (Ryan et al., 1997). Genetic deletions of the 22q11.2 genetic locus are the leading cause of the VCFS. Observations of VCFS patients having a high susceptibility to schizophrenia have lead researchers to link the deletion of genetic locus of 22q11.2 to the developmental processes of schizophrenia (Carlson et al., 1997; Chow, Bassett, & Weksberg, 1994; Cohen, Chow, Weksberg, & Bassett, 1999; Reis et al., 2013). It is believed the deletion at the 22q11 locus disrupts the rostral crest (the fetal area that develops the face and head), or the cells with which the neural crest (migratory cells that differentiate into facial cartilage, bone)

interacts, at a critical phase of organogenesis (Scambler, 2000). Thus, VCFS is a risk factor for schizophrenia that is marked by MPAs.

The second developmental avenue associated with schizophrenia and the development of MPAs is retinoid interruption (Goodman, 1998; Anchan, Drake, Haines, Gerwe, & Lamantia, 1997). Retinoids interact in an intricate way with the body by a complex genetic cascade that transforms beta carotene into retinoic acid, which influence the expression of target genes and can lead to the development of MPAs. Genetic causes (Goodman, 1995) and/or environmental factors including teratogens, such as maternal influenza, rubella, dietary insufficiency, stress, urban birth and winter birth deregulate the retinoid pathway (Brown, 2006; Waddington, Lane, Larkin, O'Callaghan, 1999; Watson, Mednick, Huttunen, & Wang, 1999). During the 9-12 week time period of in utero development, a fetus is developing cells that will eventually differentiate into limb buds, the epidermis, and neurons (Sperber, 2001). The retinoid pathway is also beginning to develop at this time. When one of the above mentioned teratogens are present during this critical period, the fetus has a higher chance of developing retinoid pathway abnormalities, which can lead to dysfunction in brain development (Anchan, Drake, Haines, Gerwe, & Lamantia, 1997; Chiang et al., 1998; Goodman, 1995) and the development of both MPAs and schizophrenia.

As can be seen in Table 1, several studies have examined the relations between MPAs, the symptoms of schizophrenia, and cognitive abilities, but these results are mixed. Some researchers found no associations between MPAs and symptoms. Aksoy-Poyraz (2011) found there to be no association between MPAs and the Scale for the Assessment of Negative Symptoms (SANS), the Scale for the Assessment of Positive Symptoms (SAPS) scores nor the disorganized dimensions of the disorder. No differences were found between people with

schizophrenia and bipolar disorder (Lohr & Flynn, 1993) and no differences between individuals with non-affective (no mood disturbances) and affective (mood disturbances present) psychosis (McGrath et al., 2002).

Other researchers examining the associations between MPAs and symptoms have found the total number of MPAs to be higher in individuals with schizophrenia compared to people without a history of mental illness (i.e., healthy controls; Green, Gaier, Ganzell, & Kharabi, 1989; Gaultieri, Adams, Shen, & Loiselle, 1982; Schiffman, Ekstrom, LaBrie, Schulsinger, Sorensen, & Mednick, 2002). Other work has found that people with schizophrenia have more MPAs than people with bipolar disorder (Green, Satz, Christenson, 2004; Trixler, Tényi, Csábi, & Szabó, 2001), and that people with bipolar disorder have more MPAs than healthy controls (Akabealiev, Siklov, & Matatkov (2014). People with schizophrenia, but without a family history of schizophrenia (sporadic schizophrenia), have higher levels of MPAs than do people with schizophrenia and a family history (Griffiths et al., 1998). The findings from Griffiths et al. (1998) suggest that sporadic schizophrenia is likely a congenital disorder caused by teratogens influencing fetal development.

Some research shows differences in MPAs between first-episode psychosis patients, affective psychosis patients, and healthy controls (Lloyd et al., 2008). The research demonstrates first-episode psychosis patients have higher number of MPAs and can be differentiated from affective psychosis (with slightly fewer MPAs) and healthy controls with the fewest number of MPAs. This research shows a link between the number of MPAs and the severity of psychosis. These studies also show the link between higher MPA scores and the pathology commonly observed in schizophrenia. More specifically, significant correlations have been found between total number of MPAs and negative symptoms (O'Callaghan et al. 1995), especially MPAs of the

mouth (Compton et al, 2007). Compton et al. (2007) also found MPAs of the mouth and feet to be associated with positive symptoms, and MPAs of the ears to be associated with general severity of psychopathology. As can been seen, links between MPAs and the symptoms of schizophrenia are mixed and contradictive. Although researchers have long been interested in MPAs, most of this has looked at the global associations of total number of MPAs and the two (positive and negative) or three (positive, negative, and disorganized) symptom dimensions rather than looking at the specific MPAs or groups of MPAs and specific symptoms of schizophrenia. Moreover, most of these studies have use dichotomous measurements of the MPAs.

The links between MPAs and cognitive abilities and neurological differences in individuals with schizophrenia are also mixed. A few researchers have reported no significant relationship between MPAs and IQ (Rosen & Weller, 1973; Alexander, Mukhurerjee, Richter, & Kaufmann, 1994), and no relationship between the curvature of the fifth finger and IQ (Hope, Bates, & Gow, 2012). In addition, associations were not found between MPAs and information processing tasks (Degraded-Stimulus continuous performance task, span of apprehension, backward masking procedure, the Pin Test, and Wisconsin Cars Sorting Task) (Green, Bracha, Satz, & Christenson, 1994). Similarly, no significant correlations were found between MPAs and neurological functioning (O'Reilly, Lane, Cernovsky, & O'Callaghan, 2001), and premorbid functioning (Alexander et al, 1994).

Although no associations have been found in some studies, others have found significant associations between MPAs and cognitive abilities. MPAs have been shown to have a negative association with receptive vocabulary in children 6-7 years of age (Rosenberg & Weller, 1973), memory of word-pairs (delayed auditory memory) (Ismail, Cantor-Graae, & McNeil, 2000),

visual immediate memory and visual delayed memory, and general memory (Mittal & Walker, 2011). Critically, all of the studies that have examined MPAs and cognitive symptoms have measured MPAs as a dichotomous variable, and no studies have used a comprehensive battery of cognitive functioning to determine which aspects of cognitive functioning are related to MPAs and which are not. In the current study, the National Institute of Mental Health's (NIMH's) Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) Consensus Cognitive Battery (MCCB) was used to evaluate cognition (Nuechterlein et al., 2008). The MCCB was developed as a comprehensive measure of cognitive functioning that taps all critical domains that are impaired in schizophrenia. The domains of cognition selected for this battery include speed of processing, verbal learning, working memory, reasoning and problems solving, social cognition, and attention/vigilance. To date no research concerning MPAs has used the MCCB.

In addition to limited research examining the relations among MPAs and specific symptoms and cognitive deficits, much of this research has focused on the presence of the minor physical anomalies and not the relative severity of them. For example, when observing the presence of MPAs like syndactyly (webbed toes) the presence of the webbing was recorded as present or not, the length the webbing reaches down the toes was not recorded (with the exception of the Lane et al. (1997) scale). Lane et al. (2007) worked to improve the measurement of the MPAs by taking quantitative measurements, and then categorized them into three groups based on the severity of the expression compared to the sample used. Since schizophrenia is also thought to vary widely in severity (e.g., American Psychiatric Association, 2013l; Van Os, 2000), treating MPAs as a dimensional variable may provide a more appropriate analytic strategy. By measuring the individual MPAs in a quantitative manner and measuring the

individual symptoms on a scale, this research has the ability to strengthen our understanding of the developmental pathway of schizophrenia by providing information about the severity of MPAs and their association to the severity of symptoms and cognitive deficits.

The current research focused on the severity of many MPAs and the different facets of symptoms based on the 3 factor model developed by Arndt et al. (1991) and Miller et al. (1993) and the cognitive deficits observed in schizophrenia. The first goal of the current research was to replicate previous findings that people with schizophrenia have a higher quantity and more severe MPAs than healthy controls. The second goal was to examine whether severity of MPAs is associated with positive, negative, and disorganized symptoms among people with schizophrenia. Finally, the third goal was to test whether the severity of MPAs is associated with the severity of cognitive deficits.

Method

Participants

Participants were recruited from the island of Oahu. Individuals in the "Healthy Control" (HC) group were recruited via www.craigslist.com (a publicly accessible website) and flyer boards at local public libraries. Individuals that responded to the posting were administered a brief phone screen to determine their eligibility in the study. The phone screen consisted of questions concerning ethnicity, age, gender, history of mental health of the individual and family, history of drug use, and history of traumatic brain injury. Individuals who did not report a history of mental health concerns, drug abuse, or traumatic brain injury were selected for the study. The HC group consisted of 31 individuals (48.38% female; 48.38% Caucasian, 22.58% mixed ethnicity) with a mean age of 42.56 (SD = 14.05; see Table 2 for a full description of the demographic variables).

Individuals were recruited for the schizophrenia group through fliers placed at local mental health providers, including Safe Haven supportive housing and Clubhouses supported by Hawaii Department of Health Adult Mental Health Division. Individuals that responded to the fliers were screened with a brief phone interview to determine their eligibility in the study. Eligibility for this study required the schizophrenia group to have a current diagnosis of schizophrenia or schizoaffective disorder with no current drug abuse. The schizophrenia group consisted of 47 individuals (46.80% female; 27.65% Caucasian, 19.14% Hawaiian) with a mean age of 49.32 (SD = 10.34; see Table 2 for a full description of the demographic characteristics).

There were no statistically significant differences between the groups for gender, χ^2 (1) < 0.001, $p = 0.99$, and ethnicity, χ^2 (8) = 12.25, $p = 0.14$. The schizophrenia group was significantly older, t (77) = 2.46, $p = 0.016$, than the Healthy Control group ($M = 49.32$, $SD = 10.34$; respectively; see Table 3 and Table 4).

Materials

Measurement of Minor Physical Anomalies.

The measurement of MPAs is a novel scale informed by previous research conducted in the area of MPAs. Six regions of the body were observed: head, eyes, ears, mouth, hands, and feet. The six regions of the body observed are based on the Waldrop Scale developed in 1962-64 with 74 “normal” Caucasian 2.5-year-old children (43 male). This scale was later revised and is now called the Waldrop-Halverson Scale (Waldrop & Halverson, 1971). Modifications to this scale have been used by many researchers (Lane et al., 1997, Yoshitsugu, 2006) in the investigation of MPAs in persons with schizophrenia. Though this scale was originally developed for use on Caucasian individuals, Lin et al. (2012) found significant results using this scale in a Chinese population. The results from the study indicate the anomalies are universal and can be observed in individuals from different ethnic backgrounds.

Based on this scale, the six regions of the body were examined. These regions included: the head, ears, mouth, eyes, hands, and feet. The Waldrop-Halverson Scale uses mostly qualitative identification of the MPAs. In order to improve the understanding of the relationship of MPAs and the symptoms of schizophrenia, similar tools and methods were described by Lane et al. (1997). These modifications are designed to quantify and elaborate on the presence of the physical anomalies. Below are descriptions of all the anomalies measured and the methods by which the measurements occurred.

Head. The anomalies measured in the head region are as follows: hair whorls, head circumference, and facial height. Hair whorls are patches of hair found on most people where the hair on the head grows in a different direction than the rest of the hair. They are normally found on the crown of the head and most people have only one. The Waldrop-Halverson Scale (Waldrop & Halversen, 1971) code for this phenomenon is based solely on the presence of more than one whorl or the lack of whorls. For the purpose of further assessing the developmental processes associated with schizophrenia, hair whorls were assessed in four ways for the purpose of this research. The first observation was to decide whether the hair whorl can be accurately observed. As cultural norms are for women to have longer hair and some men have longer hair, the characteristics of the hair whorls were not observable, it was noted if the presence of hair whorls could not be observed. The second characteristic observed was the total number of whorls present. A visual observation of the head was conducted and the total number of whorls was recorded. The determination of the number of hair whorls required there to be clear location from which the participant's hair originated. These locations were identified by a clear swirl pattern. The third characteristic observed was the direction of the hair whorl. The direction of the whorl was recorded as clockwise, counter-clockwise, or indeterminable. Finally, the fourth

characteristic measured was the position of the whorl in relation to the midline of the body. A visually inspection of the participant's whorl placement was used to determine its placement. The position of the hair whorl was recorded as centered, left-of-center, or right-of-center. To determine if the whorls were not on the midline, the center of the whole had to be more than .25 inches from the midline of the head.

The circumference of the head was measured by extending a fabric measuring tape starting at the glabella (area of the forehead between the eyebrows), continuing over the supraorbital ridge, around the back of the head above the adjoinment of the upper ear to the occiput posterior, continuing back across head over the adjoinment of the other ear, across the supraorbital ridge and back to the glabella. The total circumference of the head was recorded to the nearest millimeter.

The measurement of facial height was based on two measurements along the midline of the face. The first was measured from the glabella to the top of the philtrum (where columella of the nose meets the upper lip). The second was from the top of the philtrum to the base of the chin. These two measurements were done using calipers. A ratio of facial height was created by dividing the height of the midface (glabella to top of philtrum) by the height of the lower face (philtrum to chin). The addition of these measurements to the MPA assessment was based on findings from Lane et al. (1997) showing that individuals with schizophrenia tend to have shorter middle sections of the face.

Ears. Anomalies in the ears were noted if they were low set, have adherent lobes, were malformed, asymmetrical, and the amount they protrude from skull. The placement of the ears was measured by placing a fabric measuring tape on the bridge of the nose, across the eye to the

outer corner of the eye, then extended back to the top juncture of the ear. The distance between the measuring tape and the actual juncture of the ear was measured using calipers.

Adherent lobes were defined as lobes that are attached to the side of the head, they were recorded as attached or unattached. This measurement required that the lobes be fully attached, meaning there must not be a cleave present between the side of the head and the earlobe to be recorded as attached. Malformed ears were defined as ears that do not exhibit the formation that is seen in the general populace. The measurement of the malformation of the ear was based on gross-malformation. It involved a visual inspection of the ears and the investigator made the determination if gross malformation was present. This determination was not based on a specific measurement of the ear due to the variation in ear shapes present in all humans. To determine asymmetry of the ears, the height of each ear was recorded. The measurement was done with digital calipers reaching from the lowest part of the ear to the highest part of the ear that creates the largest distance.

The protrusion of the ears from the skull was measured using the calipers. The distance from the pinna of the ear to the skull was recorded. This measurement was recorded to the nearest millimeter.

Mouth. The measurements taken from the mouth area were palatal shape, the presence of palatal ridges, furrows of the tongue, smooth or rough spots, and bifid tongue. The measurement of the palatal shape was consistent with the Waldrop-Halverson scale. This measurement includes the steepling of the roof of the mouth, and the general shape of the roof. A visual inspection determined the presence of a U-shaped palate, a steepled palate with a flattened apex, or a steepled palate with a V-shaped apex. Visual aids were provided to improve the rater accuracy of the palatal shape.

The presence of palatal ridges was determined by visual examination of the roof of the mouth. Ridges were coded as present if they could be observed from behind the first bicuspid of further back, toward the throat. These ridges were also counted from the first bicuspid toward the back of the mouth and the total number of ridges was recorded.

The anomalies of the tongue were measured and coded based on a visual inspection of the participant's tongue. The presence of furrows was recorded as present if fissures were visible. The general location of the fissures was also recorded as on the midline or not. Rough and/or smooth spots were coded as present if the investigator easily views these anomalies. The last area of the tongue to be inspected was the tip. A bifid tongue was marked as present if an easily visible split along the midline of the tip of the tongue is present.

Eyes. The anomalies observed from the eye region were abnormal epicanthus covering, strabismus, and hypertelorism. Anomalies in the epicanthus were observed where the upper and lower lids join the nose, this point of union has varying degrees of coverage. The Waldrop-Halverson Scale coding system was used in this measurement as well. A visual inspection of the epicanthus was done to determine its coding. The coding for the epicanthal coveraged was determined by the coverage of the caruncula (fleshy, usually pink colored, area in the inner corner of the eye, where the tear ducts secrete tears). The degree to which the epicanthus covers the caruncula was recorded in three ways. The first is no coverage of the caruncula (completely visible all the way to the inner corner of the eye, the second is partial coverage (any amount of the caruncula is covered), and the third is complete coverage of the caruncula (not visible). A visual inspection of this area was conducted and the expression of the epicanthus was recorded based these three levels of measurement.

Strabismus was determined by a visual inspection performed by the investigator. The participant was asked to look straight forward at the investigator, if the eyes appear to be looking in different directions the presences of strabismus was recorded. In individuals with strabismus, the type was recorded as either esotropia (one or both eye look toward the midline), exotropia (one or both eyes look to the lateral), or hypertopia (one of the eyes look up or down).

Hypertelorism is a broadening of the space between the eyes. Digital calipers were applied to the lacrimal punctum (meeting of the upper and lower eyelids and the epicanthus) to determine the distance between the eyes. This area is also called the inner intercanthal distance. The distance between the eyes was recorded to the nearest millimeter.

Hands. The hands were observed for a curved fifth finger (pinky finger), a single transverse palmar crease, and an index finger that is longer than the middle finger. A curved fifth finger was defined as a finger that bows away from the fourth finger and curves back to meet the fourth finger. A single transverse palmar crease was defined by the individual presenting their palm to the researcher and the number of long creases that extend across the palmar surface were counted. If only one is present, the individual was coded as having the anomaly.

The difference between the index and middle finger was measured by placing the calipers along the side of the fingers. Two measurements were taken. These measurements were the length of each finger. Measurements were taken of the index finger from the base to the tip along the side it next to the middle finger. The length of the middle finger was also recorded from the base to the tip, along the side next to the index finger. The length of each was recorded to the nearest millimeter. These two values were recorded and the difference between them was calculated by subtracting the index finger length from the middle finger length.

Feet. The last region of the body measured was the feet. The anomalies observed from this region were partial syndactyly (webbing) and the gap between the first toe (big toe) and the second toe. Four measurements of the toes were taken to quantify the presence of syndactyly. The four measurements were the medial and lateral lengths of the second and third toes. With the participant in a seated position with feet flat on the floor, the digital calipers were placed against the webbing between the first and second, second and third, and third and fourth toes. The length of each side of the second and third toes was measured and recorded. Syndactyly was recorded as a ratio of the length of the exterior of the second toe and the exterior of the third toe. Based on a visual inspection, the presence of webbing was determined. The investigator observed if webbing was present between the second and third toes and recorded whether or not webbing we visually observable. The gap between the first and second toes was measured using calipers. The participant was in a seated position with feet flat on the floor. The calipers were placed in the widest part of the gap between the first and second toes, and the width of the gap was recorded to the nearest millimeter.

In order to assure that the MPAs were assessed in the same way by all raters, the primary investigator provided training to the other researches involved in gathering the data for the project. The training consisted of explaining what each of the MPAs were and how they should be measured and recorded. The methods of measuring the MPAs were also taught by performing the measurements on a volunteer not participating in the study itself. The other investigators were also observed by the primary investigator while completing the MPA assessment on at least two of the study participants to improve accuracy in the measurements.

Diagnosis and Symptom Ratings.

Scheduled Clinical Interview for DSM-IV Mental Disorders (SCID-I). The SCID-I is a well-known diagnostic tool used by clinicians to effectively assess symptoms and diagnose individuals with mental disorders as listed in the Diagnostic and Statistical Manual for the Diagnosis of Mental Disorders (DSM). This measure has been used as the "gold standard" for the diagnosis of mental disorders in many studies (e.g. Shear et al, 2000; Steiner et al, 1995). Inter-rater reliability for the SCID-I is reported to be between 0.61 and 0.83 (Lobbestael, Leurgans, & Arntz, 2011). Validity of the SCID was assessed by Basco et al. (2000) and found kappa values ranging from 0.76 - 0.78 for diagnosis comparisons between standard interview methods and SCID diagnoses with the aid of medical records.

Positive and Negative Symptom Scale (PANSS). The Positive and Negative Symptom Scale (PANSS; Kay, Fiszbein, & Opler, 1987) is a 30-item 7-point Likert-type scale used to rate schizophrenia symptoms. The PANSS assesses common symptoms of schizophrenia within three symptom cluster scales, including Positive Symptoms, Negative Symptoms, and General Psychopathology. One of the three graduate student experimenters determined PANSS scores for each schizophrenia participant, using the Structured Clinical Interview for the PANSS (SCI-PANSS). The reliability of symptoms ratings between individual raters was tested through a intraclass correlation (ICC) for the scores on the SCI-PANSS ratings and the three domains for the measure (positive, negative, and general symptoms). The ICC for all of the symptoms was found to be 0.776, indicating a high level of agreement for all of the rated symptoms. The domains of the measure were also found to have high intraclass correlations; Positive = 0.823, Negative = 0.778, and General = 0.749. These high correlations indicate that all raters were reliably rating each participant at the same level of symptom severity as the other raters. The

ratings from the SCI-PANSS and the BPRS have the same minimum (0) and maximum (7) range of scores and the scales from the BPRS are directly used in the SCI-PANSS. Therefore, it was reasonable to convert the SCI-PANSS ratings into BPRS ratings for the purposes of this study.

Cardiff Anomalous Perceptions Scale (CAPS) (Bell, Halligan, & Ellis, 2006). The Cardiff Anomalous Perceptions Scale is a 32-item self-report questionnaire. The CAPS uses three subscales to measure distress, intrusiveness, and frequency of anomalous experiences. For each of the 32 items endorsed by the individual they are asked to rate distress, intrusiveness, and frequency on a 5-point Likert scale. The ranges of scores for the subscales are as follows: distress (0=Not at all distressing to 5=Very distressing), intrusiveness (0=Not at all distracting to 5=Completely intrusive), and frequency (0=Happens hardly at all to 5=Happens all the time). Reliability of the CAPS is estimated with Cronbach's alpha coefficient equal to .87. A test-retest procedure was conducted and a Cronbach's alpha coefficient was estimated to be .92. The test-retest analysis of the measure found a Pearson correlation for the total score of r = .77. The subscale Pearson correlations are as follows: distress = 0.779, intrusiveness = 0.783, and frequency = 0.778. The CAPS validity was assessed by correlating it with the Oxford and Liverpool Inventory of Feelings and Experiences (O-LIFE), Peters Delusion Inventory (PDI), and Revised Launay-Slade Hallucinations Scale (RLSHS). Significant correlations ($p < .05$) were found for all scales and subscales except the Introvertive Anhedonia subscale of the RLSHS, demonstrating good discriminate validity of perceptions and not schizotypy in general (Bell, Halligan, & Ellis, 2006).

Peters Delusion Inventory (PDI). The Peters Delusion Inventory is a 40-item self-report questionnaire. The PDI uses three subscales to measure distress, preoccupation, and conviction. For each of the 40 items endorsed by the individual they are asked to rate distress, preoccupation,

and conviction on a 5-point Likert scale. The range of scores for the subscales are as follows: distress (0=Not at all distressing to 5=Very distressing), preoccupation (0=Hardly ever think about it to 5=Think about it all the time), and conviction (0=Don't believe it's true to 5=Believe it is absolutely true). Reliability of the PDI was estimated to be Cronbach's $\alpha = 0.88$. Test-retest reliability was estimated to be Pearson's $r = 0.82$ ($p < 0.001$). The construct validity of PDI has been examined with other measures of psychotic and psychotic-like experiences including Schizotypal Personality Scale, Magical Ideation Scale, and the Delusions Symptom-State Inventory; yielding high correlations.

Brief Psychiatric Rating Scale (BPRS) (Overall & Gorham, 1962). "The Brief Psychiatric Rating Scale was developed to provide a rapid assessment technique suited to the evaluation of patient change" (Overall & Gorham, 1962). The BPRS consists of 16 items scored on a 7-point Likert scale, 0=Not present to 7=Extremely Severe. The interviewer determines the scores. Overall & Gorham (1962) recommend at least two raters assess the individual and discuss the scores to come to a consensus score. Further analysis of this scale (Mueser, Curran & McHugo, 1997) revealed a factor structure for the measure. These four factors are Thought Disturbance, Anergia, Affect, and Disorganization. For the purposes of this study, scores for each of the four factors were calculated for each participant and employed for analyses listed below.

Cognitive Functioning.

MATRICS Consensus Cognitive Battery (MCCB) (Nuechterlein et al., 2008). The MCCB was created by a mandate of the National Institute of Mental Health's Measurement and Treatment Research to Improve Cognition in Schizophrenia to standardize the measurement of cognitive functioning in schizophrenia. The tests selected to be included in the MCCB are as

follows: Trail Making Test, Part A; Brief Assessment of Cognition in Schizophrenia, symbol coding subtest; Hopkins Verbal Learning Test – Revised, immediate recall (three learning trials only); Wechsler Memory Scale, 3rd ed., spatial span subtest; Letter-Number Span test; Neuropsychological Assessment Battery, mazes subtest; Brief Visuospatial Memory Test – Revised; Category Fluency test, animal naming; Mayer-Salovey-Caruso Emotional Intelligence Test, managing emotions branch; and Continuous Performance Test, Identical Pairs version. These tests were selected to assess the cognitive domains of speed of processing, verbal learning, working memory (verbal and nonverbal), reasoning and problem solving, visual learning, social cognition, and attention/vigilance (Nuechterlein et al., 2008). August, Kiwanuka, McMahon, and Gold (2011) found the measures to be highly sensitive to the type and level of impairment typically observed in schizophrenia, MCCB composite scores are highly correlated with the WASI FSIQ, and the domain scores are generally moderately-highly correlated.

Wechsler Abbreviated Scale of Intelligence (WASI). The Wechsler Abbreviated Scale of Intelligence is brief assessment of intelligence, taking 15-30 minutes to administer. The WASI meets the demands for fast accurate measurements of intelligence. The WASI is a general intelligence, or IQ test designed to assess specific and overall cognitive capabilities and is individually administered to children, adolescents, and adults (ages 6-89). It is a battery of four subtests: Vocabulary (31-item), Block Design (13-item), Similarities (24-item) and Matrix Reasoning (30-item). In addition to assessing general, or Full Scale, intelligence, the WASI is also designed to provide estimates of Verbal and Performance intelligence consistent with other Wechsler tests. Specifically, the four subtests comprise the full scale and yield the Full Scale IQ (FSIQ-4). The Vocabulary and Similarities subtests are combined to form the Verbal Scale and yield a Verbal IQ (VIQ) score, and the Block Design and Matrix Reasoning subtests form the

Performance Scale and yield a Performance IQ (PIQ) score. The WASI is estimated to have a reliability coefficient in the range of .93 - .98. The test-retest stability of the measure is estimated to be correlated at r = .92 for the four subtest FSIQ score. The validity of the measure was estimated by comparing the WASI to the Wechlser Adult Intelligence Scale-III. The two measures FSIQ were estimated to be correlated at r = .92.

Mini Mental State Examination II (MMSE-II). The MMSE-II is an assessment designed to screen for cognitive impairments. The assessment has been shown to have high inter-rater reliability, with intraclass correlations ranging from .94 to .99, with many tasks achieving 100% agreement. The MMSE-II is known to have internal consistency estimates of Cronbach's alphas ranging from .36 to .57 in normative samples and alphas ranging from .66 to .79 in samples of dementia patients. Test-retest stability is estimated to be from .79 to .98. In the current research, the MMSE was used to screen for dementia.

Procedure

Each participant took part in a number of tasks and measures, including: a demographics questionnaire, a non-invasive measurement of MPAs, the Scheduled Clinical Interview for the Diagnosis of DSM-IV-TR Axis I Disorders (SCID-I), the Wechsler Abbreviated Scale of Intelligence (WASI), MATRICS Consensus Cognitive Battery (MCCB), Peters Delusion Inventory (PDI), and the Cardiff Anomalous Perceptions Scale (CAPS). Following the completion of the SCID, Symptom Severity was rated with the Scale for the Assessment of Negative Symptoms (SANS), the Scale for the Assessment of Positive symptoms (SAPS), and the Brief Psychotic Rating Scale (BPRS).

Results

Data Preparation

The data were prepared for analysis by observing the individual measurements for each MPA, cognitive domain, and symptom domain. Three data points were removed due to obvious errors that appeared to occur during the MPA assessment. Some of the participants did not return for the second or third assessment sessions and others refused to allow the experimenter to measure some parts of their bodies. Because of this, the data is not missing completely at random and imputation of missing values would not be appropriate.

MPAs Differences between "Healthy Controls" and Schizophrenia Group

The first goal of this study was to evaluate if there is a between-groups difference in the presence of MPAs within an ethnically diverse setting. For MPAs that were measured as continuous variables, independent samples t-test were run to examine differences between the schizophrenia and healthy control groups (see Table 3). For MPAs that were measured as dichotomous variables, chi-square tests were run (see Table 4). No significant differences between groups were found for either the continuous or dichotomous MPAs. A few of the tests of between groups differences were approaching significance ($p < .08$), but due to the number of test performed on the datum a correction of the alpha level needed to be performed to avoid a Type I error. Using the Bonferroni method of correction for 27 tests, the individual test must reach a p-value less than 0.0019. None of the tests performed reached $p < 0.0019$, indicating there are no differences between the groups in the presentation of MPAs. There were also few significant correlations among the individual MPAs in relation to other MPAs (Table 57).

MPAs and Cognition

Significant differences are present between the Healthy Control and the Schizophrenia group for all domains of the MCCB and WASI. Individuals in the Schizophrenia group scored significantly lower on all of the domains compared to healthy controls (Table 55). Based on the

norms of the MCCB and WASI, the healthy controls scored in the "normal" range for both of the assessments.

Hair Whorls. Since hair whorls were measured as a dichotomous presence/absence variable, differences in cognitive functioning were examined between people with and without hair whorls with independent samples t-tests. There were no significant differences on the cognitive variables for hair whorl direction or count on the cognitive variables (see Table 6-7). There were no significant differences in whorl presence/absence on the MCCB. Individuals without a hair whorl (M = 80.33) had significantly lower scores, t (56) = 2.43, p = 0.018, d = -1.04) on the VCI domain of the WASI compared to individuals with a whorl present (M = 95.42; see Table 5). A one-way ANOVA showed a significant difference, F (2,39) = 3.40, p = 0.04, d = 1.85, between individuals with hair whorls on the midline, left of the midline, and right of the midline. A post hoc Tukey's HSD test indicated that the mean score for individuals with a hair whorl on the midline (M = 51.45, SD = 4.00) was significantly higher than individuals with a whorl to the right of midline (M = 43.94, SD = 4.12) on the RPS domain. However, individuals with a hair whorl to the left of midline did not significantly differ from the other two groups. A significant difference was also present between these groups on the PRI domain of the WASI, F (2,43) = 6.78, p = 0.002, d = 3.56. A follow up Tukey's HSD test revealed individuals with a whorl present to the left of midline scored (M = 84.00, SD = 6.22) significantly lower compared to individuals with a whorl on the midline (M = 107.5, SD = 6.96). These post hoc test also revealed that individuals with a whorl to the right of center (M = 95.88, SD = 7.29) and individuals with a whorl on the midline was approaching significance, p = 0.06 (see Table 8). Tests conducted within the schizophrenia group only found a significant difference F (2,20) =

3.40, $p = 0.04$, $d = 2.94$, between individual with a hair whorl left-of-center ($M = 49.50$, $SD = 4.31$) and those with a whorl right-of-center ($M = 35.49$, $SD = 5.18$).

Head Circumference. Since head circumference was measured as a continuous variable, Pearson correlations were examined between head circumference and the cognitive variables. There were no significant correlations between head circumference and any of the cognitive variables (see table 9).

Facial Proportions. Facial proportions were measured on a continuous scale and compared to scores on the cognitive domains using correlation techniques. There was a significant positive correlation between the facial proportion and the Verbal Learning Domain of the MCCB, $r = 0.27$, $p = 0.03$, $d = 0.56$. A significant negative correlation, $r = 0.44$, $p = 0.008$, $d = 0.98$, is also present within the schizophrenia group and the Social Cognition domain of the MCCB. No significant relations between facial proportions and the other MCCB domains and the WASI were present (see Table 10). In the schizophrenia group, a significant negative correlation, $r = 0.41$, $p = 0.009$, $d = 0.89$, is present, indicating as the middle of the face becomes proportionally smaller to the bottom of the face scores on the WASI Full Scale IQ became smaller.

Ears. No participants presented with gross malformation of the ears, therefore no t-tests could be conducted on this MPA. No Significant relations were found between ear symmetry, earlobe attachment/detachment, or ear protrusion to the cognitive variables (see Tables 11-14). Within the schizophrenia group, a significant negative correlation is present, $r = .33$, $p = 0.041$, $d = 0.69$.

Palate. Palate shape was measured as a categorical variable (U-shaped palate, a steepled palate with a flattened apex, or a steepled palate with a V-shaped apex) and evaluated with

ANOVA techniques. The presence of palatal ridges was measured in two ways, presence of ridges and the number of ridges present. T-tests were used to evaluate the differences in scores for the presence/absence of the ridges, while correlation techniques were used to evaluate the relation of ridge count. No significant relations were present between palatal shape, presences of ridges or palatal ridge count to the measures of cognition (see Tables 15-17).

Tongue. No significant relations were present between the presence/absence of tongue furrows or presence/absence of a bifid tongue on the cognition variables with independent samples t-tests (see Tables 18, 21). A T-test revealed a significant difference, t (23) = 2.08, p = 0.049, d = 2.73, between individuals with tongue furrows on the midline (M = 34.14, SD = 2.38) and those with a furrow not on the midline (M = 46.50, SD = 5.95) on the Attention/Vigilance domain of the MCCB. A significant relation, t (27) = 2.07, p = 0.48, d = 2.75, also indicated that individuals with a furrow on the midline of the tongue scored lower (M = 43.08, SD = 2.45) compared to those with a furrow not on the midline (M = 56.75, SD = 6.59) on the Working Memory domain (see Table 19). A T-test revealed that individuals with tongue spots present scored significantly, t (62) = 3.17, p = 0.002, d = 4.32, higher on the Speed of Processing domain of the MCCB (M = 58.60, SD = 5.34) than individuals without tongue spots (M = 41.66, SD = 1.49) (see Table 20). Within the schizophrenia group, a significant difference, t(38) = 4.203, p = 0.0473, d = 2.82, is present between individuals with a bifid tongue (M = 15, SD = 2.39) and those without a bifid tongue (M = 10.11, SD = 0.53). A significant difference is also present in the schizophrenia group. Within this group, individual without a bifid tongue (M = 93.56, SD = 2.25) scored significantly higher, t(38) = 4.61, p = 0.00004, d = 2.01 , on the VCI domain of the WASI compared to those with a bifid tongue (M = 82.16, SD = 7.70).

Eyes. No significant differences were found for any of the cognitive variables between groups with a present or absent epicanthal covering, and there were no significant correlations between hypertelorism and the cognitive variables (see Tables 22, 24) with independent samples t-tests. An ANOVA revealed a significant difference, F (3,63) = 2.93, p = 0.04, d = 2.72, between individuals without any strabismus (esotropia, exotropia, hypertropia) and those with some form of it on the Perceptual Reasoning Domain of the WASI. A post-hoc Tukey's HSD revealed that individuals without strabismus (M = 98.89, SD = 12.57) scored significantly higher than individuals with esotropia (M = 65.00, SD = 12.38) on the Perceptual Reasoning domain of the WASI (see Table 23). A significant positive correlation, r = 0.34, p = 0.049, d = 0.72, is present within the schizophrenia group on the composite score of the MCCB.

Hands. The sample acquired for this study did not have any individual present with a single transverse palmer crease, therefore no t-tests were conducted. No significant correlations were present for the curvature of the fifth finger or middle/index finger ration and the cognitive variables (see Table 25-26) which were measured as continuous variables. In just the individuals with schizophrenia, a significant positive correlation, r = 0.37, p = 0.028, d = 0.79.

Feet. No participants in this study presented with partial syndactyly of the second and third toes, measured as a dichotomous variable, therefore no t-tests with cognitive variables could be conducted. No significant correlations were present for the measure of partial syndactyly for differences in toe lengths, measured as a continuous variable, and the cognitive variables (see Tables 27-28). Several significant correlations were present between the size of the gap between the first and second toe and the domains of the MCCB. The size of the toe gap was found to be a significant predictor of the following domains; Working Memory, r = .45, p < 0.001, d = 1.01, Verbal Learning, r = .34, p = 0.006, d = 0.72, Reasoning and Problem Solving, r

= .32, p = 0.009, d = 0.67, Social Cognition, r = .39, p = 0.002, d = 0.85, and the composite score, r = .51, p < 0.001, d = 1.18, for all the MCCB subtests. A significant correlation, r = 0.28, p = 0.02, d = 0.58, was also present on the Perceptual Reasoning Index of the WASI (see Table 29). Within the schizophrenia group, significant positive correlations are present for the Composite Score, r = 0.53, p = 0.002, d = 1.25, Reasoning and Problem Solving, r = 0.34, p = 0.03, d = 72, Working Memory, r = 0.35, p = 0.03, d = 0.75, and Speed of Processing, r = 0.49, p = 0.002, d = 1.12, domains of the MCCB. All the significant correlations were positive, indicating that as the gap in between the first and second two increases, the individuals scores on the domains also increased.

The Bonferroni method of correction for the 275 tests in this section makes the required p-value for each test to be less than 0.00018. None of the tests in the above section meet this criterion and the significant results reported may be due to chance alone.

MPAs and Symptom Severity

Significant differences are present between the Healthy Control group and the Schizophrenia group on the CAPS, PDI, and all domains of the BPRS. Individuals in the Schizophrenia group have higher scores on these scales indicating higher symptoms associated with schizophrenia (Table 56).

Hair Whorls. Since hair whorls were measured as a dichotomous presence/absence variable, differences in cognitive functioning were examined between people with and without hair whorls with independent samples t-tests. No significant results were present for hair whorl direction nor count on the symptoms rating variables of the BPRS. (see Tables 30, 32). A T-test revealed a significant difference in the presence/absence of hair whorls on the CAPS, t (50) = 2.17, p = 0.03, d = 2.22, and the PDI, t (53) = 2.25, p = 0.03, d = 2.30. Individuals with a hair

whorl present (*M* = 5.77, *SD* = 3.34) scored significantly lower on the CAPS compared to individuals without a hair whorl (*M* = 13.00, *SD* = 3.17). On the PDI, individual with a whorl scored (*M* = 9.98, *SD* = 4.72) significantly lower than individuals without a hair whorl (*M* = 20.60, *SD* = 4.50; see Table 31). ANOVA tests revealed significant differences between the position of the hair whorl on the Thought Disturbance, $F(2,40) = 5.57$, $p = 0.007$, $d = 2.42$, Affect, $F(2,40) = 5.50$, $p = 0.008$, $d = 3.24$, and Disorganization, $F(2,40) = 3.88$, $p = 0.03$, $d = 2.66$, domains of the BPRS. The post-hoc Tukey's HSD revealed that individuals with a whorl on the midline (M = 7.21, SD = 2.15) were rated significantly lower than individuals with a whorl to the right of midline (M = 12.62, SD = 2.32) on the Thought Disturbance domain. On the Affect domain, individuals with a whorl on the midline (*M* = 7.54, *SD* = 1.50) were rated significantly lower than individuals with a whorl right of midline (*M* = 10.92, *SD* = 1.63). On the Disorganization domain, a significant difference was found between individuals with a whorl on the left of midline (*M* = 6.17, *SD* = 0.77) and individuals with a whorl placed on the midline (*M* = 4.00, *SD* = 0.86) (see Table 33). Within the schizophrenia group, individuals with a hair whorl to the right-of-center (*M* = 15.67, *SD* = 2.26) were rated significantly, $F(2,22) = 5.25$, $p = 0.014$, $d = 2.46$, than individuals with a hair whorl on the midline (*M* = 10.18, *SD* = 2.19) and left-of-center (*M* = 10.20, *SD* = 1.82).

Head Circumference. Head circumference was measured on a continuous scale and their relation to symptom domains of the BPRS was evaluated with correlation techniques. There were no significant correlations for head circumference and the symptom variables (see Table 34).

Facial Proportions. Facial proportions were assessed using a continuous scale and their relation to the symptom domains of the BPRS was evaluated with correlations techniques. No significant correlations were found between facial proportion and the symptom variables for the

full sample (see Table 35). A significant negative correlation, $r = -0.34$, $p = 0.037$, $d = 0.72$, is present between facial proportions and the Affect domain of the BPRS.

Ears. No participants presented with grossly malformed ears, therefore no test could be conducted. No significant differences were for present attachment/detachment of the ears. No significant correlations were present for ear symmetry, nor ear protrusion and the symptoms domains of the BPRS (see Tables 36-39). Tests within the schizophrenia group, revealed significant differences for ear protrusion and ear symmetry. A significant correlation, $r = 0.41$, $p = 0.01$, $d = 0.89$, reveals as the protrusion of the left ear increases the ratings on the Anergia domain of the BPRS also increased. The symmetry between the left and right ear height was also significantly positively correlated, $r = 0.43$, $p = 0.009$, $d = 0.95$, with scores on the CAPS.

Palate. No significant differences were present for palatal shape (U-shaped palate, a steepled palate with a flattened apex, or a steepled palate with a V-shaped apex), nor the presence/absence of palatal ridges. Correlations of the count of palatal ridges and the symptom domains also showed no significant relations (see Tables 40-42).

Tongue. T-tests were not significant for the presence/absence of tongue furrows, nor the placement of the tongue furrow (midline, non-midline), nor the presence/absence of tongue spots and the symptoms rating domains (see Tables 43-46). Within the schizophrenia group, a significant difference, $t(38) = 4.203$, $p = 0.0473$, $d = 2.82$, is present between individuals with a bifid tongue ($M = 15.00$, $SD = 2.39$) and those without a bifid tongue ($M = 10.11$, $SD = 0.53$) on the Affect domain of the BPRS. Individuals in the schizophrenia group with a bifid tongue ($M = 28.00$, $SD = 6.52$) also scored significantly, $t(33) = 2.65$, $p = 0.12$, $d = 3.69$, higher on the CAPS than individuals without a bifid tongue ($M = 10.74$, $SD = 1.10$).

Eyes. No significant relations are present for strabismus nor hypertelorism and the symptom rating domains (see Tables 48-49). An ANOVA revealed a significant difference, $F(2,61) = 3.69$, $p = 0.03$, $d = 1.11$, in individuals manifestation of epicanthal covering of the crancula on the Affect domain of the BPRS. The post hoc Tukey's HSD showed individuals with no coverage of the crancula ($M = 8.17$, $SD = 2.37$) were rated significantly lower than individuals with partial coverage ($M = 10.86$, $SD = 2.48$) on the Affect domain. No other between group differences were significant (see Table 47).

Hands. No participants presented with a single transverse palmer crease, therefore no significance tests were conducted. No significant correlations are present for the relation of the curvature of the fifth finger and the symptom variables (see Table 50). A significant positive correlation, $r = 0.32$, $p = 0.009$, $d = 0.67$, is present for the middle/index finger ration and the Disorganization domain of the BPRS (see Table 51).

Feet. No participants in the study had visible partial syndactyly of the second and third toes, therefore no test could be conducted. No significant correlations are present between syndactyly measured with toe length or the gap between the first and second toe and the symptom rating domains (see Tables 52-54).

The Bonferroni method of correction for the 150 tests in this section makes the required p-value for each test to be less than 0.0003. None of the tests in the above section meet this criterion and the significant results reported may be due to chance alone.

Discussion

The first research question for this study was if differences there were differences in presence and severity of MPAs between people with schizophrenia and health controls. The study found no significant differences between groups in MPAs. This null result is not consistent

with previous research that found a difference in the presence of MPAs between the groups. Some of the published literature (e.g., Gualtieri, Adamz, Shen, & Loiselle, 1982; Schiffman, et. al., 2002; Trixler, Tényi, Csábi, & Szabó, 2001) reported significantly higher numbers of MPAs present in individuals with schizophrenia compared to "healthy controls" and people with other disorders such as Bipolar I (e.g., Akabealiev, Sivkov, & Matarkov, 2014; Green, Satz, & Christenson, 2004). Moreover, a meta-analysis found that the average effect size of the different in MPAs between groups was very large (Cohen's d = 0.95; Xu, Chan, & Comptom, 2011). Thus, the results of the current research are very different from many previous studies.

One potential reason for the difference between the results of the current study and previous research may be due to differences in the measurement of MPAs. Much of the previous research focused on dichotomous (present/not present) identification of the MPAs and this research used quantitative measurements and qualitative measurements with more than two levels when possible. Most of the previous research that relied on dichotomous ratings of the MPAs likely needed to show a gross malformation of the area to be identified as having the MPA present. The current study was designed to represent the variation of MPAs as a spectrum. One example of this difference is the measurement of toe gap. The current study used a precise measuring device placed between the first and second toes to evaluate the actual space between the toes on a continuous scale, while the previous research used a visual inspection to make a decision if a wide toe gap was present or not on dichotomous scale. These differences in measurement type may have led the results of the current study to be null due to the variation in the healthy control group and the schizophrenia group not having a significant difference in the mean toe gap size. The previous research, using a dichotomous measurement, may have found more individuals with extreme toe gaps in the schizophrenia group that did not account for the

full variation in toe gaps. This may have lead previous researchers to find a significant difference between the groups because there were only identifying extreme values. Another consideration for this study finding null results is almost all of the previous research evaluated the group differences based on a total count of MPAs present. The total number of MPAs was counted for individuals in each group and a comparison between the groups was made. The differences in the number of MPAs does not account for which MPAs were counted and how extreme the MPAs may have been presented.

The second goal of this study was to evaluate the relation of individual MPAs and scores on tests of cognition and symptom ratings. Although none of these relations were significant at Bonferroni-adjusted p-values, some findings were significant at the traditional alpha level of 0.05 and are worth exploring. For example, the relation of the size of the toe gap between the first and second toes was positively correlated with several measures of cognition including Working Memory, Verbal Learning, Reasoning and Problem Solving, Social Cognition, and the MCCB Composite Score. This finding is different from the other MPA results in this study because many did not significantly predict cognition on any of the domains while some were predictive of a single domain. These results are opposite of the hypothesized results. Since having a large toe gap is considered an MPA on the Waldrop-Havlerson scale, it was expected that as the toe gap increased the scores on the measures of cognition would decrease. None of the previous research examining the relation of MPAs and cognition reported findings similar to this. The majority of previous research did not look at specific MPAs, rather they used a count of the total MPAs present. Based on the use of a novel MPA assessment and more specific measurement criteria, it is not possible to compare the results from this study with the results of previous research using a total MPA count.

Another interesting result was the relation of hair whorl placement and the symptom ratings. Hair whorl placement was significantly related to three of the four domains of the BPRS (Thought Disorder, Affect, and Disorganization) without correcting the p-value for the number of tests conducted. The results as a whole indicate that having a hair whorl that is not placed on the midline was related to higher scores on the BPRS domains, meaning that non-midline hair whorl placement indicates higher levels of dysfunction as rated by the BPRS. These results are novel to this study and have not been reported by previous research which found significant relations of total MPAs and scores on the Family Picture I and II of the Wechsler Memory Test III (Mittal & Walker, 2011) and the Peabody Picture Vocabulary Test (Rosenberg & Weller, 1973). The results of this study indicate a possible developmental difference among individuals that were rated higher on the BPRS domains and those rated lower that is physically represented by a non-midline hair whorl. The results from this study revealed some trends of differences in cognition and symptom ratings associated with specific MPAs, it is unlikely that the presence/severity of the MPAs could actually be translated into diagnostic criteria for schizophrenia.

Another goal of this study was to evaluate the relation of MPAs grouped by location (head, feet, midline, lateral) to the cognitive domains and the symptom ratings. Due to the number of non-significant tests and the missing data in the measurement of MPAs, this analysis was not possible. Most statistical packages use list-wise deletion when analyzing statistical models. This method removes all of the data for the individual if a single datum is missing for that individual. Using this method to analyze the data from the current study would result in a greatly reduced sample size making possible differences between groups harder to detect and reducing the generalizability of the findings to the population. Pair-wise deletion was also not a

good option for study. This method only removes the missing data between individual variables allowing for more of the data to be used in the analysis. Pair-wise deletion is considered to have unbiased estimates for the regression model when the data is assumed to be missing completely at random (Peugh & Enders, 2004). An analysis of missingness revealed in a non-significant result, indicating that the data is missing completely at random. Also, the number of non-significant results indicate a very small amount of variance of the scores being explained. By adding multiple predictive variables, the total variance explained by the regression model will increase, but it is highly unlikely that the higher order models will be significant predictors of symptom ratings or cognition. Although these analyses could not be conducted, stepwise regressions with multiple MPAs predicting the domains of the cognitive score and symptoms ratings were completed. These analyses did not find any models that were significantly better at predicting the scores and ratings than individual MPAs.

In addition to the limitations of conducting the analysis of the MPA groups, the study in general has other limitations to consider. One of these limitations is the sample size acquired for this study. Much of the previous research has had sample sized that are similar to sample of this study, while other have utilized samples of 120 or more participants. The small sample size makes true differences between the healthy controls and the schizophrenia groups more difficult to detect. A larger sample may have made the differences between the groups clearer and the results that are trending toward a significant p-value may have become significant. For example, the correlation between facial proportions and the Verbal Learning domain of the MCCB achieved an actual power of 0.56 with a sample size of 61. Using the achieved *r* from the tested model to calculate the needed sample size to find and effect if one exists, a sample of 172 participants is needed. The a priori tests used to determine the required sample for this study

using an effect size of d = 0.98 (Xu, Chan, & Comptom, 2011) calculated a need for 115 participants to find significant results. Due to limitations in resources available, it was not possible to include this large of a sample in the current study.

In addition to a relatively small sample size, the finding of the current research may have differed from previous research due to the use of hand tools to measure MPAs. Although this led to more precise measure of MPAs, it is different from the methods used in previous research and may have led to different results. Also, none of the participants had their MPAs measured by more than one researcher, therefore no ICC can be calculated to determine if all of the researchers were measuring the MPAs reliably. Another way to improve the measurement of MPAs in future studies could be to use computer assisted measurement. This could be done by taking photos of the MPAs and using computer software (like face recognition) to measure the areas of interest to improve accuracy and quality of the measurements. To the best of our knowledge, no computer assisted analysis has been conducted in the previous research.

In addition to a lack of reliability data, another limitation of the current research is that no questions were asked about post-natal injuries that may have occurred to the individual that could affect the presentation of the MPA itself. Although these questions are not typically asked in MPA research, they could help to determine if the MPAs where present since birth and thus reflect abnormalities during in utero development or if they were due to post birth accidents or surgery. One of the participants in our study reported that he was born with an extra toe on each foot but the toes were removed when he was a child and he did not have any manifest MPAs in this area at the time of the assessment. Relatedly, it is possible that some of the MPAs we did observe for a result of surgery or accidents, which we would not expect to be related to schizophrenia, symptoms, or cognitive functioning.

Another potential reason why our results differed from previous studies could be that our study included a wide range of ethnicities. However, no published articles could be found to support developmental differences during the 9-12-week period of in utero gestation across ethnicities. The original MPA scale was developed by Waldrop & Halverson using a sample of Caucasian children, and since its development the MPAs have been observed in other ethnicities, including Asians (Lin et al., 2012). Therefore, ethnic differences do not appear to have a direct effect on the presentation of MPAs. Based on previous research and lack of evidence in developmental differences, ethnic identity was not considered to test between-group differences in the presentation of MPAs.

The null results from this study may be due to the type of measurements used and the way MPAs are manifest in individuals. There is currently a debate as to whether schizophrenia and the associated symptoms are on a continuous scale or if they follow a dichotomous taxonomy. Some researchers have found evidence that the symptoms of schizophrenia may be on a continuous scale, even in the general population (Van Os, Hanssen, Bijl, & Ravelli, 2000), while others suggest that schizophrenia is taxon that is either present or not present (Lenzenweger, 1994). This study aimed to elaborate on the way MPAs have been measured and provide a dimensional look at the expression of them. This method may not work with MPAs as their presentation may not be a dimensional construct. The presentation of MPAs may require developmental processes to be interrupted to a certain extent that causes the differences in development to manifest as an MPA itself. By measuring the MPAs on a dimensional scale, the ability to detect differences between the groups may have been lost due to the normal variation in the associated regions. By measuring the MPAs on continuous scale, a more accurate relation between MPAs and the symptoms and cognition in schizophrenia may be examined.

Although the results of the current research were not consistent with many studies that have found a relation between MPAs and schizophrenia, its symptoms, and cognitive deficits, it is important to note that the results of these studies have also been mixed. For example, some studies have not found these significant relations (Alexander, Mukherjee, Richter, & Kaufmann, 1994; Hope, Bates, & Gow, 2012; Rosenberg, & Weller, 1973). Another important consideration is that null results are not regularly published, making it difficult to determine if MPAs are truly related to cognition and symptoms of schizophrenia. This research did not replicate the results of some previous research, but new possible associations were found (toe gap and hair whorl location).

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List of Tables

Table 1
Findings from Research Measuring Minor Physical Anomalies, Symptoms, and Cognitive Deficits

Article	Findings
MPAs and symptoms with significant results	
Akabealiev, Sivkov, & Matarkov, 2014	Lowest MPA scores in "healthy control", intermediate in bipolar I disorder, and highest in schizophrenia
Compton et al., 2007	Significant positive correlations between MPAs of the mouth and Positive Symptoms; MPAs of the feet and positive symptoms. Significant negative correlations of MPAs of the mouth and Negative Symptoms; MPAs of the ears and general psychopathology symptoms.
Griffiths et al., 1998	Higher total MPAs associated with individuals diagnosed with schizophrenia with no family history.
Green, Gaier, Ganzell & Kharabi, 1989	People with schizophrenia have significantly more MPAs than "normal controls". People with schizophrenia were found to have a high incidence of abnormalities of the mouth and head size.
Green, Satz, & Christenson, 2004	Significantly more MPAs found on people with schizophrenia compared to "normal controls" and people with bipolar disorder.
Gualtieri, Adams, Shen, & Loiselle, 1982	People with schizophrenia have significantly higher scores of total MPAs compared to "normal" adults.
Lloyd et al., 2008	Overall facial symmetry, symmetry of the orbital landmarks and lowered Frankfurt horizontals significantly differentiated first-episode psychosis participants from controls. Affective psychosis participants had lowered eye fissures compared to controls.
O'Callaghan et al, 1995	Significant relationship between MPAs and SANS (r = .316) and National Adult Reading Test (r =-.367*)
Schiffman, J., Ekstrom, M., LaBrie, J., Schulsinger, F., Sorensen, H., Mednick, S., (2002)	MPAs significantly associated with schizophrenia spectrum disorder relative to no mental illness. No significant differences in MPA scores between schizophrenia and other psychopathology. High risk individuals more likely to have MPAs.

Trixler, M., Tényi, T., Csábi, G., Szabó, R., (2001)	Significantly more total number of MPAs in individuals with schizophrenia compared to individuals with bipolar disorder and control group.

MPAs and symptoms with non-significant results

Aksoy-Poyraz, 2011	No significant associations between MPAs and total SANS scores, SAPS scores, or disorganized dimensions.
Lohr, & Flynn, 1993	No significant difference between people with schizophrenia and mood disorder patients.
McGrath et al., 2002	No significant differences were found between individuals with non-affective psychosis and affective psychosis in total number of MPAs, craniofacial size factor, craniofacial shape factor, or width/length ratio.

MPAs and cognitive abilities with significant results

Ismail, Cantor-Graae, & McNeil, 2000	Significant difference between patients with High and Low MPA scores on Word Pairs 2
Mittal & Walker, 2011	Significant differences between individuals with high and low MPA scores on the Wechsler Memory Scale III subtest Family Picture I and II. Those with higher MPA scores scored lower on the subtest.
Rosenberg, J.B., & Weller, G.m., 1973	No significant relationship between MPA scores and performance IQ and personality factors. Significant negative correlation between MPA scores and the Peabody Picture Vocabulary Test. Study conducted with sample of 6-7 year-olds.

MPAs and cognitive abilities with non-significant results

Alexander, Mukherjee, Richter, & Kaufmann, 1994	Total weighted Waldrop scores significantly positively correlated with third ventricle width and negatively correlated with tardive dyskinesia. No significant difference between individuals diagnosed with schizophrenia with family history and those with no family history. Age of onset, duration of illness, impairment in premorbid functioning, IQ, ventricle-brain ratio not significantly correlated with MPAs.
Green, Bracha, Satz, & Christenson, 1994	No significant associations between MPAs and dermatoglyphics compared to information processing tasks (Degraded-stimulus continuous performance task, Span of apprehension,

	Backward masking procedure, Pin Test, and Wisconsin Card Sorting Task).
Hope, Bates, & Gow, 2012	No association between IQ and curvature of the fifth digit.
O'Reilly, Lane, Cernovsky, & O'Callaghan, 2001	No significant correlations between total MPAs scores and Neurological Evaluation Scale, nor Handedness.
Rosenberg, J.B., & Weller, G.m., 1973	No significant relationship between MPA scores and performance IQ and personality factors. Significant negative correlation between MPA scores and the Peabody Picture Vocabulary Test. Study conducted with sample of 6-7 year-olds.

Table 2

Demographic Information

	Healthy Controls		Patients	
Age	Mean	Sd	Mean	Sd
	42.56	14.05	49.32	10.34
Gender	# of	# of		
Male	16	25		
Female	15	22		
Ethnicity				
Caucasian	16		13	
Mixed	7		7	
Japanese	2		4	
Chinese	1		2	
Filipino	1		4	
Hawaiian	1		9	
Black	0		4	
Pacific	0		1	
Other	4		3	

Table 3

T-tests of Group Differences for Individual MPAs

	Healthy Controls		**Patient**				
MPA	Mean	SD	Mean	SD	Df	T	P
Head Circumference (cm)	57.37	6.68	56.35	4.59	63	-0.73	0.47
Facial Proportions	0.98	0.19	0.97	0.15	69	-0.18	0.86
Ear Symmetry (mm)	2.11	2.30	1.67	1.26	71	-1.05	0.29
Ear Protrusion:							
Left	13.35	4.68	15.12	3.77	69	1.75	0.08
Right	13.05	4.47	14.58	3.27	69	1.67	0.10
Palatal Ridge Count	2.06	1.25	2.19	1.05	31	0.32	0.75
Hypertelorism	30.26	4.72	32.04	4.35	70	1.65	0.10
5th finger curvature	78.38	30.71	80.75	27.52	68	0.34	0.74
Index/Middle Finger Ratio	0.88	0.05	0.89	0.15	71	0.36	0.72
Syndactyly of Toes:							
2nd toe length differences	3.69	4.69	4.53	3.11	71	0.92	0.36
3rd toe length differences	-3.57	2.70	-3.07	3.71	71	0.62	0.53
Gap between 1st and 2nd toes	8.78	4.35	8.84	3.24	70	0.07	0.94

Table 4

T-tests of Group Differences for Individual MPAs

MPA	X^2	n	df	*p*
Hair Whorls:				
Presence	3.48	61	1	0.06
Count	0.39	45	1	0.53
Direction	1.56	55	1	0.21
Position	2.44	49	2	0.29
Adherent Earlobes	1.63	74	1	0.20
Palatal Shape	5.68	73	2	0.06
Palatal Ridge Presence	1.62	71	1	0.20
Tongue Furrows:				
Presence	0.22	74	1	0.64
Placement	0.49	36	1	0.48
Tongue Spots	0.85	73	1	0.36
Bifid Tongue	0.72	74	1	0.39
Epicanthal Covering	1.84	73	2	0.39
Strabismus[§]	2.93	71	3	0.40
Palmer Crease	0.00	74	1	1.00
Toe Syndactyly	1.95	74	1	0.16

[§] Esotropia, Exotropia, and Hypertropia are only present in the Patient group

Table 5

Relation of Hair Whorl Presence and the MCCB

	Not Present		Present				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	40.83	4.66	44.31	4.94	52	0.71	0.48
BACS	40.33	5.33	44.98	5.65	52	0.82	0.42
HVLT	35.00	4.12	40.81	4.37	52	1.33	0.19
WMS	43.67	4.82	51.85	5.11	52	1.60	0.12
LNS	41.67	5.12	41.50	5.43	52	-0.03	0.98
Mazes	41.67	3.82	48.12	4.05	52	1.59	0.12
BVMT	37.50	5.02	43.81	5.33	52	1.19	0.24
Fluency	40.50	5.12	47.71	5.44	52	1.33	0.19
MSCEIT	36.50	5.69	38.51	6.05	51	0.33	0.74
CPT	36.67	4.39	39.30	4.68	47	0.56	0.58
Domains							
SoP	37.50	5.20	44.21	5.52	52	1.22	0.23
AV	36.67	4.39	39.30	4.68	47	0.56	0.58
WM	41.17	5.24	45.91	5.56	52	0.86	0.40
VrblLrng	35.00	4.12	40.81	4.37	52	1.33	0.19
VisLrng	37.50	5.02	43.81	5.33	52	1.19	0.24
RPS	41.67	3.82	48.12	4.05	52	1.59	0.12
SC	36.50	5.69	38.51	6.05	51	0.33	0.74
Comp	30.33	5.15	38.79	5.50	46	1.54	0.13
Wasi Domains							
VCI	80.33	5.89	95.42	6.22	56	2.43	0.02*
PRI	87.00	6.81	100.07	7.19	56	1.82	0.07
Comp	82.00	9.34	91.87	9.86	56	1.00	0.32

*p<.05

Table 6

Relation of Hair Whorl Direction and the MCCB

	Clockwise		**Counter-Clockwise**				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	44.42	1.67	43.40	5.17	46	-0.20	0.84
BACS	45.44	1.87	41.00	5.78	46	-0.77	0.45
HVLT	41.79	1.57	32.40	4.78	46	-1.96	0.06
WMS	51.49	1.81	55.00	5.59	46	0.63	0.53
LNS	42.02	1.88	37.00	5.82	46	-0.86	0.39
Mazes	47.81	1.36	49.60	4.21	46	0.66	0.51
BVMT	44.42	1.87	37.60	5.80	46	-1.00	0.32
Fluency	48.19	1.97	43.60	6.11	46	-0.75	0.46
MSCEIT	38.51	2.11	38.50	7.24	45	-0.00	0.99
CPT	38.97	1.69	41.80	4.95	41	0.57	0.57
Domains							
SoP	44.67	1.88	40.20	5.83	46	-0.77	0.45
AV	38.97	1.69	41.80	4.95	41	0.57	0.57
WM	46.00	1.92	45.20	5.94	46	-0.14	0.89
VrblLrng	41.79	1.57	32.40	4.78	46	-1.96	0.06
VisLrng	44.42	1.87	37.60	5.80	46	-1.00	0.32
RPS	47.81	1.36	49.60	4.21	46	0.66	0.51
SC	38.51	2.11	38.50	7.24	45	-0.00	0.99
Comp	38.82	1.91	38.50	6.18	40	-0.05	0.96
Wasi Domains							
VCI	96.64	2.07	84.00	6.69	50	-1.89	0.06
PRI	100.53	2.39	95.80	7.71	50	-0.61	0.54
Comp	92.29	3.45	87.80	11.12	50	-0.40	0.69

*p<.05

Table 7

Relation of Hair Whorl Count and the MCCB

BPRS	**One Whorl**		**Two Whorls**				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	45.63	1.68	49.00	10.49	37	0.32	0.75
BACS	46.68	1.87	50.00	11.70	37	0.37	0.71
HVLT	41.32	1.76	54.00	11.01	37	1.15	0.26
WMS	53.03	2.23	35.00	12.63	37	1.43	0.16
LNS	42.40	2.01	50.00	12.55	37	0.61	0.55
Mazes	49.55	1.39	45.00	8.68	37	0.53	0.60
BVMT	44.47	1.95	55.00	12.18	37	0.86	0.39
Fluency	47.40	2.02	49.00	12.63	37	0.13	0.90
MSCEIT	39.38	2.12	32.00	13.08	36	0.56	0.58
CPT	38.86	1.69	51.00	10.12	34	1.20	0.24
Domains							
SoP	45.37	1.92	50.00	11.97	37	0.39	0.70
AV	38.86	1.69	51.00	10.12	34	1.20	0.24
WM	47.18	2.09	41.00	13.06	37	0.47	0.64
VrblLrng	41.32	1.76	54.00	11.01	37	1.15	0.26
VisLrng	44.47	1.95	55.00	12.18	37	0.86	0.39
RPS	49.55	1.39	45.00	8.68	37	0.53	0.60
SC	39.38	2.12	32.00	13.08	36	0.56	0.58
Comp	39.59	1.93	45.00	11.39	33	0.48	0.64
Wasi Domains							
VCI	96.03	2.28	111.50	10.47	40	1.48	0.15
PRI	100.60	2.55	101.50	11.69	40	0.08	0.94
Comp	93.48	3.47	108.00	15.91	40	0.91	0.37

*p<.05

Table 8

Relation of the Whorl Position and the Cognitive Variables

	Whorl Positon Left		**Whorl Position Midline**		**Whorl Position Right**				
Subtests	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
TMT	39.67	3.87	49.45	4.41	38.06	4.54	2,39	7.05	0.00*
BACS	42.33	4.45	47.70	5.08	39.13	5.22	2,39	2.80	0.07
HVLT	37.50	4.39	40.95	5.00	42.06	5.15	2,39	0.39	0.68
WMS	53.50	4.97	53.10	5.67	49.31	5.83	2,39	0.50	0.61
LNS	37.67	5.18	41.55	5.90	40.13	6.07	2,39	0.23	0.80
Mazes	47.83	3.52	51.45	4.00	43.94	4.12	2,39	3.40	0.04*
BVMT	49.17	5.16	42.70	5.88	41.19	6.04	2,39	0.89	0.42
Fluency	43.00	5.17	45.25	5.90	51.63	6.07	2,39	1.54	0.23
MSCEIT	35.33	6.05	40.58	6.94	37.50	7.10	2,38	0.36	0.70
CPT	43.40	4.17	38.95	4.69	38.54	4.91	2,34	0.54	0.59
Domains									
SoP	39.00	4.64	46.55	5.29	40.56	5.45	2, 39	1.71	0.19
AV	43.00	4.17	38.95	4.69	38.54	4.91	2,34	0.54	0.59
WM	44.67	5.33	42.58	6.07	43.44	6.24	2,39	0.29	0.75
VrblLrng	37.50	4.39	40.95	5.00	42.06	5.15	2, 39	0.39	0.68
VisLrng	49.17	5.16	42.70	5.88	41.19	6.04	2,39	0.89	0.42
RPS	47.83	3.52	51.45	4.00	43.94	4.12	2,39	3.40	0.04*
SC	35.33	6.05	40.58	6.94	37.50	7.10	2,38	0.36	0.70
Comp	38.20	5.30	40.17	5.99	35.62	6.24	2,33	0.56	0.58
Wasi Domains									
VCI	92.83	5.90	94.12	6.57	96.27	6.98	2,43	0.16	0.85
PRI	84.00	6.22	107.50	6.96	95.88	7.29	2,43	6.78	0.00*
Comp	88.00	10.07	88.88	11.26	95.25	11.81	2,43	0.37	0.69

*p<.05

Table 9

Relation of Head Circumference and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	57	-0.01	0.94
BACS	58	0.16	0.23
HVLT	58	0.09	0.49
WMS	58	0.16	0.22
LNS	58	-0.11	0.39
Mazes	58	-0.06	0.67
BVMT	57	-0.06	0.65
Fluency	58	-0.07	0.58
MSCEIT	57	0.19	0.15
CPT	52	-0.01	0.94
Domains			
SoP	58	0.04	0.75
AV	52	0.01	0.94
WM	58	-0.16	0.23
VrblLrng	58	0.09	0.49
VisLrng	57	-0.06	0.65
RPS	58	-0.06	0.67
SC	57	0.19	0.15
Comp	50	0.02	0.91
Wasi Domains			
VCI	61	0.03	0.80
PRI	62	0.00	0.98
Comp	62	0.01	0.96

*p<.05

Table 10

Relation of Facial Proportion and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	60	0.19	0.12
BACS	61	0.02	0.90
HVLT	61	0.27	0.04*
WMS	61	-0.01	0.93
LNS	61	0.21	0.10
Mazes	61	0.21	0.09
BVMT	60	0.16	0.23
Fluency	61	0.16	0.20
MSCEIT	60	0.08	0.51
CPT	54	-0.03	0.83
Domains			
SoP	61	0.16	0.21
AV	54	-0.03	0.83
WM	61	0.10	0.42
VrblLrng	61	0.27	0.04*
VisLrng	60	0.16	0.23
RPS	61	0.21	0.09
SC	60	-0.08	0.51
Comp	52	0.06	0.64
Wasi Domains			
VCI	66	0.00	0.99
PRI	67	0.03	0.82
Comp	67	0.09	0.43

*p<.05

Table 11

Relation of Ear Lobe Attachment and the Cognitive Variables

Cognitive Variables	**Attached**		**Detached**				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	42.83	2.19	44.05	2.77	62	0.44	0.66
BACS	41.04	2.59	45.34	3.27	63	1.32	0.19
HVLT	37.54	2.22	41.92	2.79	63	1.57	0.12
WMS	50.50	2.60	49.85	3.27	63	-0.20	0.84
LNS	38.92	2.49	42.85	3.14	63	1.26	0.21
Mazes	48.91	1.93	46.42	2.43	63	-1.03	0.31
BVMT	41.04	2.68	44.44	3.35	62	1.01	0.32
Fluency	42.92	2.44	49.73	3.08	63	2.22	0.03*
MSCEIT	32.91	3.11	40.44	3.88	62	1.94	0.06
CPT	38.18	2.155	39.47	2.74	56	0.47	0.64
Domains							
SoP	39.71	2.46	45.19	3.10	63	1.77	0.08
AV	38.18	2.16	39.47	2.74	56	0.47	0.64
WM	43.54	2.70	45.53	2.39	63	0.59	0.56
VrblLrng	37.54	2.22	41.92	2.79	63	1.57	0.12
VisLrng	41.04	2.68	44.44	3.35	62	1.01	0.32
RPS	48.91	1.93	46.42	2.43	63	-1.03	0.31
SC	32.91	3.11	40.44	3.88	62	1.94	0.06
Comp	34.65	2.92	39.06	3.64	54	1.21	0.23
Wasi Domains							
VCI	89.89	3.50	94.28	4.47	68	0.98	0.33
PRI	99.65	3.62	96.39	4.58	68	0.71	0.48
Comp	82.92	4.65	94.23	5.86	68	1.93	0.06

*p<.05

Table 12

Relation of Ear Symmetry and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	62	0.12	0.37
BACS	63	0.04	0.76
HVLT	63	0.04	0.76
WMS	63	0.05	0.72
LNS	63	0.02	0.90
Mazes	63	0.11	0.40
BVMT	62	0.06	0.62
Fluency	63	0.02	0.87
MSCEIT	62	0.00	0.99
CPT	56	0.09	0.50
Domains			
SoP	63	0.04	0.75
AV	56	0.09	0.50
WM	63	0.03	0.79
VrblLrng	63	0.04	0.76
VisLrng	62	0.06	0.62
RPS	63	0.11	0.40
SC	62	0.00	0.99
Comp	54	0.01	0.95
Wasi Domains			
VCI	68	0.09	0.44
PRI	68	0.05	0.71
Comp	68	0.09	0.43

*p<.05

Table 13

Relation of Left Ear Protrusion and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	60	0.14	0.27
BACS	61	0.05	0.70
HVLT	61	0.02	0.85
WMS	61	0.02	0.90
LNS	61	0.00	0.98
Mazes	61	0.16	0.21
BVMT	60	0.06	0.66
Fluency	61	0.28	0.03*
MSCEIT	60	0.05	0.69
CPT	54	0.21	0.11
Domains			
SoP	61	0.15	0.23
AV	54	0.21	0.11
WM	61	0.01	0.92
VrblLrng	61	0.02	0.85
VisLrng	60	0.06	0.66
RPS	61	0.16	0.21
SC	60	0.05	0.69
Comp	52	0.10	0.47
WASI Domains			
VCI	66	0.06	0.62
PRI	66	0.12	0.32
Comp	66	0.00	0.97

*p<.05

Table 14

Relation of Right Ear Protrusion and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	60	0.10	0.43
BACS	61	0.02	0.88
HVLT	61	0.06	0.66
WMS	61	0.04	0.74
LNS	61	0.00	0.98
Mazes	61	0.13	0.32
BVMT	60	0.06	0.63
Fluency	61	0.27	0.04*
MSCEIT	60	0.10	0.43
CPT	54	0.16	0.25
Domains			
SoP	61	0.15	0.24
AV	54	0.16	0.25
WM	61	0.06	0.66
VrblLrng	61	0.06	0.66
VisLrng	60	0.06	0.63
RPS	61	0.13	0.32
SC	60	0.10	0.43
Comp	52	0.00	0.62
Wasi Domains			
VCI	66	0.05	0.67
PRI	66	0.12	0.31
Comp	66	0.03	0.82

*p<.05

Table 15

Relation of Palatal Shape and the Cognitive Variables

	Steepled w/ Flattened Apex		U-Shaped		V-Shaped				
Subtests	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
TMT	42.50	7.65	43.54	7.78	49.00	13.25	2,61	0.14	0.87
BACS	45.00	7.48	43.51	7.66	51.00	14.96	2,62	0.18	0.84
HVLT	39.33	6.37	40.13	6.52	54.00	12.73	2,62	0.79	0.46
WMS	48.00	7.32	50.44	7.51	35.00	14.65	2,62	0.77	0.47
LNS	33.67	7.09	41.64	7.27	50.00	14.19	2,62	0.85	0.43
Mazes	42.33	5.52	47.62	5.65	45.00	11.03	2,62	0.47	0.63
BVMT	42.67	7.49	43.05	7.68	55.00	14.99	2,61	0.42	0.66
Fluency	58.33	7.08	46.64	7.26	49.00	14.17	2,62	1.31	0.28
MSCEIT	48.00	8.82	37.32	9.04	32.00	17.65	2,61	0.77	0.47
CPT	40.67	5.82	38.67	5.98	30.33	11.64	2,55	0.78	0.46
Domains									
SoP	49.00	7.13	42.77	7.31	50.00	14.27	2,62	0.52	0.59
AV	40.67	5.82	38.67	5.98	30.33	11.64	2,55	0.78	0.46
WM	38.67	7.66	45.16	7.85	41.00	15.32	2,62	0.38	0.68
VrblLrng	39.33	6.37	40.13	6.52	54.00	12.73	2,62	0.79	0.46
VisLrng	42.67	7.49	43.05	7.68	55.00	14.99	2,61	0.42	0.66
RPS	42.33	5.52	47.62	5.65	45.00	11.03	2,62	0.47	0.63
SC	48.00	8.82	37.32	9.04	32.00	17.65	2,61	0.77	0.47
Comp	38.33	7.68	37.29	7.89	45.00	15.36	2,53	0.17	0.84
Wasi Domains									
VCI	87.00	10.54	92.13	10.79	109.50	16.67	2.66	0.37	0.37
PRI	88.33	10.80	97.81	11.05	103.50	17.08	2,66	0.47	0.63
Comp	86.67	13.03	90.83	13.33	108.00	20.59	2,66	0.62	0.54

*p<.05

Table 16

Relation of the Presence of Palatal Ridges and the Cognitive Variables

MCCB	**Not Present**		**Present**				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	43.23	1.96	43.87	2.78	61	0.23	0.82
BACS	41.78	2.67	46.26	3.23	62	1.39	0.17
HVLT	39.00	1.95	42.16	2.78	62	1.14	0.26
WMS	47.28	2.17	53.10	3.09	62	1.88	0.06
LNS	40.94	2.21	42.13	3.16	62	0.38	0.71
Mazes	49.13	1.66	45.32	2.37	62	-1.61	0.11
BVMT	43.59	2.28	43.23	3.27	61	-0.11	0.91
Fluency	46.13	2.17	49.16	3.09	62	0.98	0.33
MSCEIT	36.94	2.75	39.45	3.88	61	0.65	0.52
CPT	39.31	1.87	38.18	2.66	56	-0.43	0.67
MCCB Domains							
SoP	41.72	2.18	45.19	3.11	62	1.12	0.27
AV	39.31	1.87	38.18	2.66	56	0.43	0.67
WM	42.84	2.33	47.00	3.32	62	1.25	0.22
VrblLrng	39.00	1.95	42.16	2.78	62	1.14	0.26
VisLrng	43.59	2.28	43.23	3.27	61	-0.11	0.91
RPS	49.13	1.66	45.32	2.37	62	-1.61	0.11
SC	36.94	2.75	39.45	3.88	61	0.65	0.52
Comp	36.43	2.50	38.96	3.56	54	0.71	0.48
WASI Domains							
VCI	89.03	3.17	96.09	4.45	65	1.59	0.12
PRI	97.24	3.21	99.00	4.51	65	0.39	0.69
Comp	88.61	3.93	94.24	5.52	65	1.02	0.31

*p<.05

Table 17

Relation of Palatal Ridge Count and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	29	0.13	0.47
BACS	29	-0.07	0.70
HVLT	29	0.19	0.30
WMS	29	-0.05	0.79
LNS	29	0.08	0.67
Mazes	29	0.09	0.63
BVMT	28	0.11	0.55
Fluency	29	0.18	0.34
MSCEIT	29	0.09	0.65
CPT	25	0.02	0.91
Domains			
SoP	29	0.12	0.52
AV	25	0.02	0.91
WM	29	0.02	0.92
VrblLrng	29	0.19	0.30
VisLrng	28	0.11	0.55
RPS	29	0.09	0.63
SC	29	0.09	0.65
Comp	24	0.15	0.47
Wasi Domains			
VCI	32	0.08	0.65
PRI	32	0.15	0.39
Comp	32	0.10	0.56

*p<.05

Table 18

Relation of the Presence of Tongue Furrows and the Cognitive Variables

Cognitive Variables	**Not Present**		**Present**				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	43.47	1.85	43.73	2.69	62	0.10	0.92
BACS	44.03	2.18	43.43	3.21	63	-0.19	0.85
HVLT	41.43	1.86	39.00	2.74	63	-0.89	0.38
WMS	50.14	2.15	50.03	3.17	63	-0.03	0.97
LNS	40.60	2.08	42.33	3.07	63	0.57	0.57
Mazes	47.00	1.61	47.73	2.37	63	0.31	0.76
BVMT	42.29	2.22	42.27	3.24	62	0.61	0.54
Fluency	48.06	2.10	46.23	3.08	63	-0.59	0.56
MSCEIT	39.03	2.58	36.17	3.84	62	-0.74	0.46
CPT	40.97	1.75	36.54	2.61	56	-1.70	0.09
Domains							
SoP	43.63	2.09	42.63	3.07	63	-0.32	0.75
AV	40.97	1.75	36.54	2.61	56	-1.70	0.09
WM	44.40	2.24	45.27	3.29	63	0.26	0.79
VrblLrng	41.43	1.86	39.00	2.74	63	-0.89	0.38
VisLrng	42.29	2.22	42.27	3.24	62	0.61	0.54
RPS	47.00	1.61	47.73	2.37	63	0.31	0.76
SC	39.03	2.58	36.17	3.84	62	-0.74	0.46
Comp	37.84	2.37	37.04	3.55	54	-0.23	0.82
Wasi Domains							
VCI	91.47	3.05	93.76	4.37	68	0.52	0.60
PRI	95.61	3.08	99.71	4.41	68	0.93	0.36
Comp	93.14	4.02	86.84	5.77	68	1.11	0.27

*p<.05

Table 19

Relation of Tongue Furrow Placement and the Cognitive Variables

	Midline		Non-Midline				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	42.40	2.19	52.50	5.90	27	1.71	0.10
BACS	41.68	2.90	57.50	7.80	27	2.03	0.05*
HVLT	37.40	1.93	41.75	5.20	27	0.84	0.41
WMS	48.76	2.24	56.50	6.03	27	1.28	0.21
LNS	39.92	2.64	55.00	6.29	27	2.38	0.02*
Mazes	46.52	1.84	51.00	4.95	27	0.91	0.37
BVMT	42.72	2.62	51.75	7.05	27	1.28	0.21
Fluency	44.76	2.42	50.75	6.51	27	0.92	0.37
MSCEIT	34.88	2.71	37.25	7.18	26	0.33	0.74
CPT	34.14	2.38	46.50	5.95	23	2.08	0.05*
Domains							
SoP	40.60	2.79	54.75	7.50	27	1.89	0.07
AV	34.14	2.38	46.50	5.95	23	2.08	0.04*
WM	43.08	2.45	56.75	6.59	27	2.07	0.04*
VrblLrng	37.40	1.93	41.75	5.20	27	0.84	0.41
VisLrng	42.72	2.62	51.75	7.05	27	1.28	0.21
RPS	46.52	1.84	51.00	4.95	27	0.91	0.37
SC	34.88	2.71	37.25	7.18	26	0.33	0.74
Comp	33.80	2.91	13.70	7.12	22	1.93	0.07
Wasi Domains							
VCI	93.31	3.81	93.50	10.94	31	0.02	0.99
PRI	97.72	2.81	111.75	8.08	31	1.74	0.09
Comp	87.31	5.44	77.00	15.63	31	0.66	0.51

*p<.05

Table 20

Relation of the Presence of Tongue Spots and the Cognitive Variables

	Not Present		Present				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	42.64	1.37	53.40	4.85	61	2.22	0.03*
BACS	42.20	1.56	60.20	5.57	62	3.23	0.00*
HVLT	39.61	1.42	46.20	5.09	62	1.30	0.20
WMS	49.29	1.64	58.20	5.86	62	1.52	0.13
LNS	40.75	1.60	47.00	5.71	62	1.10	0.28
Mazes	46.93	1.23	53.00	4.41	62	1.38	0.17
BVMT	42.21	1.65	50.80	5.86	61	1.47	0.15
Fluency	46.25	1.58	55.10	5.65	62	1.76	0.08
MSCEIT	37.45	2.02	39.00	7.18	61	0.22	0.83
CPT	38.42	1.38	45.75	5.20	55	1.41	0.16
Domains							
SoP	41.66	1.49	58.60	5.34	62	3.17	0.00*
AV	38.42	1.38	45.75	5.20	55	1.41	0.16
WM	43.93	1.70	53.00	6.08	62	1.49	0.14
VrblLrng	39.61	1.42	46.20	5.09	62	1.30	0.20
VisLrng	42.21	1.65	50.80	5.86	61	1.47	0.15
RPS	46.93	1.23	53.00	4.41	62	1.38	0.17
SC	37.45	2.02	39.00	7.18	61	0.22	0.83
Comp	36.41	1.80	47.50	6.68	53	1.66	0.10
Wasi Domains							
VCI	91.81	2.31	100.33	7.82	67	1.09	0.28
PRI	96.27	2.28	106.93	7.74	67	1.36	0.18
Comp	88.38	3.02	103.83	10.24	67	1.51	0.14

*p<.05

Table 21

Relation of the Presence of Bifid Tongue and the Cognitive Variables

	Not Present		**Present**				
Subtests	Mean	SD	Mean	SD	df	t	*p*
TMT	43.74	1.41	42.17	4.61	63	-0.34	0.73
BACS	43.64	1.68	44.83	5.52	64	0.22	0.83
HVLT	40.27	1.44	40.67	4.75	64	0.08	0.93
WMS	50.08	1.66	50.17	5.46	64	0.02	0.99
LNS	41.49	1.61	40.50	5.29	64	-0.19	0.85
Mazes	47.83	1.23	42.50	4.04	64	-1.32	0.19
BVMT	43.81	1.69	37.50	5.50	63	-1.15	0.26
Fluency	47.02	1.62	49.17	5.32	64	0.40	0.69
MSCEIT	37.74	2.02	37.67	6.58	63	-0.01	0.99
CPT	38.46	1.35	46.00	5.15	57	1.46	0.15
Domains							
SoP	43.08	1.61	44.00	5.30	64	0.17	0.86
AV	38.46	1.35	46.00	5.15	57	1.46	0.15
WM	44.88	1.72	44.00	5.67	64	-0.155	0.88
VrblLrng	40.27	1.44	40.67	4.75	64	0.08	0.93
VisLrng	43.81	1.69	37.50	5.50	63	-1.15	0.26
RPS	47.83	1.23	42.50	4.04	64	-1.32	0.19
SC	37.74	2.02	37.67	6.58	63	-0.01	0.99
Comp	37.04	1.82	43.25	6.81	55	0.91	0.37
Wasi Domains							
VCI	93.56	2.26	82.19	7.70	68	-1.48	0.14
PRI	97.47	2.32	99.00	7.93	68	0.19	0.85
Comp	89.14	3.02	99.50	10.31	68	1.01	0.32

*p<.05

Table 22

Relation of the Epicanthus Coverage of the Tear Duct and the Cognitive Variables

	No Coverage of Tear Duct		**Partial Coverage of Tear Duct**		**Full Coverage of Tear Duct**				
Subtests	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
TMT	44.39	2.67	46.44	5.29	48.46	3.86	2,60	0.71	0.50
BACS	41.64	3.25	37.20	6.45	42.86	4.65	2,61	0.89	0.42
HVLT	36.77	2.81	28.77	5.61	34.04	4.03	2,61	1.17	0.32
WMS	49.13	3.22	46.38	6.40	48.68	4.60	2,61	0.15	0.86
LNS	37.37	3.04	28.65	6.05	36.87	4.35	2,61	2.03	0.14
Mazes	46.79	2.45	44.77	4.88	44.68	3.51	2,61	0.18	0.84
BVMT	40.88	3.30	34.18	6.53	35.64	4.76	2,60	0.66	0.52
Fluency	43.42	3.18	35.67	6.32	42.35	4.54	2,61	1.25	0.29
MSCEIT	36.27	3.10	32.27	7.79	32.75	5.70	2,60	0.19	0.82
CPT	37.90	2.65	34.38	5.20	34.44	3.91	2,54	0.40	0.68
Domains									
SoP	40.82	3.10	36.00	6.16	42.26	4.43	2,61	1.20	0.31
AV	37.90	2.65	34.38	5.20	34.44	3.91	2,54	0.40	0.68
WM	41.73	3.27	34.67	6.50	41.14	4.67	2,61	1.09	0.34
VrblLrng	36.77	2.81	28.77	5.61	34.04	4.03	2,61	1.17	0.32
VisLrng	40.88	3.30	34.18	6.53	35.64	4.76	2,60	0.66	0.52
RPS	46.79	2.45	44.77	4.88	44.68	3.51	2,61	0.18	0.84
SC	36.27	3.10	32.27	7.79	32.75	5.70	2,60	0.19	0.82
Comp	34.28	3.39	25.84	6.58	29.85	5.05	2,52	0.82	0.44
Wasi Domains									
VCI	93.73	13.22	91.27	13.81	80.00	12.97	2,66	0.61	0.55
PRI	92.93	13.99	99.42	13.34	88.50	13.09	2,66	0.94	0.39
Comp	82.50	17.40	90.11	17.73	91.57	18.61	2,66	0.12	0.89

Table 23

Relation of the Strabismus and the Cognitive Variables

	Strabismus Esotropia		**Strabismus Exotropia**		**Strabismus Hypertropia**		**None Present**				
Subtests	Mean	SD	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
TMT	38.00	10.99	35.00	15.54	43.00	15.54	43.76	11.08	3,57	0.29	0.83
BACS	32.00	13.15	48.00	18.59	39.00	18.59	44.10	13.26	3,58	0.36	0.78
HVLT	24.00	10.90	36.00	15.41	30.00	15.41	40.80	10.99	3,58	1.14	0.34
WMS	53.00	12.88	67.00	18.22	46.00	18.22	50.05	12.99	3, 58	0.62	0.61
LNS	33.00	12.45	44.00	17.61	39.00	17.61	41.81	12.56	3, 58	0.19	0.90
Mazes	43.00	9.25	52.00	13.08	37.00	13.01	38.51	9.33	3,58	0.58	0.63
BVMT	23.00	12.45	56.00	17.61	-	-	43.81	12.56	2,58	1.87	0.16
Fluency	36.00	12.36	41.00	17.48	41.00	17.48	47.17	12.46	3,58	0.42	0.74
MSCEIT	-	-	29.00	15.37	43.00	21.73	48.46	15.50	2,58	0.23	0.79
CPT	31.00	10.38	47.00	14.68	42.00	14.68	39.17	10.48	3,51	0.42	0.74
Domains											
SoP	30.00	12.52	38.00	17.70	38.00	17.70	43.41	12.62	3,58	0.49	0.69
AV	31.00	10.38	47.00	14.68	42.00	14.68	39.17	10.48	3 51	0.42	0.74
WM	42.00	13.34	56.00	18.86	41.00	18.86	45.03	13.45	3,58	0.27	0.84
VrblLrng	24.00	10.90	36.00	15.41	30.00	15.41	40.80	10.99	3,58	1.14	0.34
VisLrng	23.00	12.45	56.00	17.61	-	-	43.81	12.56	2,58	1.87	0.16
RPS	43.00	9.25	52.00	13.08	37.00	13.08	47.49	9.33	3,58	0.58	0.63
SC	29.00	15.37	-	-	43.00	21.73	38.46	15.50	2,58	0.23	0.79
Comp	-	-	42.00	12.95	-	-	37.81	13.08	1,51	0.10	0.75
Wasi Domains											
VCI	72.50	12.95	73.00	22.43	110.00	22.43	93.05	13.15	3,63	1.49	0.22
PRI	65.00	12.38	76.00	21.44	99.00	21.44	98.86	12.57	3,63	2.93	0.04*
Comp	67.00	17.30	72.00	29.96	105.00	29.96	90.44	17.57	3,63	0.89	0.45

- Missing data

* $p < 0.05$

Table 24

Relation of Hypertelorism and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	62	0.10	0.44
BACS	63	0.19	0.13
HVLT	63	0.11	0.40
WMS	63	0.00	0.99
LNS	63	0.01	0.94
Mazes	63	0.05	0.71
BVMT	62	0.07	0.58
Fluency	63	0.07	0.57
MSCEIT	62	0.03	0.79
CPT	56	0.13	0.33
Domains			
SoP	63	0.09	0.46
AV	56	0.13	0.33
WM	63	0.01	0.93
VrblLrng	63	0.11	0.40
VisLrng	62	0.07	0.58
RPS	63	0.05	0.71
SC	62	0.03	0.79
Comp	54	0.01	0.91
Wasi Domains			
VCI	67	0.15	0.22
PRI	67	0.01	0.91
Comp	67	-0.10	0.40

*p<.05

Table 25

Relation of Curvature of the Fifth Finger and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	59	0.04	0.77
BACS	60	0.04	0.74
HVLT	60	0.12	0.36
WMS	60	0.11	0.41
LNS	60	0.12	0.34
Mazes	60	0.07	0.57
BVMT	59	0.06	0.65
Fluency	60	0.05	0.72
MSCEIT	59	0.04	0.74
CPT	53	0.06	0.68
Domains			
SoP	60	0.02	0.89
AV	53	0.06	0.68
WM	60	0.00	0.97
VrblLrng	60	0.12	0.36
VisLrng	59	0.06	0.65
RPS	60	0.07	0.57
SC	59	0.04	0.74
Comp	51	0.04	0.80
Wasi Domains			
VCI	65	0.06	0.61
PRI	65	0.09	0.44
Comp	65	0.05	0.71

*p<.05

Table 26

Relation of Length Proportion of the 3rd and 4th Fingers and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	62	0.25	0.04*
BACS	63	0.11	0.38
HVLT	63	0.06	0.66
WMS	63	0.00	0.99
LNS	63	0.11	0.38
Mazes	63	0.10	0.44
BVMT	62	0.01	0.94
Fluency	63	0.00	0.99
MSCEIT	62	0.06	0.66
CPT	56	0.01	0.94
Domains			
SoP	63	0.15	0.23
AV	56	0.01	0.94
WM	63	0.07	0.57
VrblLrng	63	0.06	0.66
VisLrng	62	0.01	0.94
RPS	63	0.10	0.44
SC	62	0.06	0.66
Comp	54	0.10	0.46
Wasi Domains			
VCI	68	0.03	0.82
PRI	68	0.26	0.03*
Comp	68	0.13	0.30

*p<.05

Table 27

Relation of Difference in the Length of the Interior and Lateral Length of the Second Toe and the MCCB

Subtests	df	*r*	*p*
TMT	62	-0.11	0.38
BACS	63	0.00	0.95
HVLT	63	-0.01	0.95
WMS	63	-0.13	0.32
LNS	63	-0.02	0.89
Mazes	63	0.11	0.40
BVMT	62	0.10	0.43
Fluency	63	0.07	0.60
MSCEIT	62	0.06	0.65
CPT	56	-0.14	0.29
Domains			
SoP	63	-0.07	0.59
AV	56	-0.14	0.29
WM	63	-0.08	0.52
VrblLrng	63	-0.01	0.95
VisLrng	62	0.10	0.43
RPS	63	0.11	0.40
SC	62	0.06	0.65
Comp	54	-0.07	0.63
Wasi Domains			
VCI	68	0.04	0.74
PRI	68	0.07	0.57
Comp	68	-0.09	0.43

*p<.05

Table 28

Relation of Difference in the Length of the Interior and Lateral Length of the Third Toe and the Cognitive Variables

Subtests	df	*r*	*p*
TMT	62	0.01	0.93
BACS	63	0.00	1.00
HVLT	63	0.02	0.84
WMS	63	0.44	0.27
LNS	63	0.03	0.81
Mazes	63	0.01	0.95
BVMT	62	0.05	0.67
Fluency	63	0.04	0.75
MSCEIT	62	-0.07	0.60
CPT	56	0.04	0.77
Domains			
SoP	63	0.01	0.93
AV	56	0.04	0.77
WM	63	0.10	0.42
VrblLrng	63	0.02	0.84
VisLrng	62	0.05	0.67
RPS	63	0.01	0.95
SC	62	-0.07	0.60
Comp	54	0.04	0.75
Wasi Domains			
VCI	68	0.14	0.24
PRI	68	0.13	0.30
Comp	68	-0.05	0.69

*p<.05

Table 29

Relation of Gap between the First and Second Toes and the MCCB

Subtests	df	*r*	*p*
TMT	61	0.30	0.02*
BACS	62	0.23	0.07
HVLT	62	0.34	0.01*
WMS	62	0.38	0.00*
LNS	62	0.40	0.00*
Mazes	62	0.32	0.01*
BVMT	61	0.23	0.07
Fluency	62	0.04	0.73
MSCEIT	61	0.39	0.00*
CPT	55	0.13	0.32
Domains			
SoP	62	0.24	0.05
AV	55	0.13	0.32
WM	62	0.45	0.00*
VrblLrng	62	0.34	0.01*
VisLrng	61	0.23	0.07
RPS	62	0.32	0.01*
SC	61	0.39	0.00*
Comp	53	0.51	0.00*
Wasi Domains			
VCI	67	0.18	0.14
PRI	67	0.28	0.02*
Comp	67	0.14	0.26

*p<.05

Table 30

Relation of Hair Whorl Direction and Symptom Ratings

	Clockwise		**Counter-Clockwise**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	5.17	1.10	10.80	3.38	45	1.67	0.10
PDI	9.64	1.48	13.00	4.67	48	0.72	0.48
BPRS							
ThotDis	8.84	0.77	9.40	2.39	47	0.23	0.82
Anergia	6.84	0.49	7.00	1.52	46	0.11	0.92
Affect	8.77	0.55	8.60	1.71	47	0.10	0.92
Disorg	4.48	0.29	4.60	0.92	47	0.13	0.89

*p<.05

Table 31

Relation of Hair Whorl Presence and Symptom Ratings

	Not Present		**Present**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	13.00	3.17	5.77	3.34	50	2.17	0.03*
PDI	20.60	4.50	9.98	4.72	53	2.25	0.03*
BPRS							
ThotDis	9.17	2.01	8.90	2.13	53	0.13	0.90
Anergia	8.00	1.25	6.85	1.32	52	0.87	0.39
Affect	10.83	1.43	8.75	1.51	53	1.37	0.18
Disorg	5.33	0.80	4.49	0.85	53	0.99	0.32

*p<.05

Table 32

Relation of Hair Whorl Count and Symptom Ratings

	One Whorl		**Two Whorls**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	5.28	1.08	1.00	4.74	36	0.90	0.37
PDI	10.03	1.51	2.00	6.77	38	1.19	0.24
BPRS							
ThotDis	8.43	0.70	4.50	3.09	37	1.27	0.21
Anergia	7.06	0.55	4.00	2.40	36	1.27	0.21
Affect	8.41	0.51	6.00	2.25	37	1.07	0.29
Disorg	4.41	0.29	3.00	1.30	37	1.08	0.29

*p<.05

Relation of the Whorl Position and Symptom Ratings

	Whorl Positon Left		**Whorl Position Midline**		**Whorl Position Right**				
	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
CAPS	11.00	3.69	4.39	4.00	7.067	4.16	2,39	1.62	0.21
PDI	14.25	5.04	8.67	5.45	12.38	5.64	2,41	0.95	0.39
BPRS									
ThotDis	9.33	1.92	7.21	2.15	12.62	2.32	2,40	5.57	0.01*
Anergia	6.50	1.24	6.22	1.39	8.62	1.49	2,39	2.69	0.08
Affect	10.83	1.34	7.54	1.50	10.92	1.63	2,40	5.50	0.01*
Disorg	6.17	0.77	4.00	0.86	5.15	0.93	2,40	3.88	0.03*

*p<.05

Table 34

Relation of Head Circumference and Symptom Ratings

	df	*r*	*p*
CAPS	54	0.05	0.71
PDI	57	0.01	0.92
BPRS			
ThotDis	57	-0.06	0.67
Anergia	57	0.01	0.93
Affect	57	0.05	0.69
Disorg	57	-0.11	0.43

*p<.05

Table 35

Relation of Facial Proportions and Symptom Ratings

	df	*r*	*p*
CAPS	58	0.02	0.87
PDI	61	0.05	0.71
BPRS			
ThotDis	61	0.04	0.78
Anergia	60	-0.06	0.64
Affect	61	-0.12	0.33
Disorg	61	0.07	0.59

*p<.05

Table 36

Relation of Ear Lobe Attachment and Symptom Ratings

	Attached		**Detached**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	8.36	1.47	5.51	1.90	60	1.49	0.14
PDI	12.92	1.94	9.28	2.51	63	1.45	0.15
BPRS							
ThotDis	9.16	0.93	8.58	1.19	63	0.49	0.62
Anergia	6.75	0.61	6.98	0.77	62	0.29	0.77
Affect	8.48	0.69	9.13	0.88	63	0.73	0.47
Disorg	4.96	0.39	4.44	0.51	63	1.05	0.29

*p<.05

Table 37

Relation of Ear Symmetry and Symptom Ratings

	df	*r*	*p*
CAPS	60	0.10	0.42
PDI	63	0.12	0.36
BPRS			
ThotDis	63	-0.05	0.69
Anergia	62	0.01	0.92
Affect	63	0.03	0.79
Disorg	63	-0.09	0.49

*p<.05

Table 38

Relation of Left Ear Protrusion and Symptom Ratings

	df	*r*	*p*
CAPS	58	0.13	0.32
PDI	61	0.13	0.32
BPRS			
ThotDis	61	0.11	0.38
Anergia	60	0.24	0.61
Affect	61	0.11	0.40
Disorg	61	-0.00	0.99

*p<.05

Table 39

Relation of Right Ear Protrusion and Symptom Ratings

	df	*r*	*p*
CAPS	58	0.14	0.30
PDI	61	0.16	0.21
BPRS			
ThotDis	61	0.05	0.69
Anergia	60	0.13	0.31
Affect	61	0.08	0.51
Disorg	61	0.09	0.50

*p<.05

Table 40

Relation of the Palatal Shape and Symptom Ratings

	Steepled w/ Flat Apex		**U-Shaped**		**V-Shaped**				
	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
CAPS	13.67	4.24	6.55	4.35	0.00	6.69	2,58	2.19	0.12
PDI	20.33	5.66	10.44	5.81	1.50	8.95	2,61	2.35	0.10
BPRS									
ThotDis	11.67	2.67	8.79	2.74	4.00	4.22	2,61	1.66	0.19
Anergia	8.00	1.71	6.97	1.76	4.00	2.71	2,60	1.18	0.32
Affect	10.00	1.99	8.02	2.04	5.00	3.15	2,61	1.43	0.25
Disorg	7.00	1.13	4.58	1.16	3.50	1.78	2,61	2.56	0.09

*p<.05

Table 41

Relation of the Presence of Palatal Ridges and Symptom Ratings

	Not Present		**Present**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	5.54	1.35	6.87	1.86	57	0.72	0.48
PDI	10.48	1.89	10.42	2.59	60	0.02	0.98
BPRS							
ThotDis	8.79	0.83	8.69	0.83	60	0.08	0.94
Anergia	7.19	0.53	6.55	0.77	59	0.82	0.42
Affect	8.91	0.61	8.69	0.89	60	0.25	0.81
Disorg	5.00	0.35	4.28	0.50	60	1.64	0.11

*p<.05

Table 42

Relation of Palatal Ridge Count and Symptom Ratings

	df	*r*	*p*
CAPS	29	0.00	0.98
PDI	31	0.07	0.69
BPRS			
ThotDis	26	0.05	0.81
Anergia	26	-0.09	0.65
Affect	26	0.20	0.29
Disorg	26	0.03	0.88

*p<.05

Table 43

Relation of the Presence of Tongue Furrows and Symptom Ratings

	Not Present		**Present**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	8.21	1.27	4.89	1.86	60	1.79	0.08
PDI	11.71	1.72	9.68	2.48	63	0.82	0.42
BPRS							
ThotDis	8.97	0.80	8.66	1.16	63	0.31	0.76
Anergia	6.88	0.52	6.90	0.75	62	0.03	0.97
Affect	9.12	0.59	8.61	0.86	63	0.59	0.56
Disorg	4.85	0.34	4.39	0.49	63	0.94	0.35

*p<.05

Table 44

Relation of Tongue Furrow Placement and Symptom Ratings

	Midline		**Non-Midline**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	4.92	1.21	6.33	3.70	26	0.38	0.71
PDI	10.29	1.88	7.33	5.93	28	0.49	0.62
BPRS							
ThotDis	8.74	0.97	7.75	2.69	29	0.37	0.72
Anergia	6.85	0.58	7.25	1.60	29	0.25	0.81
Affect	8.56	0.67	9.00	1.86	29	0.24	0.81
Disorg	4.22	0.39	5.50	1.09	29	1.17	0.25

*p<.05

Table 45

Relation of the Presence of Tongue Spots and Symptom Ratings

	Not Present		**Present**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	6.93	1.01	4.66	3.23	59	0.49	0.48
PDI	11.03	1.33	7.83	4.33	62	0.74	0.16
BPRS							
ThotDis	9.14	0.60	6.17	1.97	62	1.51	0.14
Anergia	7.11	0.39	5.17	1.26	61	1.54	0.13
Affect	9.10	0.45	7.17	1.48	62	1.31	0.19
Disorg	4.75	0.26	3.67	0.85	62	1.28	0.21

*p<.05

Table 46

Relation of the Presence of Bifid Tongue and Symptom Ratings

	Not Present		**Present**				
	Mean	SD	Mean	SD	df	t	*p*
CAPS	6.57	0.98	8.00	3.86	60	0.37	0.71
PDI	10.67	1.29	11.75	5.19	63	0.21	0.84
BPRS							
ThotDis	8.78	0.60	9.00	2.17	63	0.10	0.92
Anergia	6.86	0.39	7.00	1.39	62	0.24	0.81
Affect	8.72	0.44	10.80	1.59	63	1.30	0.19
Disorg	4.67	0.26	4.20	0.93	63	0.49	0.62

*p<.05

Table 47

Relation of the Epicanthus Coverage of the Tear Duct and Symptom Ratings

	No Coverage of Tear Duct		**Partial Coverage of Tear Duct**		**Full Coverage of Tear Duct**				
	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
CAPS	6.28	5.46	7.15	5.74	10.00	5.34	2,58	0.28	0.76
PDI	10.02	7.23	12.43	7.58	9.50	7.09	2,61	0.32	0.72
BPRS									
ThotDis	7.98	3.15	10.71	3.30	9.50	3.09	2,61	2.17	0.12
Anergia	6.57	2.94	6.81	2.87	7.00	2.84	2,60	0.04	0.96
Affect	8.17	2.37	10.86	2.48	9.50	2.32	2,61	3.69	0.03*
Disorg	4.42	1.45	4.79	1.52	5.00	1.42	2,61	0.89	0.41

*p<.05

Table 48

Relation of the Strabismus and Symptom Ratings

	Esotropia		**Exotropia**		**Hypertropia**		**None Present**				
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	df	F	*p*
CAPS	0.00	7.41	20.00	10.47	7.00	10.47	6.74	7.47	3,56	1.34	0.27
PDI	2.00	9.99	19.00	14.14	19.00	14.14	10.66	10.08	3,58	0.71	0.55
BPRS											
ThotDis	10.50	3.04	7.00	5.27	-	-	8.60	3.09	2,60	0.26	0.77
Anergia	9.00	2.08	5.00	3.59	-	-	6.79	2.11	2,59	0.74	0.48
Affect	10.50	2.44	9.00	4.23	-	-	8.80	2.48	2,60	0.23	0.79
Disorg	7.00	1.33	4.00	2.31	-	-	4.47	1.35	2,60	1.79	0.18

*p<.05

Table 49

Relation of Hypertelorism and Symptom Ratings

	df	*r*	*p*
CAPS	59	0.12	0.35
PDI	62	0.06	0.64
BPRS			
ThotDis	62	0.12	0.34
Anergia	61	0.17	0.18
Affect	62	0.06	0.65
Disorg	62	-0.11	0.40

*p<.05

Table 50

Relation of Curvature of the Fifth Finger and Symptom Ratings

	df	*r*	*p*
CAPS	58	0.06	0.63
PDI	61	0.04	0.75
BPRS			
ThotDis	60	0.08	0.54
Anergia	59	-0.09	0.49
Affect	60	-0.02	0.87
Disorg	60	-0.10	0.43

*p<.05

Table 51

Relation of Length Proportion of the 3rd and 4th Fingers and Symptom Ratings

	df	*r*	*p*
CAPS	60	0.19	0.13
PDI	63	0.06	0.63
BPRS			
ThotDis	63	0.11	0.37
Anergia	62	-0.11	0.37
Affect	63	0.24	0.06
Disorg	63	0.32	0.01*

*p<.05

Table 52

Relation of Difference in the Length of the Interior and Lateral Length of the Second Toe and Symptom Ratings

	df	*r*	*p*
CAPS	60	0.12	0.35
PDI	63	0.09	0.48
BPRS			
ThotDis	63	0.15	0.25
Anergia	62	0.08	0.51
Affect	63	0.11	0.36
Disorg	63	0.15	0.23

*p<.05

Table 53

Relation of Difference in the Length of the Interior and Lateral Length of the Third Toe and Symptom Ratings

	df	*r*	*p*
CAPS	60	0.14	0.29
PDI	63	0.14	0.28
BPRS			
ThotDis	63	0.01	0.96
Anergia	62	0.00	0.99
Affect	63	-0.03	0.82
Disorg	63	-0.05	0.68

*p<.05

Table 54

Relation of Gap between the First and Second Toes and Symptom Ratings

	df	*r*	*p*
CAPS	59	0.15	0.26
PDI	62	0.14	0.28
BPRS			
ThotDis	62	-0.11	0.38
Anergia	61	-0.03	0.84
Affect	62	-0.15	0.23
Disorg	62	0.05	0.72

*p<.05

Table 55

Between Group Differences on Measures of Cognition

	Healthy Controls		**Patients**			
MCCB	*M*	*SD*	*M*	*SD*	*t*(df)	*p*
SOP	51.67	1.99	37.07	2.548	5.73(68)	<0.000*
AV	42.92	1.96	36.19	2.516	2.67(59)	0.009*
WM	50.29	2.41	41.95	3.07	2.72(68)	0.008*
VrblLrng	47.74	1.81	35.72	2.31	5.21(68)	<0.000*
VisLrng	47.630	2.38	39.76	3.05	2.58(67)	0.012*
RPS	51.07	1.74	44.65	2.22	2.89(68)	0.005*
SC	43.85	2.81	33.12	3.62	2.97(66)	0.004*
Comp	45.63	2.37	32.20	3.08	4.36(57)	<0.000*
WASI						
VCI	105.22	2.58	83.68	3.35	6.44(77)	<0.000*
PRI	107.91	2.90	90.02	3.76	4.76(77)	<0.000*
FSIQ	101.47	3.853	82.66	4.99	3.77(77)	<0.000*

Table 56

Between Group Differences on Symptom Measures

	Healthy Controls		**Patients**			
	M	*SD*	*M*	*SD*	*t*(df)	*p*
CAPS	1.00	1.05	11.14	1.35	7.52(69)	<0.000*
PDI	4.26	1.42	15.91	1.86	6.28(72)	<0.000*
BPRS						
ThotDis	5.04	0.74	11.68	0.93	7.12(69)	<0.000*
Anergia	5.15	0.52	8.14	0.66	4.52(68)	<0.000*
Affect	6.52	0.64	10.91	0.82	5.38(69)	<0.000*
Disorg	3.37	0.38	5.75	0.48	4.97(69)	<0.000*

Table 57
Correlation Coefficients of MPAs

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. WhorlCount																						
2. WhorlPos	-0.01																					
3. WhorlDir	-0.07	-0.07																				
4. HeadCir	0.54*	-0.20	0.16																			
5. FacePor	0.26	-0.11	0.31*	0.08																		
6. EarLeft	0.20	-0.14	-0.17	0.06	0.39*																	
7. EarRight	0.13	-0.12	-0.13	0.11	0.34*	0.91*																
8. FingPor	-0.02	-0.09	-0.04	-0.05	-0.03	0.05	0.07															
9. FingFifth	0.18	-0.02	-0.14	-0.02	0.15	0.19	0.14	-0.32*														
10. EarLobes	-0.14	-0.07	0.22	-0.04	0.03	0.05	0.05	0.13	-0.09													
11. EarLeftPro	0.28	-0.05	-0.03	0.17	0.22	0.19	0.18	0.09	-0.09	0.11												
12. EarRightPro	0.21	-0.21	-0.06	0.06	0.26*	0.26*	0.22	0.16	-0.11	0.13	0.83*											
13. Epicanth	0.09	-0.03	-0.09	0.03	0.05	-0.02	-0.04	-0.26*	0.03	-0.09	0.02	0.10										
14. Hypertel	-0.24	-0.03	0.08	0.02	-0.07	-0.01	0.05	0.25*	-0.19	0.18	0.28*	0.13	-0.22									
15. Strab	-0.05	-0.31*	0.06	0.04	0.11	-0.04	-0.05	0.01	-0.01	0.02	-0.05	-0.02	-0.11	0.11								
16. PalShape	-0.03	-0.20	0.55*	0.10	0.14	0.02	0.02	-0.07	0.00	-0.07	0.10	0.06	-0.03	-0.02	-0.06							
17. RalRidge	0.01	0.20	-0.14	-0.19	0.03	-0.14	-0.13	-0.29*	-0.13	-0.23	-0.08	-0.11	0.17	0.03	0.11	-0.11						
18. PalRidgeCnt	0.16	-0.13	-0.05	-0.14	-0.04	-0.23	-0.14	-0.25	0.13	-0.17	0.16	0.08	0.03	0.26	0.02	-0.01	0.32					
19. TonBifid	-0.07	0.02	-0.11	-0.22	0.04	0.20	0.18	-0.06	0.13	-0.04	0.01	-0.01	0.02	-0.07	-0.07	-0.07	0.22	-0.11				
20. TonFurPres	0.00	0.12	0.10	-0.10	0.01	0.08	0.05	-0.19	0.03	0.14	0.02	0.05	0.13	-0.11	-0.15	-0.12	0.13	-0.08	0.00			
21. TonFurPlc	-0.05	-0.10	-0.11	0.11	-0.23	-0.12	0.03	0.10	0.02	0.26	0.16	0.02	0.16	0.38*	-0.07	-0.07	-0.11	0.01	0.17	.c		
22. TonFurrowP	0.20	-0.18	0.39*	0.09	0.31*	-0.07	0.04	0.09	-0.09	-0.01	0.11	0.08	-0.04	0.09	-0.08	0.29*	-0.07	0.25	-0.10	0.18	0.07	
23. ToeGap	-0.27	-0.02	-0.01	-0.06	-0.19	-0.16	-0.16	0.11	-0.09	0.07	-0.10	-0.08	0.07	0.19	0.08	0.11	-0.07	0.06	-0.13	0.05	0.21	-0.03

*. Correlation is significant at the 0.05 level (2-tailed)
c. Cannot be computed because at least one of the variables is constant.

List of Appendices

APPENDIX A: Measurement of Minor Physical Anomalies

Measurement of MPAs

Head:

Hair Whorls: Whorls cannot be determined_____
Present ____ Not Present___ Total number of whorls___
Position: midline, left or right
Direction of whorls: clockwise or counter-clockwise

*Head circumference:*___ (measure above the eyes, around the head over the ears)

Glabella to top of philtrum ___mm

Top of philtrum to base of chin: ___mm

Supraorbital ridge: Left ___mm Right___mm

Palatal Shape: U-shaped (wider, shorter) ___ Steepled w/ flattened apex ___ V-Shaped___

Palatal Ridges: Present___ Not present___ Number present from the second bicuspid to the back of the mouth___

Malformed ear: Present___ Not present ___

Ear symmetry: Height of left ear___ mm Height of right ear___mm

Ear placement: ____mm

Ear lobes: Attached___ Detached___

Ear protrusion: Distance from pinna to cranium Left___ Right___

Bifid Tongue: Split present___ No split present___

Epicanthus: No coverage of tear duct___ Partial coverage of tear duct___
Full coverage of tear duct___

Hypertelorism: ___mm

Facial height: glabella to top of philtrum (where the columella and philtrum meet) ___
top of philtrum to base of chin___

Strabismus: Esotropia___ exotropia___ hypertropia___

Furrowed Tongue: Present___ (Midline___, Non-midline___) Not present___

Smooth/Rough spots on the tongue: Present___ Not Present___

Hand:

Curved fifth finger: ___ degrees

Single transverse palmar crease: Present___ Not present___

Lateral side of index finger: ___mm

Interior side of middle finger: ___mm

Feet:

Second toe length: lateral ___mm interior___mm

Third toe length: lateral ___mm interior___mm

Webbing between the second and third toe: present___ not present___

*Gap between the first and second toe (widest area):*___mm

APPENDIX B: Brief Psychiatric Rating Scale

Brief Psychiatric Rating Scale (BPRS)
Expanded Version (4.0)

Introduction

This section reproduces an interview schedule, symptom definitions, and specific anchor points for rating symptoms on the BPRS. Clinicians intending to use the BPRS should also consult the detailed guidelines for administration contained in the reference below.

Scale Items and Anchor Points

Rate items 1-14 on the basis of individual's self-report. Note items 7, 12 and 13 are also rated on the basis of observed behaviour. Items 15-24 are rated on the basis of observed behaviour and speech.

1. Somatic Concern

Degree of concern over present bodily health. Rate the degree to which physical health is perceived as a problem by the individual, whether complaints have realistic bases or not. Somatic delusions should be rated in the severe range with or without somatic concern. Note: be sure to assess the degree of impairment due to somatic concerns only and not other symptoms, e.g., depression. In addition, if the individual rates 6 or 7 due to somatic delusions, then you must rate Unusual Thought Content at least 4 or above.

2 Very mild Occasional somatic concerns that tend to be kept to self.

3 Mild Occasional somatic concerns that tend to be voiced to others (e.g., family, doctor).

4 Moderate Frequent expressions of somatic concern or exaggerations of existing ills OR some preoccupation, but no impairment in functioning. Not delusional.

5 Moderately severe Frequent expressions of somatic concern or exaggerations of existing ills OR some preoccupation and moderate impairment of functioning. Not delusional.

6 Severe Preoccupation with somatic complaints with much impairment in functioning OR somatic delusions without acting on them or disclosing to others.

7 Extremely severe Preoccupation with somatic complaints with severe impairment in functioning OR somatic delusions that tend to be acted on or disclosed to others.

"Have you been concerned about your physical health?" "Have you had any physical illness or seen a medical doctor lately? (What does your doctor say is wrong? How serious is it?)"

"Has anything changed regarding your appearance?"

"Has it interfered with your ability to perform your usual activities and/or work?"

"Did you ever feel that parts of your body had changed or stopped working?"

[If individual reports any somatic concerns/delusions, ask the following]:

"How often are you concerned about [use individual's description]?"

"Have you expressed any of these concerns to others?"

2. Anxiety

Reported apprehension, tension, fear, panic or worry. Rate only the individual's statements - not observed anxiety which is rated under Tension.

2 Very mild Reports some discomfort due to worry OR infrequent worries that occur more than usual for most normal individuals.

3 Mild Worried frequently but can readily turn attention to other things.

4 Moderate Worried most of the time and cannot turn attention to other things easily but no impairment in functioning OR occasional anxiety with autonomic accompaniment but no impairment in functioning.

5 Moderately Severe Frequent, but not daily, periods of anxiety with autonomic accompaniment OR some areas of functioning are disrupted by anxiety or worry.

6 Severe Anxiety with autonomic accompaniment daily but not persisting throughout the day OR many areas of functioning are disrupted by anxiety or constant worry.

7 Extremely Severe Anxiety with autonomic accompaniment persisting throughout the day OR most areas of functioning are disrupted by anxiety or constant worry.

"Have you been worried a lot during [mention time frame]? Have you been nervous or apprehensive? (What do you worry about?)"

"Are you concerned about anything? How about finances or the future?"

"When you are feeling nervous, do your palms sweat or does your heart beat fast (or shortness of breath, trembling, choking)?"

[If individual reports anxiety or autonomic accompaniment, ask the following]:

"How much of the time have you been [use individual's description]?"

"Has it interfered with your ability to perform your usual activities/work?"

3. Depression

Include sadness, unhappiness, anhedonia and preoccupation with depressing topics (can't attend to TV or conversations due to depression), hopeless, loss of self-esteem (dissatisfied or disgusted with self or feelings of worthlessness). Do not include vegetative symptoms, e.g., motor retardation, early waking or the amotivation that accompanies the deficit syndrome.

2 Very mild Occasionally feels sad, unhappy or depressed.

3 Mild Frequently feels sad or unhappy but can readily turn attention to other things.

4 Moderate Frequent periods of feeling very sad, unhappy, moderately depressed, but able to function with extra effort.

5 Moderately Severe Frequent, but not daily, periods of deep depression OR some areas of functioning are disrupted by depression.

6 Severe Deeply depressed daily but not persisting throughout the day OR many areas of functioning are disrupted by depression.

7 Extremely Severe Deeply depressed daily OR most areas of functioning are disrupted by depression.

"How has your mood been recently? Have you felt depressed (sad, down, unhappy, as if you didn't care)?"

"Are you able to switch your attention to more pleasant topics when you want to?"

"Do you find that you have lost interest in or get less pleasure from things you used to enjoy, like family, friends, hobbies, watching TV, eating?"

[If individual reports feelings of depression, ask the following]:

"How long do these feelings last?" "Has it interfered with your ability to perform your usual activities?"

4. Suicidality

Expressed desire, intent, or actions to harm or kill self.

2 Very mild Occasional feelings of being tired of living. No overt suicidal thoughts.

3 Mild Occasional suicidal thoughts without intent or specific plan OR he/she feels they would be better off dead.

4 Moderate Suicidal thoughts frequent without intent or plan.

5 Moderately Severe Many fantasies of suicide by various methods. May seriously consider making an attempt with specific time and plan OR impulsive suicide attempt using non-lethal method or in full view of potential saviours.

6 Severe Clearly wants to kill self. Searches for appropriate means and time, OR potentially serious suicide attempt with individual knowledge of possible rescue.

7 Extremely Severe Specific suicidal plan and intent (e.g., "as soon as _____ I will do it by doing X"), OR suicide attempt characterised by plan individual thought was lethal or attempt in secluded environment.

"Have you felt that life wasn't worth living? Have you thought about harming or killing yourself? Have you felt tired of living or as though you would be better off dead? Have you ever felt like ending it all?"

[If individual reports suicidal ideation, ask the following]:

"How often have you thought about [use individual's description]?"

"Did you (Do you) have a specific plan?"

5. Guilt

Overconcern or remorse for past behaviour. Rate only individual's statements, do not infer guilt feelings from depression, anxiety, or neurotic defences. Note: if the individual rates 6 or 7 due to delusions of guilt, then you must rate Unusual Thought Content at least 4 or above, depending on level of preoccupation and impairment.

2 Very mild Concerned about having failed someone, or at something, but not preoccupied. Can shift thoughts to other matters easily.

3 Mild Concerned about having failed someone, or at something, with some preoccupation. Tends to voice guilt to others.

4 Moderate Disproportionate preoccupation with guilt, having done wrong, injured others by doing or failing to do something, but can readily turn attention to other things.

5 Moderately Severe Preoccupation with guilt, having failed someone or at something, can turn attention to other things, but only with great effort. Not delusional.

6 Severe Delusional guilt OR unreasonable self-reproach very out of proportion to circumstances. Moderate preoccupation present.

7 Extremely Severe Delusional guilt OR unreasonable self-reproach grossly out of proportion to circumstances. Individual is very preoccupied with guilt and is likely to disclose to others or act on delusions.

"Is there anything you feel guilty about? Have you been thinking about past problems?"

"Do you tend to blame yourself for things that have happened?"

"Have you done anything you're still ashamed of?"

[If individual reports guilt/remorse/delusions, ask the following]:

"How often have you been thinking about [use individual's description]?"

"Have you disclosed your feelings of guilt to others?"

6. Hostility

Animosity, contempt, belligerence, threats, arguments, tantrums, property destruction, fights, and any other expression of hostile attitudes or actions. Do not infer hostility from neurotic defences, anxiety or somatic complaints. Do not include incidents of appropriate anger or obvious self-defence.

2 Very mild Irritable or grumpy, but not overtly expressed.

3 Mild Argumentative or sarcastic.

4 Moderate Overtly angry on several occasions OR yelled at others excessively.

5 Moderately Severe Has threatened, slammed about or thrown things.

6 Severe Has assaulted others but with no harm likely, e.g., slapped or pushed, OR destroyed property, e.g., knocked over furniture, broken windows.

7 Extremely Severe Has attacked others with definite possibility of harming them or with actual harm, e.g., assault with hammer or weapon.

"How have you been getting along with people (family, co-workers, etc.)?"

"Have you been irritable or grumpy lately? (How do you show it? Do you keep it to yourself?"

"Were you ever so irritable that you would shout at people or start fights or arguments? (Have you found yourself yelling at people you didn't know?)"

"Have you hit anyone recently?"

7. Elevated Mood

A pervasive, sustained and exaggerated feeling of well-being, cheerfulness, euphoria (implying a pathological mood), optimism that is out of proportion to the circumstances. Do not infer elation from increased activity or from grandiose statements alone.

2 Very mild Seems to be very happy, cheerful without much reason.

3 Mild Some unaccountable feelings of well-being that persist.

4 Moderate Reports excessive or unrealistic feelings of well-being, cheerfulness, confidence or optimism inappropriate to circumstances, some of the time. May frequently joke, smile, be giddy, or overly enthusiastic OR few instances of marked elevated mood with euphoria.

5 Moderately Severe Reports excessive or unrealistic feelings of well-being, confidence or optimism inappropriate to circumstances, much of the time. May describe feeling `on top of the world', `like everything is falling into place', or `better than ever before', OR several instances of marked elevated mood with euphoria.

6 Severe Reports many instances of marked elevated mood with euphoria OR mood definitely elevated almost constantly throughout interview and inappropriate to content.

7 Extremely Severe Individual reports being elated or appears almost intoxicated, laughing, joking, giggling, constantly euphoric, feeling invulnerable, all inappropriate to immediate circumstances.

"Have you felt so good or high that other people thought that you were not your normal self?" "Have you been feeling cheerful and `on top of the world' without any reason?"

[If individual reports elevated mood/euphoria, ask the following]:

"Did it seem like more than just feeling good?"

"How long did that last?"

8. Grandiosity

Exaggerated self-opinion, self-enhancing conviction of special abilities or powers or identity as someone rich or famous. Rate only individual's statements about himself, not his/her demeanour. Note: if the individual rates 6 or 7 due to grandiose delusions, you must rate Unusual Thought Content at least 4 or above.

2 Very mild Feels great and denies obvious problems, but not unrealistic.

3 Mild Exaggerated self-opinion beyond abilities and training.

4 Moderate Inappropriate boastfulness, e.g., claims to be brilliant, insightful or gifted beyond realistic proportions, but rarely self-discloses or acts on these inflated self-concepts. Does not claim that grandiose accomplishments have actually occurred.

5 Moderately Severe Same as 4 but often self-discloses and acts on these grandiose ideas. May have doubts about the reality of the grandiose ideas. Not delusional.

6 Severe Delusional - claims to have special powers like ESP, to have millions of dollars, invented new machines, worked at jobs when it is known that he/she was never employed in these capacities, be Jesus Christ, or the Prime Minister. Individual may not be very preoccupied.

7 Extremely Severe Delusional - same as 6 but individual seems very preoccupied and tends to disclose or act on grandiose delusions.

"Is there anything special about you? Do you have any special abilities or powers? Have you thought that you might be somebody rich or famous?"

[If the individual reports any grandiose ideas/delusions, ask the following]:

"How often have you been thinking about [use individuals description]? Have you told anyone about what you have been thinking? Have you acted on any of these ideas?"

9. Suspiciousness

Expressed or apparent belief that other persons have acted maliciously or with discriminatory intent. Include persecution by supernatural or other non-human agencies (e.g., the devil). Note: ratings of 3 or above should also be rated under Unusual Thought Content.

2 Very mild Seems on guard. Reluctant to respond to some `personal' questions. Reports being overly self-conscious in public.

3 Mild Describes incidents in which others have harmed or wanted to harm him/her that sound plausible. Individual feels as if others are watching, laughing or criticising him/her in public, but this occurs only occasionally or rarely. Little or no preoccupation.

4 Moderate Says other persons are talking about him/her maliciously, have negative intentions or may harm him/her. Beyond the likelihood of plausibility, but not delusional. Incidents of suspected persecution occur occasionally (less than once per week) with some preoccupation.

5 Moderately Severe Same as 4, but incidents occur frequently, such as more than once per week. Individual is moderately preoccupied with ideas of persecution OR individual reports persecutory delusions expressed with much doubt (e.g., partial delusion).

6 Severe Delusional - speaks of Mafia plots, the FBI or others poisoning his/her food, persecution by supernatural forces.

7 Extremely Severe Same as 6, but the beliefs are bizarre or more preoccupying. Individual tends to disclose or act on persecutory delusions.

"Do you ever feel uncomfortable in public? Does it seem as though others are watching you? Are you concerned about anyone's intentions toward you? Is anyone going out of their way to give you a hard time, or trying to hurt you? Do you feel in any danger?"

[If individual reports any persecutory ideas/delusions, ask the following]:

"How often have you been concerned that [use individual's description]? Have you told anyone about these experiences?"

10. Hallucinations

Reports of perceptual experiences in the absence of relevant external stimuli. When rating degree to which functioning is disrupted by hallucinations, include preoccupation with the content and experience of the hallucinations, as well as functioning disrupted by acting out on the hallucinatory content (e.g., engaging in deviant behaviour due to command hallucinations). Include thoughts aloud (`gedenkenlautwerden') or pseudohallucinations (e.g., hears a voice inside head) if a voice quality is present.

2 Very mild While resting or going to sleep, sees visions, smells odours or hears voices, sounds, or whispers in the absence of external stimulation, but no impairment in functioning.

3 Mild While in a clear state of consciousness, hears a voice calling the individual's name, experiences non-verbal auditory hallucinations (e.g., sounds or whispers), formless visual hallucinations or has sensory experiences in the presence of a modality-relevant stimulus (e.g., visual illusions) infrequently (e.g., 1-2 times per week) and with no functional impairment.

4 Moderate Occasional verbal, visual, gustatory, olfactory or tactile hallucinations with no functional impairment OR non-verbal auditory hallucinations/visual illusions more than infrequently or with impairment.

5 Moderately Severe Experiences daily hallucinations OR some areas of functioning are disrupted by hallucinations.

6 Severe Experiences verbal or visual hallucinations several times a day OR many areas of functioning are disrupted by these hallucinations.

7 Extremely Severe Persistent verbal or visual hallucinations throughout the day OR most areas of functioning are disrupted by these hallucinations.

"Do you ever seem to hear your name being called?"

"Have you heard any sounds or people talking to you or about you when there has been nobody around?

[If hears voices]:

"What does the voice/voices say? Did it have a voice quality?"

"Do you ever have visions or see things that others do not see? What about smell odours that others do not smell?"

[If the individual reports hallucinations, ask the following]:

"Have these experiences interfered with your ability to perform your usual activities/work? How do you explain them? How often do they occur?"

11. Unusual thought content

Unusual, odd, strange, or bizarre thought content. Rate the degree of unusualness, not the degree of disorganisation of speech. Delusions are patently absurd, clearly false or bizarre ideas that are expressed with full conviction. Consider the individual to have full conviction if he/she has acted as though the delusional belief was true. Ideas of reference/persecution can be differentiated from delusions in that ideas are expressed with much doubt and contain more elements of reality. Include thought insertion, withdrawal and broadcast. Include grandiose, somatic and persecutory delusions even if rated elsewhere. Note: if Somatic Concern, Guilt, Suspiciousness or Grandiosity are rated 6 or 7 due to delusions, then Unusual Thought Content must be rated 4 or above.

2 Very mild Ideas of reference (people may stare or may laugh at him), ideas of persecution (people may mistreat him). Unusual beliefs in psychic powers, spirits, UFOs, or unrealistic beliefs in one's own abilities. Not strongly held. Some doubt.

3 Mild Same as 2, but degree of reality distortion is more severe as indicated by highly unusual ideas or greater conviction. Content may be typical of delusions (even bizarre), but without full conviction. The delusion does not seem to have fully formed, but is considered as one possible explanation for an unusual experience.

4 Moderate Delusion present but no preoccupation or functional impairment. May be an encapsulated delusion or a firmly endorsed absurd belief about past delusional circumstances.

5 Moderately Severe Full delusion(s) present with some preoccupation OR some areas of functioning disrupted by delusional thinking.

6 Severe Full delusion(s) present with much preoccupation OR many areas of functioning are disrupted by delusional thinking.

7 Extremely Severe Full delusion(s) present with almost total preoccupation OR most areas of functioning disrupted by delusional thinking.

"Have you been receiving any special messages from people or from the way things are arranged around you? Have you seen any references to yourself on TV or in the newspapers?"

"Can anyone read your mind?"

"Do you have a special relationship with God?"

"Is anything like electricity, X-rays, or radio waves affecting you?"

"Are thoughts put into your head that are not your own?"

"Have you felt that you were under the control of another person or force?"

[If individual reports any odd ideas/delusions, ask the following]:

"How often do you think about [use individual's description]?"

"Have you told anyone about these experiences? How do you explain the things that have been happening [specify]?"

Rate items 12-13 on the basis of individual's self-report and observed behaviour.

12. Bizarre behaviour

Reports of behaviours which are odd, unusual, or psychotically criminal. Not limited to interview period. Include inappropriate sexual behaviour and inappropriate affect.

2 Very mild Slightly odd or eccentric public behaviour, e.g., occasionally giggles to self, fails to make appropriate eye contact, that does not seem to attract the attention of others OR unusual behaviour conducted in private, e.g., innocuous rituals, that would not attract the attention of others.

3 Mild Noticeably peculiar public behaviour, e.g., inappropriately loud talking, makes inappropriate eye contact, OR private behaviour that occasionally, but not always, attracts the attention of others, e.g., hoards food, conducts unusual rituals, wears gloves indoors.

4 Moderate Clearly bizarre behaviour that attracts or would attract (if done privately) the attention or concern of others, but with no corrective intervention necessary. Behaviour occurs occasionally, e.g., fixated staring into space for several minutes, talks back to voices once, inappropriate giggling/laughter on 1-2 occasions, talking loudly to self.

5 Moderately Severe Clearly bizarre behaviour that attracts or would attract (if done privately) the attention of others or the authorities, e.g., fixated staring in a socially disruptive way, frequent inappropriate giggling/laughter, occasionally responds to voices, or eats non-foods.

6 Severe Bizarre behaviour that attracts attention of others and intervention by authorities, e.g., directing traffic, public nudity, staring into space for long periods, carrying on a conversation with hallucinations, frequent inappropriate giggling/laughter.

7 Extremely Severe Serious crimes committed in a bizarre way that attract the attention of others and the control of authorities, e.g., sets fires and stares at flames OR almost constant bizarre behaviour, e.g., inappropriate giggling/laughter, responds only to hallucinations and cannot be engaged in interaction.

"Have you done anything that has attracted the attention of others?"

"Have you done anything that could have gotten you into trouble with the police?"

"Have you done anything that seemed unusual or disturbing to others?"

13. Self-neglect

Hygiene, appearance, or eating behaviour below usual expectations, below socially acceptable standards or life threatening.

2 Very mild Hygiene/appearance slightly below usual community standards, e.g., shirt out of pants, buttons unbuttoned, shoe laces untied, but no social or medical consequences.

3 Mild Hygiene/appearance occasionally below usual community standards, e.g., irregular bathing, clothing is stained, hair uncombed, occasionally skips an important meal. No social or medical consequences.

4 Moderate Hygiene/appearance is noticeably below usual community standards, e.g., fails to bathe or change clothes, clothing very soiled, hair unkempt, needs prompting, noticeable by others OR irregular eating and drinking with minimal medical concerns and consequences.

5 Moderately Severe Several areas of hygiene/appearance are below usual community standards OR poor grooming draws criticism by others and requires regular prompting. Eating or hydration are irregular and poor, causing some medical problems.

6 Severe Many areas of hygiene/appearance are below usual community standards, does not always bathe or change clothes even if prompted. Poor grooming has caused social ostracism at school/residence/work, or required intervention. Eating erratic and poor, may require medical intervention.

7 Extremely Severe Most areas of hygiene/appearance/nutrition are extremely poor and easily noticed as below usual community standards OR hygiene/appearance/nutrition require urgent and immediate medical intervention.

"How has your grooming been lately? How often do you change your clothes? How often do you take showers? Has anyone (parents/staff) complained about your grooming or dress? Do you eat regular meals?"

14. Disorientation

Does not comprehend situations or communications, such as questions asked during the entire BPRS interview. Confusion regarding person, place, or time. Do not rate if incorrect responses are due to delusions.

2 Very mild Seems muddled or mildly confused 1-2 times during interview. Oriented to person, place and time.

3 Mild Occasionally muddled or mildly confused 3-4 times during interview. Minor inaccuracies in person, place, or time, e.g., date off by more than 2 days, or gives wrong division of hospital or community centre.

4 Moderate Frequently confused during interview. Minor inaccuracies in person, place, or time are noted, as in 3 above. In addition, may have difficulty remembering general information, e.g., name of Prime Minister.

5 Moderately Severe Markedly confused during interview, or to person, place, or time. Significant inaccuracies are noted, e.g., date off by more than one week, or cannot give correct name of hospital. Has difficulty remembering personal information, e.g., where he/she was born or recognising familiar people.

6 Severe Disoriented as to person, place, or time, e.g., cannot give correct month and year. Disoriented in 2 out of 3 spheres.

7 Extremely Severe Grossly disoriented as to person, place, or time, e.g., cannot give name or age. Disoriented in all three spheres.

"May I ask you some standard questions we ask everybody?"

"How old are you? What is the date [allow 2 days]"

"What is this place called? What year were you born? Who is the Prime Minister?"

Rate items 15-24 on the basis of observed behaviour and speech.

15 Conceptual disorganisation

Degree to which speech is confused, disconnected, vague or disorganised. Rate tangentiality, circumstantiality, sudden topic shifts, incoherence, derailment, blocking, neologisms, and other speech disorders. Do not rate content of speech.

2 Very mild Peculiar use of words or rambling but speech is comprehensible.

3 Mild Speech a bit hard to understand or make sense of due to tangentiality, circumstantiality, or sudden topic shifts.

4 Moderate Speech difficult to understand due to tangentiality, circumstantiality, idiosyncratic speech, or topic shifts on many occasions OR 1-2 instances of incoherent phrases.

5 Moderately Severe Speech difficult to understand due to circumstantiality, tangentiality, neologisms, blocking or topic shifts most of the time, OR 3-5 instances of incoherent phrases.

6 Severe Speech is incomprehensible due to severe impairment most of the time. Many BPRS items cannot be rated by self-report alone.

7 Extremely Severe Speech is incomprehensible throughout interview.

16. Blunted affect

Restricted range in emotional expressiveness of face, voice, and gestures. Marked indifference or flatness even when discussing distressing topics. In the case of euphoric or dysphoric individuals, rate Blunted Affect if a flat quality is also clearly present.

2 Very mild Emotional range is slightly subdued or reserved but displays appropriate facial expressions and tone of voice that are within normal limits.

3 Mild Emotional range overall is diminished, subdued or reserved, without many spontaneous and appropriate emotional responses. Voice tone is slightly monotonous.

4 Moderate Emotional range is noticeably diminished, individual doesn't show emotion, smile or react to distressing topics except infrequently. Voice tone is monotonous or

there is noticeable decrease in spontaneous movements. Displays of emotion or gestures are usually followed by a return to flattened affect.

5 Moderately Severe Emotional range very diminished, individual doesn't show emotion, smile, or react to distressing topics except minimally, few gestures, facial expression does not change very often. Voice tone is monotonous much of the time.

6 Severe Very little emotional range or expression. Mechanical in speech and gestures most of the time. Unchanging facial expression. Voice tone is monotonous most of the time.

7 Extremely Severe Virtually no emotional range or expressiveness, stiff movements. Voice tone is monotonous all of the time.

Use the following probes at end of interview to assess emotional responsivity:

"Have you heard any good jokes lately? Would you like to hear a joke?"

17. Emotional withdrawal

Deficiency in individual's ability to relate emotionally during interview situation. Use your own feeling as to the presence of an `invisible barrier' between individual and interviewer. Include withdrawal apparently due to psychotic processes.

2 Very mild Lack of emotional involvement shown by occasional failure to make reciprocal comments, appearing preoccupied, or smiling in a stilted manner, but spontaneously engages the interviewer most of the time.

3 Mild Lack of emotional involvement shown by noticeable failure to make reciprocal comments, appearing preoccupied, or lacking in warmth, but responds to interviewer when approached.

4 Moderate Emotional contact not present much of the interview because individual does not elaborate responses, fails to make eye contact, doesn't seem to care if interviewer is listening, or may be preoccupied with psychotic material.

5 Moderately Severe Same as 4 but emotional contact not present most of the interview.

6 Severe Actively avoids emotional participation. Frequently unresponsive or responds with yes/no answers (not solely due to persecutory delusions). Responds with only minimal affect.

7 Extremely Severe Consistently avoids emotional participation. Unresponsive or responds with yes/no answers (not solely due to persecutory delusions). May leave during interview or just not respond at all.

18. Motor retardation

Reduction in energy level evidenced by slowed movements and speech, reduced body tone, decreased number of spontaneous body movements. Rate on the basis of observed behaviour of the individual only. Do not rate on the basis of individual's subjective impression of his own energy level. Rate regardless of medication effects.

2 Very mild Slightly slowed or reduced movements or speech compared to most people.

3 Mild Noticeably slowed or reduced movements or speech compared to most people.

4 Moderate Large reduction or slowness in movements or speech.

5 Moderately Severe Seldom moves or speaks spontaneously OR very mechanical or stiff movements

6 Severe Does not move or speak unless prodded or urged.

7 Extremely Severe Frozen, catatonic.

19. Tension

Observable physical and motor manifestations of tension, `nervousness' and agitation. Self-reported experiences of tension should be rated under the item on anxiety. Do not rate if restlessness is solely akathisia, but do rate if akathisia is exacerbated by tension.

2 Very mild More fidgety than most but within normal range. A few transient signs of tension, e.g., picking at fingernails, foot wagging, scratching scalp several times or finger tapping.

3 Mild Same as 2, but with more frequent or exaggerated signs of tension.

4 Moderate Many and frequent signs of motor tension with one or more signs sometimes occurring simultaneously, e.g., wagging one's foot while wringing hands together. There are times when no signs of tension are present.

5 Moderately Severe Many and frequent signs of motor tension with one or more signs often occurring simultaneously. There are still rare times when no signs of tension are present.

6 Severe Same as 5, but signs of tension are continuous.

7 Extremely Severe Multiple motor manifestations of tension are continuously present, e.g., continuous pacing and hand wringing.

20. Unco-operativeness

Resistance and lack of willingness to co-operate with the interview. The unco-operativeness might result from suspiciousness. Rate only unco-operativeness in relation to the interview, not behaviours involving peers and relatives.

2 Very mild Shows non-verbal signs of reluctance, but does not complain or argue.

3 Mild Gripes or tries to avoid complying, but goes ahead without argument.

4 Moderate Verbally resists but eventually complies after questions are rephrased or repeated.

5 Moderately Severe Same as 4, but some information necessary for accurate ratings is withheld.

6 Severe Refuses to co-operate with interview, but remains in interview situation.

7 Extremely Severe Same as 6, with active efforts to escape the interview

21. Excitement

Heightened emotional tone or increased emotional reactivity to interviewer or topics being discussed, as evidenced by increased intensity of facial expressions, voice tone, expressive gestures or increase in speech quantity and speed.

2 Very mild Subtle and fleeting or questionable increase in emotional intensity. For example, at times seems keyed-up or overly alert.

3 Mild Subtle but persistent increase in emotional intensity. For example, lively use of gestures and variation in voice tone.

4 Moderate Definite but occasional increase in emotional intensity. For example, reacts to interviewer or topics that are discussed with noticeable emotional intensity. Some pressured speech.

5 Moderately Severe Definite and persistent increase in emotional intensity. For example, reacts to many stimuli, whether relevant or not, with considerable emotional intensity. Frequent pressured speech.

6 Severe Marked increase in emotional intensity. For example, reacts to most stimuli with inappropriate emotional intensity. Has difficulty settling down or staying on task. Often restless, impulsive, or speech is often pressured.

7 Extremely Severe Marked and persistent increase in emotional intensity. Reacts to all stimuli with inappropriate intensity, impulsiveness. Cannot settle down or stay on task. Very restless and impulsive most of the time. Constant pressured speech.

22. Distractibility

Degree to which observed sequences of speech and actions are interrupted by stimuli unrelated to the interview. Distractibility is rated when the individual shows a change in the focus of attention as characterised by a pause in speech or a marked shift in gaze. Individual's attention may be drawn to noise in adjoining room, books on a shelf, interviewer's clothing, etc. Do not rate circumstantiality, tangentiality or flight of ideas. Also, do not rate rumination with delusional material. Rate even if the distracting stimulus cannot be identified.

2 Very mild Generally can focus on interviewer's questions with only 1 distraction or inappropriate shift of attention of brief duration.

3 Mild Individual shifts focus of attention to matters unrelated to the interview 2-3 times.

4 Moderate Often responsive to irrelevant stimuli in the room, e.g., averts gaze from the interviewer.

5 Moderately Severe Same as above, but now distractibility clearly interferes with the flow of the interview.

6 Severe Extremely difficult to conduct interview or pursue a topic due to preoccupation with irrelevant stimuli.

7 Extremely Severe Impossible to conduct interview due to preoccupation with irrelevant stimuli.

23. Motor hyperactivity

Increase in energy level evidenced in more frequent movement and/or rapid speech. Do not rate if restlessness is due to akathisia.

2 Very mild Some restlessness, difficulty sitting still, lively facial expressions, or somewhat talkative

3 Mild Occasionally very restless, definite increase in motor activity, lively gestures, 1-3 brief instances of pressured speech.

4 Moderate Very restless, fidgety, excessive facial expressions, or non-productive and repetitious motor movements. Much pressured speech, up to one-third of the interview.

5 Moderately Severe Frequently restless, fidgety. Many instances of excessive non-productive and repetitious motor movements. On the move most of the time. Frequent pressured speech, difficult to interrupt. Rises on 1-2 occasions to pace.

6 Severe Excessive motor activity, restlessness, fidgety, loud tapping, noisy, etc., throughout most of the interview. Speech can only be interrupted with much effort. Rises on 3-4 occasions to pace.

7 Extremely Severe Constant excessive motor activity throughout entire interview, e.g., constant pacing, constant pressured speech with no pauses, individual can only be interrupted briefly and only small amounts of relevant information can be obtained

24. Mannerisms and posturing

Unusual and bizarre behaviour, stylised movements or acts, or any postures which are clearly uncomfortable or inappropriate. Exclude obvious manifestations of medication side effects. Do not include nervous mannerisms that are not odd or unusual.

2 Very mild Eccentric or odd mannerisms or activity that ordinary persons would have difficulty explaining, e.g., grimacing, picking. Observed once for a brief period.

3 Mild Same as 2, but occurring on two occasions of brief duration.

4 Moderate Mannerisms or posturing, e.g., stylised movements or acts, rocking, nodding, rubbing, or grimacing, observed on several occasions for brief periods or infrequently but very odd. For example, uncomfortable posture maintained for 5 seconds more than twice.

5 Moderately Severe Same as 4, but occurring often, or several examples of very odd mannerisms or posturing that are idiosyncratic to the individual.

6 Severe Frequent stereotyped behaviour, assumes and maintains uncomfortable or inappropriate postures, intense rocking, smearing, strange rituals or foetal posturing. Individual can interact with people and the environment for brief periods despite these behaviours.

7 Extremely Severe Same as 6, but individual cannot interact with people or the environment due to these behaviours.

APPENDIX C: Peter Delusion Inventory

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Appendix. Peters et al. Delusions Inventory

This questionnaire is designed to measure beliefs and vivid mental experiences. We believe that they are much more common than has previously been supposed, and that most people have had some such experiences during their lives. Please answer the following questions as honestly as you can. There are no right or wrong answers, and there are no trick questions. **Please note that we are NOT interested in experiences people may have had when under the influence of drugs.**

IT IS IMPORTANT THAT YOU ANSWER *ALL* QUESTIONS.

For the questions you answer YES to, we are interested in: (a) how distressing these beliefs or experiences are; (b) how often you think about them; and (c) how true you believe them to be. On the right hand side of the page we would like you to circle the number which corresponds most closely to how distressing this belief is, how often you think about it, and how much you believe that it is true.

SEX ..... **ETHNIC BACKGROUND** ..... **AGE** .....

RELIGION ..... **PROFESSION** ..... **DATE** ....

Examples:

Do you ever feel as if people are reading your mind?	**Not at all distressing**				**Very distressing**
	1	**2**	**3**	**4**	**5**
	Hardly ever think about it				**Think about it all the time**
	1	**2**	**3**	**4**	**5**
No **Yes ——————>**	**Don't believe it's true**				**Believe it is absolutely true**
	1	**2**	**3**	**4**	**5**
Do you ever feel as if you can read other people's minds?	**Not at all distressing**				**Very distressing**
	1	**2**	**3**	***4***	**5**
	Hardly ever think about it				**Think about it all the time**
	1	***2***	**3**	**4**	**5**
No ***Yes*** **——————>**	**Don't believe it's true**				**Believe it is absolutely true**
	1	**2**	***3***	**4**	**5**

Please circle if answered YES

(1) Do you ever feel as if you are under the control of some force or power other than yourself? (please circle)	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(2) Do you ever feel as if you are a robot or zombie without a will of your own? (please circle)	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(3) Do you ever feel as if you are possessed by someone or something else? (please circle)	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(4) Do you ever feel as if your feelings or actions are not under your control? (please circle)	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5

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Please circle if answered YES

(5) Do you ever feel as if someone or something is playing games with your mind?	Not at all distressing				Very distressing
	1	2	3	4	5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(6) Do you ever feel as if people seem to drop hints about you or say things with a double meaning?	Not at all distressing				Very distressing
	1	2	3	4	5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(7) Do you ever feel as if things in magazines or on TV were written especially for you?	Not at all distressing				Very distressing
	1	2	3	4	5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(8) Do you ever think that everyone is gossiping about you?	Not at all distressing				Very distressing
	1	2	3	4	5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5

Please circle if answered YES

(9) Do you ever feel as if some people are not what they seem to be? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(10) Do things around you ever feel unreal, as though it was all part of an experiment? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(11) Do you ever feel as if someone is deliberately trying to harm you? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(12) Do you ever feel as if you are being persecuted in some way? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5

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Please circle if answered YES

(13) Do you ever feel as if there is a conspiracy against you? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(14) Do you ever feel as if some organization or institution has it in for you? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(15) Do you ever feel as if someone or something is watching you? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(16) Do you ever feel as if you have special abilities or powers? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5

Please circle if answered YES

(17) Do you ever feel as if there is a special purpose or mission to your life? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(18) Do you ever feel as if there is a mysterious power working for the good of the world? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(19) Do you ever feel as if you are or destined to be someone very important? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(20) Do you ever feel that you are a very special or unusual person? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5

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Please circle if answered YES

(21) Do you ever feel that you are especially close to God?	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever				Think about it
(please circle)	think about it				all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(22) Do you ever think that people can communicate telepathically?	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever				Think about it
(please circle)	think about it				all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(23) Do you ever feel as if electrical devices such as computers can influence the way you think?	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever				Think about it
(please circle)	think about it				all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(24) Do you ever feel as if there are forces around you which affect you in strange ways?	Not at all distressing				Very distressing
	1	2	3	4	5
	Hardly ever				Think about it
(please circle)	think about it				all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5

Please circle if answered YES

(25) Do you ever feel as if you have been chosen by God in some way? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(26) Do you believe in the power of witchcraft, voodoo, or the occult? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(27) Are you often worried that your partner may be unfaithful? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(28) Do you ever think that you smell very unusual to other people? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5

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Please circle if answered YES

(29) Do you ever feel as if your body is changing in a peculiar way?	Not at all distressing	2	3	4	Very distressing
	1				5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(30) Do you ever think that strangers want to have sex with you?	Not at all distressing				Very distressing
	1	2	3	4	5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(31) Do you ever feel that you have sinned more than the average person?	Not at all distressing				Very distressing
	1	2	3	4	5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5
(32) Do you ever feel that people look at you oddly because of your appearance?	Not at all distressing				Very distressing
	1	2	3	4	5
(please circle)	Hardly ever think about it				Think about it all the time
	1	2	3	4	5
No Yes ——————>	Don't believe it's true				Believe it is absolutely true
	1	2	3	4	5

Please circle if answered YES

(33) Do you ever feel as if you had no thoughts in your head at all? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(34) Do you ever feel as if your insides might be rotting? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(35) Do you ever feel as if the world is about to end? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(36) Do your thoughts ever feel alien to you in some way? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5

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Please circle if answered YES

(37) Have your thoughts ever been so vivid that you were worried other people would hear them? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(38) Do you ever feel as if your own thoughts were being echoed back to you? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(39) Do you ever feel as if your thoughts were blocked by someone or something else? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5
(40) Do you ever feel as if other people can read your mind? (please circle) No Yes ——————>	Not at all distressing 1 Hardly ever think about it 1 Don't believe it's true 1	2	3	4	Very distressing 5 Think about it all the time 5 Believe it is absolutely true 5

APPENDIX D: Cardiff Anomalous Perceptions Scale

CAPS

Introduction

This questionnaire asks questions about sensations and perceptions you may have experienced. Some of the experiences are unusual, some of them are more everyday.

We realise circling answers may not always represent your experience as accurately as you might like. However, we would ask you to circle the answers that most closely match your experience and avoid missing any questions out.

We would appreciate it if you could be as honest as possible when giving your answers.

The only experiences we are not interested in are those that may have occurred whilst under the influence of drugs.

Instructions

Each item has a question on the left hand side. Please read the question and circle either YES or NO

- If you circle **NO** please move straight on to the next question.
- If you circle **YES** please rate the experience in all of the three boxes on the right hand side of the item by circling a number between 1 and 5.

These ask about how distressing you found the experience, how distracting you found it, and how often the experience occurs.

Example questions

You do not need to answer these questions, they are just examples to illustrate the instructions.

Do you ever notice that lights seem to flicker on and off for no reason ?

NO YES

If YES please rate on right hand side.

Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

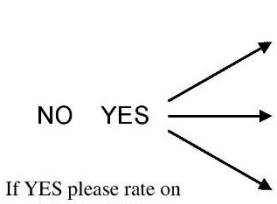
Do you ever feel that the sound on the TV or radio seems unusually quiet ?

NO YES

If YES please rate on right hand side.

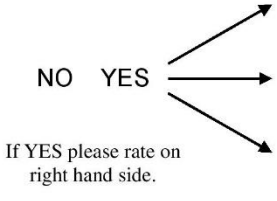
Not at all distressing				Very distressing
1	**2**	3	4	5
Not at all distracting				Completely intrusive
1	2	**3**	4	5
Happens hardly at all				Happens all the time
1	**2**	3	4	5

1) Do you ever notice that sounds are much louder than they normally would be ?



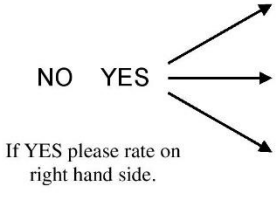
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

2) Do you ever sense the presence of another being, despite being unable to see any evidence ?



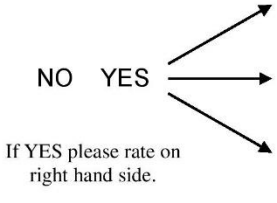
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

3) Do you ever hear your own thoughts repeated or echoed ?



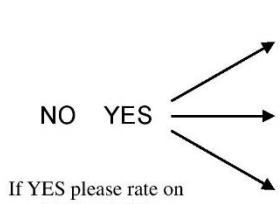
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

4) Do you ever see shapes, lights or colours even though there is nothing really there ?



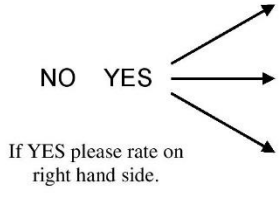
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

5) Do you ever experience unusual burning sensations or other strange feelings in or on your body ?



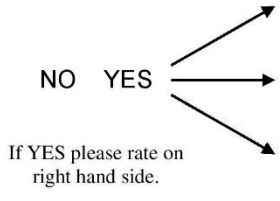
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

6) Do you ever hear noises or sounds when there is nothing about to explain them ?



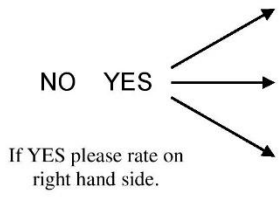
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

7) Do you ever hear your own thoughts spoken aloud in your head, so that someone near might be able to hear them ?



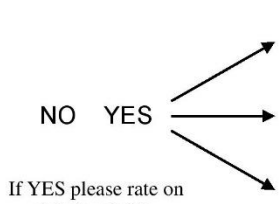
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

8) Do you ever detect smells which don't seem to come from your surroundings ?



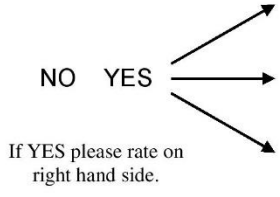
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

9) Do you ever have the sensation that your body, or a part of it, is changing or has changed shape ?



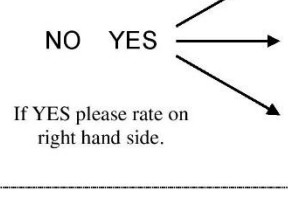
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

10) Do you ever have the sensation that your limbs might not be your own or might not be properly connected to your body?



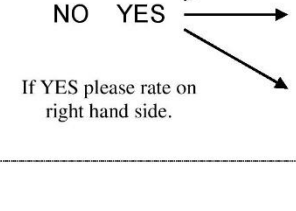
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

11) Do you ever hear voices commenting on what you are thinking or doing ?



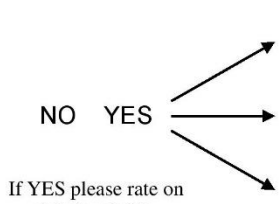
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

12) Do you ever feel that someone is touching you, but when you look nobody is there ?



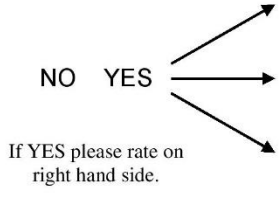
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

13) Do you ever hear voices saying words or sentences when there is no-one around that might account for it ?



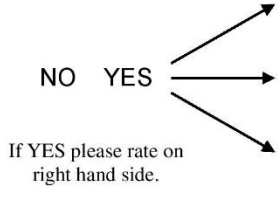
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

14) Do you ever experience unexplained tastes in your mouth ?



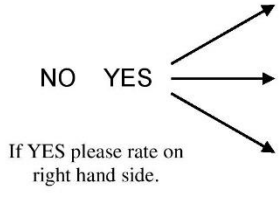
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

15) Do you ever find that sensations happen all at once and flood you with information ?



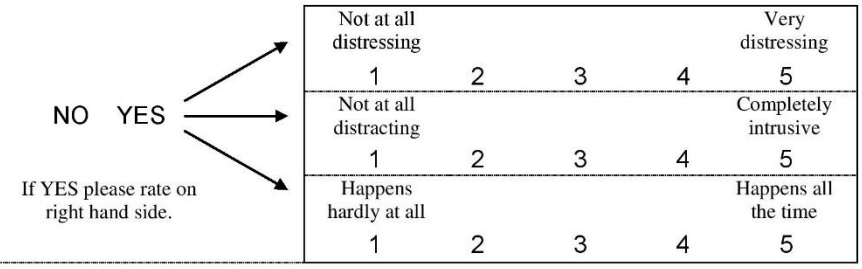
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

16) Do you ever find that sounds are distorted in strange or unusual ways ?

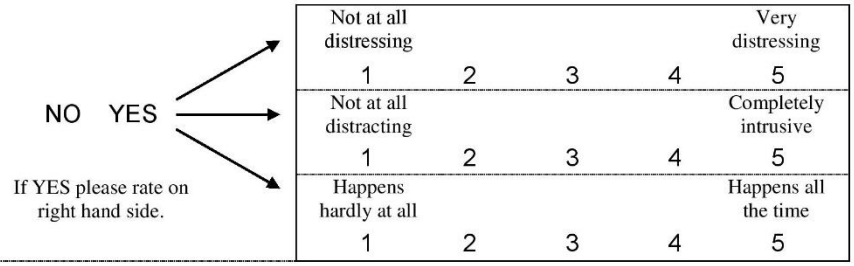


Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

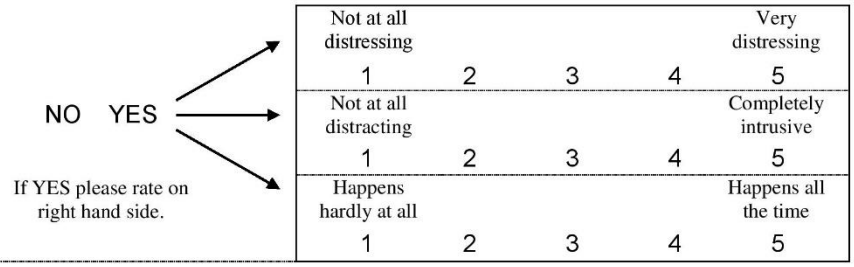
17) Do you ever have difficulty distinguishing one sensation from another ?



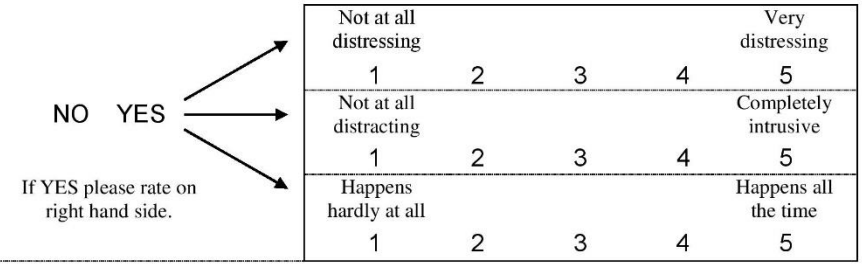
18) Do you ever smell everyday odours and think that they are unusually strong ?



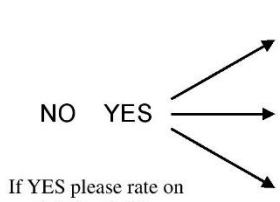
19) Do you ever find the appearance of things or people seems to change in a puzzling way, e.g. distorted shapes or sizes or colour ?



20) Do you ever find that your skin is more sensitive to touch, heat or cold than usual ?

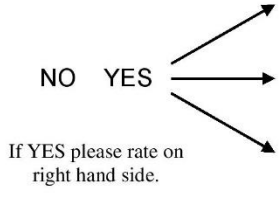


21) Do you ever think that food or drink tastes much stronger than it normally would ?



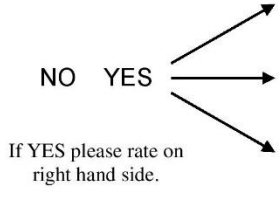
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

22) Do you ever look in the mirror and think that your face seems different from usual ?



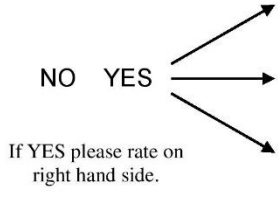
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

23) Do you ever have days where lights or colours seem brighter or more intense than usual ?



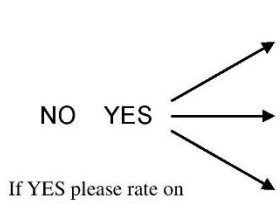
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

24) Do you ever have the feeling that of being uplifted, as if driving or rolling over a road while sitting quietly ?



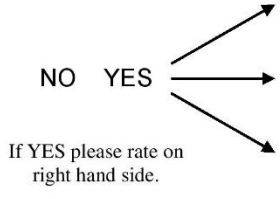
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

25) Do you ever find that common smells sometimes seem unusually different ?



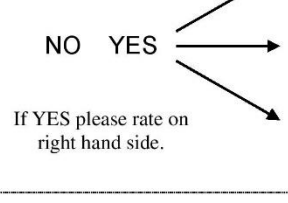
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

26) Do you ever think that everyday things look abnormal to you ?



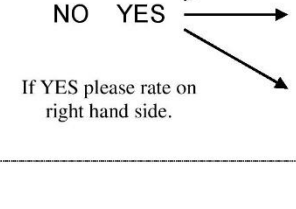
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

27) Do you ever find that your experience of time changes dramatically ?



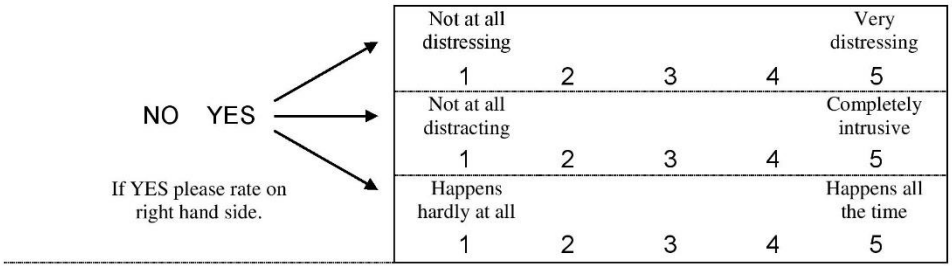
Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

28) Have you ever heard two or more unexplained voices talking with each other ?

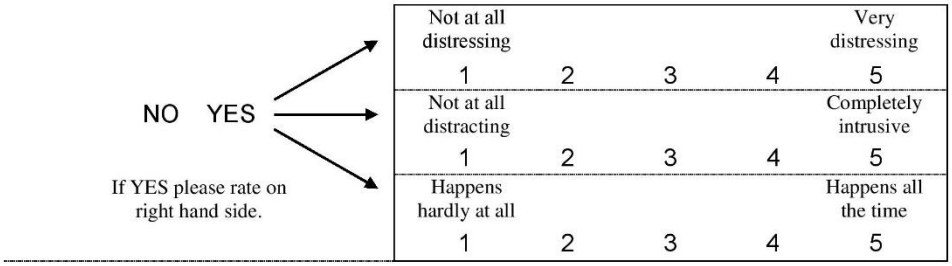


Not at all distressing				Very distressing
1	2	3	4	5
Not at all distracting				Completely intrusive
1	2	3	4	5
Happens hardly at all				Happens all the time
1	2	3	4	5

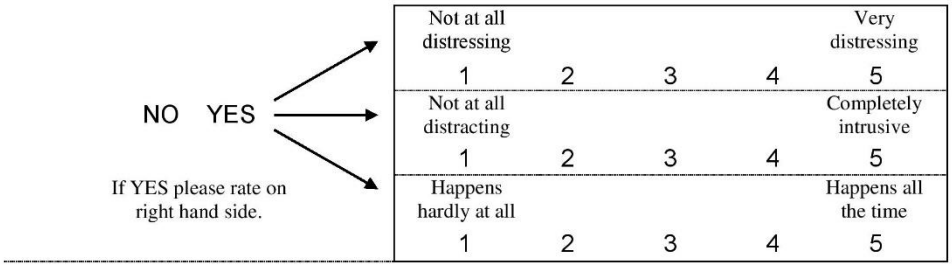
29) Do you ever notice smells or odours that people next to you seem unaware of ?



30) Do you ever notice that food or drink seems to have an unusual taste ?



31) Do you ever see things that other people cannot ?



32) Do you ever hear sounds or music that people near you don't hear ?