Examining the relationship between hallucination proneness and personality in a non-clinical sample

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Abstract

A noticeable proportion of the general population experiences hallucinations. However, the relationship between these experiences and individual characteristics such as personality is not well understood, and no research exists on the topic in South Africa. This study examined whether any personality traits on the South African Personality Inventory predicted schizotypy in general, as well as hallucination proneness in particular, while controlling for schizotypy. A sample of 136 undergraduate students from the University of Cape Town completed the study, administered via questionnaire. Results indicate that the prevalence of hallucination proneness and schizotypy in this sample is comparable to similar studies. Multiple regression analyses indicated that Neuroticism, Negative Social Relational Disposition and Openness/Intellect were all positively associated with schizotypy in general, depending on which schizotypy scale was used ($p < .05$). Further, higher Neuroticism scores significantly predicted higher hallucination proneness scores ($p = .014$), but this trait was no longer significant when controlling for schizotypy. Negative Social Relational Disposition was not only significantly positively associated with schizotypy, but also with hallucination proneness, and this association remained significant when the influence of schizotypy was controlled for ($p = .008$). These findings indicate the need to distinguish between schizotypy and hallucination proneness in such investigations, and point to the importance of personality in explaining variations in features of the psychosis continuum.

Keywords: hallucination proneness, schizotypy, personality, non-clinical

The concept of hallucination is somewhat amorphous, with boundaries between 'true' hallucinations and illusions or distortions of perception often unclear, leading prominent voices on the subject such as neurologist Oliver Sacks to opt for the broad definition of "percepts arising in the absence of external reality" (Sacks, 2012, p. 1). These percepts can occur within any, or more than one, sensory modality. Often, hallucinations are thought of as synonymous with mental illnesses such as schizophrenia, in which these percepts are often pervasive and cause severe distress. However, they can also occur in a wide variety of other contexts, from the neurological deterioration seen in Parkinson's, to various forms of seizure, partial loss of eyesight, and a range of other neurological and psychiatric conditions (Diederich, Fenelon, Stebbins, & Goetz, 2009; Larøi et al., 2012; Schadlu, Schadlu, & Shepherd, 2009; Waters & Fernyhough, 2017).

Hallucinations are, however, also evident in non-clinical populations, where there is an absence of a physical or psychiatric disorder. Setting aside chemically-induced hallucinations from psychoactive drugs, environmental precipitants include acute stress, anxiety, intense emotional states, trauma, and many others (Allen et al., 2005; Freeman & Fowler, 2009; Paulik, Badcock, & Maybery, 2006). Indeed, the propensity to hallucinate is evident in noticeable proportion of the general population. For instance, a meta-analysis of studies from 52 countries found a mean lifetime prevalence of 5.8%, though this varied substantially by country, from 0.8% in Vietnam to 31.4% in Nepal, with South Africa's prevalence rate at 8.2% (Nuevo et al., 2010). Regardless of the exact figures, the propensity for healthy individuals to hallucinate gives credence to the increasingly popular conclusion that the larger construct of psychosis, of which hallucinations are a great constituent, exists on a continuum from transient experiences in non-clinical populations to persistent disturbances symptomatic of mental illness (Larøi et al., 2019; Van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009).

Though numerous studies have focused on the environmental precipitants of transient hallucinations in these non-clinical samples (Temmingh, Stein, Seedat, & Williams, 2011; for a review, see Van Os et al., 2009), there is a comparatively small but growing body of research into the individual characteristics influencing hallucination proneness in these populations. For instance, studies have found metacognitive beliefs, inhibitory control deficits and intrusive thoughts to be associated with hallucinatory tendencies. (Badcock & Hugdahl, 2012; Badcock, Mahfouda, & Maybery, 2015; Varese & Bentall, 2011). In terms of personality, studies using the Eysenck Personality Questionnaire and the Millon Clinical

Multiaxial Inventory found positive associations between hallucination proneness and features of neuroticism (Barrett & Etheridge, 1994; Jakes & Hemsley, 1987; Young, Bentall, Slade, & Dewey, 1986). However, these personality inventories are somewhat outdated, with both measures undergoing extensive revision since this research in an effort to improve their psychometric properties (Choca & Grossman, 2015; Eysenck, Eysenck, & Barrett, 1985).

More recent measures of personality commonly make use of inventories based on the Five Factor Model (FFM), comprising the following traits and features (McCrae, Costa, Del Pilar, Rolland, & Parker, 1998):

- Extroversion (assertiveness, excitement-seeking, gregariousness)
- Agreeableness (trusting, kindness, gentleness, reliability)
- Openness (creativity, aesthetic appreciation)
- Neuroticism (emotional vulnerability and lability)
- Conscientiousness (competence, dutifulness)

Instruments based on the FFM have shown good validity and temporal stability, even across cultures (Oh, Wang, & Mount, 2011; Schinka, Kinder, & Kremer, 1997; Soldz & Vaillant, 1999). The research using personality inventories based on the FFM to predict hallucination proneness is limited. Much of this research has been conducted in clinical samples – among individuals diagnosed with schizophrenia or other psychotic disorders. Lysaker, Wilt, Plascak-Hallberg, Brenner and Clements (2003) found higher levels of positive symptoms (for instance, hallucinations and delusions) were linked with lower Agreeableness scores. Neuroticism is also consistently positively associated with schizotypy (of which hallucination proneness is a constituent) in individuals with psychotic disorders (Goodwin, Fergusson, & Horwood, 2003; Horan, Blanchard, Clark, & Green, 2008; Lysaker et al., 2003). Other studies with clinical samples have found that higher levels of schizotypy in general were associated with lower Openness scores (Shi et al., 2018; Xu et al., 2004).

Of the research using non-clinical samples, some studies have also found a positive association between Neuroticism and schizotypy (Barrantes-Vidal, Ros-Morente, & Kwapil, 2009; Horan et al., 2008). While Openness tend to be negatively associated with schizotypy in clinical samples, the opposite seems to be true in non-clinical samples. For instance, Ross, Lutz and Bailley (2002) found higher Openness scores were linked with higher levels of schizotypy symptoms including hallucinations. Moreover, McCrae and Costa (1997) concluded that individuals who score highly on measures of Openness often have unusual

perceptual experiences, also a feature of schizotypy. There has been some suggestion that the conflicting conclusions about the Openness trait in these samples could indicate a change in levels of the Openness trait during the course a of psychotic disorder. For instance, Xu et al. (2004) found that among individuals who had experienced a period of psychosis, Openness levels were considerably higher before the onset of psychosis and during remission than in the course of a psychotic experience. Some authors posit that this could underlie the discrepancy between clinical and non-clinical samples (Shi et al., 2018).

Because the research on associations between personality and hallucination proneness is so limited, however, drawing general conclusions about why these associations exist may be premature. Determining whether these associations exist in other non-clinical samples requires more research. A further shortcoming in previous research is that 'schizotypy' and 'hallucination proneness' are used interchangeably. Schizotypy is a broad construct that encompasses a range of distinct characteristics on the psychosis continuum. It is often categorised into four categories: impulsive nonconformity (unstable behaviour and affect in relation to social norms), introvertive anhedonia (asocial behaviour, introversion, flat affect), cognitive disorganisation (tangential, derailed or disorganised thought), and unusual experiences (perceptual experiences such as hallucinations, and superstitious or magical attributions to events) (Bentall, Claridge, & Slade, 1989; Claridge et al., 1996). As such, hallucination proneness is a feature within the broader construct of schizotypy, and although related to it, is by no means synonymous with it.

The implication of this lack of clarity is that in order to investigate the link between hallucination proneness and personality, schizotypy must be disentangled from hallucination proneness. Fortunately, there are instruments that seem to be able to achieve this. For instance, the Revised Launay-Slade Hallucinations Scale (LSHS-R), is a Likert-type questionnaire that specifically measures an individual's proneness to hallucinations, while omitting other aspects of schizotypy such as introvertive anhedonia or cognitive disorganisation (Bentall & Slade, 1985). While the aforementioned studies made use of general schizotypy scales (for instance, the Cardiff Anomalous Perceptions Scale and the Oxford-Liverpool Inventory of Feelings and Experiences), one study has used the LSHS-R to specifically measure hallucination proneness and determine its association to FFM personality traits, in both young adult and elderly samples (Larøi, DeFruyt, Van Os, Aleman, & Van der Linden, 2005). The authors found that Openness was positively associated with hallucination proneness in young adults, while both and Openness and Neuroticism were

positively associated with hallucination proneness in the elderly group (Larøi, et al., 2005). That these findings converge with previous research suggests that perhaps these FFM traits predict not only schizotypy in general, but hallucinations in particular. However, this conclusion cannot be drawn without more research, and specifically research that measures both hallucination proneness in particular and schizotypy in general within the same sample. This would allow any specific contribution of personality in predicting hallucination proneness to be investigated.

Definitions aside, there are other opportunities for contributing to the body of literature on the link between personality and hallucination proneness. Importantly, existing research has been conducted almost exclusively in the global North, and as such, generalisability of these results to other contexts like South Africa is limited. Any such research in South Africa would also need to make use of locally relevant measures of personality. Though the FFM has long been considered among the most valid and temporally stable trait-based measures of personality, even across cultures (McCrae et al., 1998; McCrae & Terracciano, 2005; Oh et al., 2011; Schinka et al., 1997; Soldz & Vaillant, 1999), recent research contests this claim in relation to South Africa (Laher, 2013). For instance, in an extensive review, Laher (2008) concludes that despite being appropriate for Western populations, common measures of the FFM such as the Revised NEO Personality Inventory (NEO PI-R) may not be applicable to African and specifically South African contexts. The author asserts that some aspects of the FFM, such as an emphasis on individualism as opposed to collectivism, result in the neglect of some aspects of personality that are particularly important in African cultures. Moreover, some factors in the FFM likely manifest differently in South African samples (Laher, 2008). As such, for the results of any study involving measures of personality in South Africa to be meaningful, the FFM alone is not a sufficient encapsulation of personality.

In recent years, in an effort to address the shortcomings of the FFM in local contexts, the South African Personality Inventory (SAPI) was constructed. This measure draws from personality facets found across language and cultural groups in South Africa. It has been developed using a two-pronged approach of exploring personality structure as it exists indigenously across South African cultures, through extensive interviews (an ‘emic’ approach) and adapting already-existing theories of ‘universal’ traits (an ‘etic’ approach), to arrive at a conceptualization of personality that encompasses universal and indigenous perspectives, an ‘emic-etic’ approach **(**Hill et al., 2013). This inventory has the potential to

provide unique insight into the potential link between hallucination proneness and personality outside of Western contexts.

On the whole, the body of literature examining links between hallucination proneness and personality is lacking in a number of respects. Previous research has not distinguished between hallucination proneness and schizotypy, meaning that conclusions cannot be formed regarding whether personality predicts hallucination proneness in particular or schizotypy more generally. Controlling for the influence of other schizotypal traits allows any link found to be more precisely understood. Moreover, research conducted in the global North can provide only part of the picture. The use of locally-relevant, combined emic-etic approaches to measuring personality such as the SAPI means that any potential link can be investigated while taking into account all aspects of personality relevant to the cultures in question, outside of conventional Western models of personality.

Research Questions and Hypotheses

The present study aimed to contribute to the growing body of knowledge on hallucination proneness in a non-clinical sample, while ensuring the findings are relevant by making use of a measure of personality that is culturally applicable to South Africa. Ultimately, it the study sought to answer to the following question: What is the relationship between hallucination proneness and personality traits in a non-clinical sample of South African undergraduates? Since some personality factors may be a predictor of schizotypal traits as a whole, encompassed in this question is whether personality is predictive of hallucination tendencies in particular, over and above other schizotypal traits. The study also aimed to investigate associations between schizotypy and personality more generally. Despite aforementioned personality associations found in previous studies, since the SAPI has until now not been used in such research, non-directional hypotheses were used.

Hypotheses

1. At least one trait on the SAPI is a significant predictor of hallucination proneness, as measured by the LSHS-R.
2. At least one trait on the SAPI is a significant predictor of schizotypy, as measured by the CAPS and the O-LIFE.
3. At least one trait on the SAPI is a significant predictor of hallucination proneness (LSHS-R) while controlling for the influence of schizotypy (CAPS and O-LIFE).

Method

Participants

Participants were undergraduate psychology students from the University of Cape Town (UCT). They were recruited through convenience sampling, via an invitation sent to all undergraduate psychology students, which described what would be required of their participation (Appendix D). They were not compensated financially, but rather awarded points as part of the university's Student Research Participation Program (SRPP). The only exclusion criteria used were that participants could not have been diagnosed with a mental illness, and had to be at least 18 years of age. A total of 136 participants completed the study in its entirety. This comprised of 122 (89.7%) female participants, the remainder identifying as male. Age ranged from 18 to 27 (m = 20, SD = 1.579).

Sample Size Calculation

Preferred sample size was calculated using an a priori sample size calculator for multiple regression (G*Power, version 3.1.9.4), where there are 9 predictor variables, there is a desired power level of 0.8, a significance level of $\alpha = .05$, and a medium effect size (f^2 = .15) (Faul, Erdfelder, Buchner, & Lang, 2009; Soper, 2019). The minimum sample size was found to be 108 participants.

Measures

Four self-report questionnaires were used for this study. This included one general personality inventory, which also included basic demographic questions, as well as two inventories of schizotypy, and one inventory of hallucination proneness.

Personality: The South African Personality Inventory. The recently-developed SAPI draws from personality facets found across cultural groups in South Africa. It has been constructed using a two-pronged approach of exploring personality structure as it exists indigenously across South African cultures (an 'emic' approach) and adapting already-existing theories of universal traits (an 'etic' approach), to arrive at a conceptualization of personality that encompasses indigenous and universal perspectives, an 'emic-etic' approach **(**Hill et al., 2013). The emic component consisted of deriving facets of personality that were common among and considered important to all major language groups. This was done through conducting interviews with representative samples of participants from the eleven official language groups in the country **(**Hill et al., 2013). The etic component consisted of

using the FFM framework as a theoretical basis for the structure of the inventory (Fetvadjiev, Meiring, Van de Vijver, Nel, & Hill, 2015; Hill et al., 2013; Nel et al., 2012). Items were generated and the pool refined iteratively, ultimately yielding a six-factor structure. The measure has been found to have acceptable measurement invariance and model fit (Morton, Hill, & Meiring, 2018). Because this inventory was developed using a bottom-up approach, conceptualising personality as it is understood by the individuals it aims to categorise, the SAPI was considered the most appropriate personality measure for this study.

The structure of the SAPI comprises the following traits and sub-traits (Fetvadjiev et al., 2015):

- Conscientiousness (Achievement Oriented, Orderliness, Traditionalism-Religiosity)
- Extraversion (Playfulness, Sociability)
- Neuroticism (Emotional Balance, Negative Emotionality)
- Openness/Intellect (Broadmindedness, Epistemic Curiosity)
- Negative Social Relational Disposition (Arrogance, Conflict Seeking, Deceitfulness, Hostility/Egoism)
- Positive Social-Relational Disposition (Empathy, Facilitating, Integrity, Interrelatedness, Social Intelligence, Warm-Heartedness).

Correspondence Between the SAPI and FFM Inventories. Due to the SAPI sharing a theoretical framework with the FFM, these inventories are largely similar to one another (Fetvadjiev et al., 2017). In the SAPI, Extraversion, Neuroticism, Openness and Conscientiousness are all parallel to their counterparts in the FFM in terms of the content areas measured, both theoretically and in their statistical association, with high correlations consistently seen between these traits on the SAPI and common measures of the FFM (Fetvadjiev et al., 2015; Fetvadjiev et al., 2017; Hill et al., 2013).

Where the SAPI and FFM differ is in the former's stronger emphasis on social relational aspects of personality. Positive Social-Relational Disposition (PSRD) and Negative Social Relational Disposition (NSRD) are broadly related to high and low scores on the FFM's Agreeableness trait, respectively. Commonalities include measuring facets such as altruism, honesty, loyalty and compliance (Hill et al., 2013). However, social relational traits on the SAPI also measure concepts beyond what is covered by the Agreeableness trait, including "guidance, maintenance of harmonious relationships, and manifestations of

integrity, but also behaviors disruptive of interpersonal relationships and social harmony." (Valchev et al., 2014, p.30). Despite this, social relational traits and Agreeableness still tend to covary, with some analyses finding moderate positive correlations between high and low Agreeableness and the Social Relational Disposition traits – which, heuristically, suggests a "high overlap between the indigenous and imported measure" on this aspect of personality (Fetvadjiev et al., 2015, p. 25).

Schizotypy: The Oxford-Liverpool Inventory of Feelings and Experiences. The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE) is a comprehensive measure of schizotypal features drawn from a large dataset of schizotypy inventories (Claridge et al., 1996). It is particularly useful in non-clinical populations and has shown acceptable test-retest reliability (r = .76-.93 for various subscales) and internal consistency (α >.77) (Burch, Steel, & Hemsley, 1998; Mason, Claridge, & Jackson, 1995). Construct validity has been established over years of use in various research fields and types of study (Mason, Linney, & Claridge, 2005). Originally comprising over 100 items, a shorter version of the O-LIFE has since been developed, retaining comparable psychometric properties, including in non-Western contexts (Fonseca-Pedrero, Ortuño-Sierra, Mason, & Muñiz, 2015; Mason et al., 2005; Yaghoubi, & Mohammadzadeh, 2012). For efficiency, this shortened version was be used in the present study, covering four schizotypy content areas: cognitive disorganisation, introvertive anhedonia, impulsive nonconformity and unusual experiences (Mason et al., 2005). These subscales have shown significant moderate positive correlations with other common schizotypy scales such as the Cardiff Anomalous Perceptions Scale (Bell, Halligan, & Ellis, 2005). The scale is presented in a dichotomous yes/no format, comprising 43 items in total.

Schizotypy: The Cardiff Anomalous Perceptions Scale. The 32-item Cardiff Anomalous Perceptions Scale (CAPS), developed for use in non-clinical populations, is now one of the most widely-used measures of schizotypy traits, and has shown high validity and reliability across studies (Bell, et al., 2005). These psychometric properties extend to non-Western contexts. In a Taiwanese sample, the CAPS demonstrated high temporal stability, internal consistency and construct validity (Kao, Wang, Lu, & Liu, 2013). The scale also demonstrated good reliability and validity among ethnic minorities in UK (Bell, Halligan, Pugh, & Freeman, 2011). The CAPS measures distortions of time perception, somatosensory disturbances and sensory flooding in five modalities. It also includes sub-questions on the nature of each feature being tested: when an item is endorsed (e.g. "Do you ever hear noises

or sounds when there is nothing around to explain them?"), participants are instructed to rate the experience on five-point scales indicating the levels of intrusiveness of the experience, distress it caused, and the frequency of the experience (Bell et al., 2005). The scale has shown good convergent validity with the O-LIFE, particularly on the Unusual Experiences subscale (Bell et al., 2005).

Hallucination Proneness: The Revised Launay-Slade Hallucination Scale. To measure hallucination proneness in particular, as opposed to schizotypy more generally, the revised version of the Launay-Slade Hallucination Scale (LSHS-R) was used. This self-report survey has been found to be reliable in non-clinical samples of young adults (r = .90) (Bentall & Slade, 1985; Fonseca-Pedrero et al., 2010). Other studies, also using young adult, university student samples, have yielded similar reliability, and the scale seems to be stable over time (Lipp, Arnold, & Siddle, 1994; Morrison, Wells, & Nothard, 2002; Waters, Badcock, & Maybery, 2003). The LSHS-R has also demonstrated acceptable psychometric properties in some non-Western and non-English speaking contexts (Aleman, Nieuwenstein, Böcker, & De Haan, 2001; Castiajo & Pinheiro, 2017; Fonseca-Pedrero et al., 2010; Vellante et al., 2012). The LSHS-R is a Likert-type survey consisting of 12 items measuring tendency to hallucinate, for example, "In the past, I have had the experience of hearing a person's voice and then found that no-one was there". Participants indicate how far they agree with each statement on a four-point scale (Waters et al., 2003). Importantly, this scale measures hallucination proneness in particular, as opposed to schizotypy in general.

Procedure

UCT undergraduates were invited to participate via an announcement posted on Vula, the university's communication platform (Appendix D) All questionnaires were administered online and were remotely accessed by participants. Those interested in participating completed an online consent form (Appendix C) and were then directed to the surveys. After participation they were sent a debriefing email (Appendix E).

Ethical Considerations

Ethical approval for this study was granted by the University of Cape Town Research Ethics Committee, reference code PSY2019-032 (Appendix I) .

Consent. All study participants were required to provide their informed consent (Appendix B), and were only given access to the main study once they had done so. The

consent page contained a description of the study aims, the reasons for conducting the research, the parties involved in the study, the experimental procedure and what was be required of participants. The potential benefits, inconveniences and risks to the participant were outlined, and contact details of both the experimenter and an independent party were provided, along with encouragement for participants to contact them if should any concerns or questions arise. The form also contained assurances that confidentiality would be upheld, meaning their data would not be shared with anyone not involved in the study. The form also reminded potential participants that their participation was entirely voluntary, and that they would be able to withdraw their consent at any time without any penalty. Compensation was be mentioned, in the form of SRPP points, as well as any potential costs to the participant.

Risks, Benefits and Debriefing. The study posed minimal risk to participants. There were no foreseeable direct benefits to participants, apart from potential enjoyment of the tasks. Participants were compensated with SRPP points. After completion of the tasks, participants were thanked and provided with a debriefing letter (Appendix E) which explained the purpose of the experiment more fully, and contained the contact details of the experimenter, UCT's Student Wellness Service, and the Research Ethics Committee Administrator.

Data Analysis

Results were analyzed using the Statistical Package for the Social Sciences (SPSS). Significance was set at $p = .05$. Prior to regression analyses, descriptive statistics were obtained, as well as correlations between the scales. The reliability of each scale determined using Cronbach's Alpha.

Multiple Regression Analysis (MRA) was used to investigate these hypotheses. Age was used as a control variable due to previous research finding that hallucination prevalence generally decreases with age (Kråkvik et al., 2015; Larøi et al., 2019; Soulas, Cleret de Langavant, Monod, & Fénelon, 2016). To find the models with the best fit to the data for each hypothesis, in accordance with the law of parsimony, any nonsignificant predictors were removed at each stage of model-building. At each stage, assumptions for MRA were checked.

Hypothesis 1. At least one trait on the SAPI is a significant predictor of hallucination proneness, as measured by the LSHS-R.

For this analysis, a hierarchical MRA was performed. Hierarchical MRA allows a model to be built that is able to partial out the influence of predictors that, based on a theoretical knowledge, are believed to be associated with the dependent variable. Controlling for the influence of particular predictors is thus possible (Field, 2009). Hallucination proneness (LSHS-R scores) was entered as the dependent variable. Age was entered into the first block of the model, followed by the six SAPI traits in the second block.

Hypothesis 2**.** At least one trait on the SAPI is a significant predictor of schizotypy, as measured by the CAPS and the O-LIFE.

Two hierarchical MRAs were conducted. In the first, schizotypy measured by the CAPS was entered as the dependent variable. Age was again entered into the first block as a control, followed by the SAPI traits in the second block. In the second MRA, schizotypy measured by the O-LIFE was entered as the dependent variable. As before, age was entered into the first block as a control, followed by the SAPI traits in the second block.

Hypothesis 3. At least one trait on the SAPI is a significant predictor of hallucination proneness (LSHS-R) while controlling for the influence of schizotypy (CAPS and O-LIFE).

Because hallucination proneness falls within the larger construct of schizotypy, it is reasonable to assume that there is a considerable positive association between schizotypy and hallucination proneness. Indeed, this has been found in studies using LSHS-R as a measure of hallucination proneness, and CAPS and O-LIFE as measures of schizotypy (Bell et al., 2005; Tamayo-Agudelo et al., 2019). Because schizotypy may explain some of the variance in hallucination proneness, then, it was necessary to control for its influence, so that the influence of personality traits alone predicting hallucination proneness could be investigated. A hierarchical MRA was conducted as before. Here, both schizotypy scales were entered as controls (CAPS and O-LIFE). The SAPI traits were then entered in the next block.

Results

Descriptive Statistics

Descriptive statistics for each variable are shown in Table 1. Average scores for SAPI traits were highest for PSRD (m = 3.92, SD = .38), and lowest for NSRD (m = 2.22, SD = .47). Internal consistency of the scales was determined using Cronbach's Alpha (Table 2) and was high (>.82) for all scales (see Table 1 in Appendix A). Correlations among the schizotypy scales and hallucination proneness scale show that all correlations reached

significance at the .01 level (see Table 2 in Appendix A). All were moderately positively correlated with one another. The CAPS and O-LIFE are more strongly correlated with each other (.685) than with the LSHS-R (.439 and .482, respectively).

Table 1

Descriptive Statistics for All Variables

	Mean	Range		Std. Deviation	Variance
		Potential	Actual		
Age	20.35	18-	18-27	1.58	2.49
PSRD	3.93	1-5	2.46-4.83	.38	.14
NSRD	2.23	1-5	1.09-3.50	.47	.22
Extroversion	3.67	1-5	2.08-5.00	.57	.32
Conscientiousness	3.82	1-5	2.31-4.96	.42	.17
Neuroticism	3.01	1-5	1.50-4.33	.51	.26
Openness/Intellect	3.84	1-5	2.61-4.74	.42	.17
LSHS-R	18.53	0-48	0-37	8.65	74.81
CAPS	8.10	0-32	0-32	5.25	27.51
O-LIFE	15.09	0-43	1-33	6.62	43.86

PSRD = Positive Social Relational Disposition; NSRD = Negative Social Relational Disposition

Main Analysis

Hypothesis 1. At least one trait on the SAPI is a significant predictor of hallucination proneness, as measured by the LSHS-R.

Step 1. The results of the first model indicated that age was a nonsignificant predictor (p = .233), explaining only 1.1% of the variance in hallucination proneness scores. When examining correlations between variables, very high correlations were seen between Conscientiousness and Extroversion (.886), which could indicate multicollinearity (Table 2). To investigate this, collinearity diagnostics were examined. For Conscientiousness, tolerance was notably low at .06, with a value of below 0.2 generally considered problematic (Field, 2009). Variance Inflation Factor (VIF) was also notably high (15.99), above the heuristic of 10, also suggesting multicollinearity (Field, 2009). Tolerance and VIF were also problematic for Extroversion (.11 and 9.0, respectively). Because Conscientiousness had more concerning

collinearity diagnostics than Extroversion, and because Conscientiousness was also highly correlated with another independent variable (Positive Social Relational Disposition, at .789), it was removed from the model. Another MRA was run, also removing Age as a control on account of its nonsignificance.

Step 2. This MRA thus included five SAPI traits as predictors, and as before, hallucination proneness (LSHS-R scores) as the dependent variable. No correlations between predictor variables were extremely high, and collinearity diagnostics were in acceptable ranges for all variables, indicating that the issue of multicollinearity had disappeared. All other assumptions were met. The overall model was significant, $F(5,130) = 5.61$, $p < .001$, explaining 17.7% of the variance in hallucination proneness. Examining coefficients, two SAPI traits had significant positive associations with hallucination proneness, namely Negative Social Relational Disposition (NSRD) ($p = .002$, $\beta = 31$) and Neuroticism ($p = .014$, $\beta = .22$). As such, a further MRA was conducted with the nonsignificant SAPI traits removed.

Step 3. This model thus included NSRD and Neuroticism. Overall, the model was significant, $F(2,133) = 12.91$, $p < .001$, explaining 16.3% of the variance in hallucination proneness. Here, NSRD was significant ($p = .001$), and was more strongly associated with hallucination proneness than Neuroticism was ($\beta = .28$, part and partial correlations .27 and .28, respectively) (see Table 3). Neuroticism also remained significant ($p = .014$, $\beta = .21$, part and partial correlations .20 and .21, respectively) (see tables 3 and 4 in Appendix B). This was found to be the most parsimonious model. All assumptions were met (see figures 1 -5 in Appendix B). Data approximated a normal distribution, no heteroscedasticity was detected, and no deviations from linearity observed. No influential cases were detected and there were no outliers outside three standard deviations.

Hypothesis 2. At least one trait on the SAPI is a significant predictor of schizotypy, as measured by the CAPS and the O-LIFE.

Part One: CAPS. Step 1. As previously, Conscientiousness was not included in the model, in order to prevent issues of multicollinearity. Overall, as with the hallucination proneness models, age was found to be a nonsignificant predictor ($p = .257$), explaining just 1% of the variance in schizotypy (CAPS scores). As such, it was removed from the model.

Step 2. Another MRA was conducted with age removed. All assumptions were met. Here, the overall model was significant, $F(5,130) = 6.09$, $p < .001$, and accounted for 19% of the variance in schizotypy (CAPS scores). When examining coefficients, two SAPI traits

were found to be positively associated with schizotypy, namely Neuroticism (β = .29, *p* = .001) and Openness/Intellect (β = .37, *p* = .001).

Step 3. A final MRA was conducted with only the significant predictors (Neuroticism and Openness/Intellect) included. The overall model was significant, $F(2,133) = 10.63$, $p < .001$, explaining 13.8% of the variance in schizotypy (CAPS scores). In this model, Neuroticism was more strongly associated with schizotypy (β = .35, $p < .001$) than Openness/Intellect was, with part and partial correlations of .34 and .34. Openness/Intellect remained a significant predictor (β = .23, *p* = .006), with part and partial correlations of .23 and .24, respectively (see Table 3, as well as tables 5 and 6 in Appendix B). This was found to be the most parsimonious model. All assumptions were met (see figures 6-10 in Appendix B).). Data approximated a normal distribution, no heteroscedasticity was detected, and no deviations from linearity observed. No influential cases were detected and there were no outliers outside three standard deviations.

Part Two: O-LIFE. Step 1. As before, Conscientiousness was omitted from the model to avoid multicollinearity. Again, age was found to be nonsignificant as a predictor, explaining just 0.7% of the variance, *p* = .321. It was thus removed from the model. All assumptions were met.

Step 2. Here, the overall model was significant, $F(5,130)$, $p < .001$, accounting for 26.7% of the variance in schizotypy (O-LIFE scores). Looking at coefficients, three SAPI traits were significantly positively associated with schizotypy as measured by the O-LIFE. These were NSRD (β = .22, *p* = .021), Neuroticism (β = .39, $p < .001$) and Openness/Intellect (β = .21, *p* = .044). All assumptions were met.

Step 3. A further model containing only the three significant predictors was built. The overall model was significant, $F(3,132) = 14.33$, $p < .001$, accounting for 24.6% of the variance in schizotypy (O-LIFE scores). Here, Neuroticism was most strongly related to schizotypy (β = .40, $p < .001$), with part and partial correlations of .37 and .39 respectively, followed by NSRD (β = .22, *p* = .009), with part and partial correlations of .20 and .23 respectively (see Table 3). In this model, Openness/Intellect was no longer a significant predictor (*p* = .217, β = .10). All assumptions were met.

Step 4. A final MRA consisting of only Neuroticism and NSRD was built. Here, the overall model was significant, $F(2,133) = 20.65$, $p < .001$, explaining 23.7% of the variance in schizotypy (O-LIFE scores). Neuroticism remained more strongly associated with

schizotypy (β = .38, $p < .001$), with part and partial correlations of .36 and .38, respectively, while NSRD (β = .20, $p = .012$) had part and partial correlations of .19 and .22 respectively (see Table 3, as well as Tables 7 and 8 in Appendix B). This was found to be the most parsimonious model. All assumptions were met (see figures 11-15 in Appendix B). Data approximated a normal distribution, no heteroscedasticity was detected, and no deviations from linearity observed. No influential cases were detected and there were no outliers outside three standard deviations.

Hypothesis 3. At least one trait on the SAPI is a significant predictor of hallucination proneness (LSHS-R) while controlling for the influence of schizotypy (CAPS and O-LIFE).

Step 1. For this model, CAPS and O-LIFE were entered as controls (representing schizotypy), and SAPI traits were entered in the next block (excluding Conscientiousness, as before, to avoid multicollinearity). Age was omitted, as it had already been found to be a nonsignificant predictor of hallucination proneness. The first model, containing the schizotypy scales, was significant, $F(2,133) = 22.76$, explaining 25.5% of the variance in hallucination proneness. When SAPI traits were added, these explained a further 4.6% of the variance, a change which was not significant ($p = .147$). However, examining the coefficients, one SAPI trait was a significant predictor of hallucination proneness, namely NSRD ($p = .020$, β = 22), with part and partial correlations of .18 and .21, respectively. In this model, CAPS was narrowly nonsignificant ($p = .058$), while O-LIFE retained significance ($p = .030$, β =24), with part and partial correlations of .16 and .19, respectively. All assumptions were met for this model.

Step 2. A final hierarchical MRA was conducted with only the significant SAPI trait, NSRD, included, to determine its influence over and above the schizotypy scales. Here, the model with NSRD predicting hallucination proneness, controlling for schizotypy, was significant overall, $F(3,132) = 18.32$, $p < .001$. Here, while schizotypy explained 25.5% of the variance, NSRD accounted for a further 3.9% of the variance in hallucination proneness, a change that was significant ($p = .008$). Looking at coefficients, NSRD (β = .21) was less strongly associated with hallucination proneness than O-LIFE was (β = .28, $p = .008$), but more strongly associated with hallucination proneness than CAPS was, a relationship that was narrowly nonsignificant (β = .20, $p = .054$) (see Table 3). When rounded to two decimal places, the part and partial correlations of the significant predictors were identical (0.20 and 0.23, respectively) (see tables 9 and 10 in Appendix B). This was the most parsimonious

model. All assumptions were met (see figures 16-21 in Appendix B).). Data approximated a normal distribution, no heteroscedasticity was detected, and no deviations from linearity observed. No influential cases were detected and there were no outliers outside three standard deviations.

Table 2

Pearson Correlations Between All Variables

	LSHS-R	Age	CAPS	OLIFE	PSRD	NSRD	Extraversion	Conscientiousness	Neuroticism	Openness /Intellect
LSHS-R	1.000	-.103	.439**	.482**	-.145	.351**	-.066	-.146	.304**	-.039
AGE	-.103	1.000	-.098	-.086	.104	-.121	-.098	-.023	-.102	-.001
CAPS	.439**	-.098	1.000	.685**	-.044	.253**	.016	-.058	.295**	.148
O-LIFE	.482**	-.086	.685**	1.000	-.172*	.330**	-.111	-.219*	.447**	-.038
PSRD	-.145	.104	-.044	-.172*	1.000	-.383**	.532**	.789**	-.200*	.672**
NSRD	.351**	-.121	.253**	.330**	-.383**	1.000	.071	-.192*	.333**	-.188*
Extraversion	-.066	-.098	.016	-.111	.532**	.071	1.000	.886**	-.133	.465**
Conscientiousness	-.146	-.023	-.058	-.219	.789**	-.192*	.886**	1.000	-.259**	.580**
Neuroticism	.304**	-.102	.295**	.447**	-.200*	.333**	-.133	-.259**	1.000	-.238**
Openness/Intellect	-.039	-.001	.148	-.038	.672**	-.188*	.465**	.580**	-.238**	1.000

** Significant at the 0.01 level (2-tailed)

* Significant at the 0.05 level (2-tailed)

Table 3
Summaries of Parsimonious Models

Analysis	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics F Change	df1	df2	Sig. F Change
Hypothesis 1	1	.403	.163	.150	7.975	.163	12.911	2	133	.000
Hypothesis 2 Part 1	1	.371	.138	.125	4.907	.138	10.628	2	133	.000
Hypothesis 2 Part 2	1	.487	.237	.225	5.829	.237	20.646	2	133	.000
Hypothesis 3	1	.505[a]	.255	.244	7.522	.255	22.760	2	133	.000
	2	.542[b]	.294	.278	7.350	.039	7.291	1	132	.008

a. Predictors: (Constant), CAPS, OLIFE.

b. Predictors: (Constant), CAPS, OLIFE, NSRD

Note. Hypothesis 1 = NSRD and Neuroticism predicting LSHS-R. Hypothesis 2 Part 1 = Neuroticism and Openness/Intellect predicting CAPS. Hypothesis 2 Part 2 = Neuroticism and NSRD predicting O-LIFE. Hypothesis 3 = NSRD predicting LSHS-R, controlling for O-LIFE and CAPS.

Discussion

In interpreting the prevalence of schizotypal features in the current sample, it is useful to compare these findings to a similar study. A study by Tamayo-Agudelo et al. (2019) in Spanish and Colombian samples was chosen for comparison, as it administered the same versions of the scales as the present study did, had a sufficiently large sample size, and involved both clinical and non-clinical participants. As expected, there were notable differences between the present non-clinical sample and the comparison clinical sample, with the present sample scoring lower on all measures. Overall, the present sample was comparable in both schizotypy and hallucination proneness levels with non-clinical samples in Spain and Colombia. Moreover, these results are comparable to studies conducted in the United Kingdom and Australia using the same scales (Bell et al., 2005; Mason et al., 2005; Waters et al., 2003).

For all scales, internal consistency was high, converging with previous research (see Measures). Though extremely high values can suggest redundancy of items, the highest value was still below the generally accepted cut-off of .95 (Streiner, 2003). Correlations between the LSHS-R, CAPS and O-LIFE scales were all moderate, which is to be expected in that all measure aspects of the same construct (schizotypy). The CAPS and O-LIFE being more strongly correlated with one another than with the LSHS-R supports the notion that while the CAPS and O-LIFE measure schizotypy, the LSHS-R measures a single aspect of schizotypy, hallucination proneness.

The results of the multiple regression analyses indicated that all three hypotheses were supported. The inclusion of Conscientiousness posed issues of multicollinearity, and consequently this trait was removed from the models. Age was found to be a nonsignificant predictor in all models. This may be explained by the small age range in this sample compared to previous studies that have found age to be associated with schizotypy or hallucination proneness. All participants in this sample were still young adults, whereas previous research has generally compared young adults to elderly participants (Larøi et al., 2019; Larøi et al., 2005).

In relation to the question of whether any SAPI traits predict schizotypy as a whole, in the present study Neuroticism was significantly positively associated with both schizotypy scales (CAPS and O-LIFE). This converges with previous research in both clinical and non-

clinical samples that has shown a consistent positive association between Neuroticism on the FFM and schizotypy measured by various scales (Barrantes-Vidal et al., 2009; Goodwin et al., 2003; Horan et al., 2008; Lysaker et al., 2003; Macare, Bates, Heath, Martin, & Ettinger, 2012; Van Os & Jones, 2001). In the SAPI and inventories of the FFM, Neuroticism is characterised by tendencies toward low self-confidence and low mood, as well as feelings of dissatisfaction, anxiety and irritability (Fetvadjiev et al., 2015; McCrae et al., 1998). Whether these tendencies are caused by schizotypal features or a result of them, or some other explanation, is not well known (Goodwin et al., 2003; Van Os & Jones, 2001). There may be similar genetic influences that result in both Neuroticism and schizotypy, as Macare et al. (2012) assert.

Additionally, the findings of the present study indicate that although Neuroticism does also significantly predict hallucination proneness, this significance disappears when the influence of schizotypy is controlled for. In previous research, where some studies found Neuroticism to predict hallucination proneness as measured by Launay-Slade Hallucinations Scales (LSHS-R and LSHS), the influence of schizotypy was not partialled out (Barrett & Etheridge, 1994; Jakes & Hemsley, 1987; Young et al., 1986). However, some studies have found that high Neuroticism is more strongly linked to increased negative symptoms of schizotypy (such as social anhedonia and cognitive disorganisation) than positive symptoms (such as hallucinations, delusions and unusual perceptions) (Kerns, 2006; Macare et al., 2012). Since hallucination proneness is a positive feature of schizotypy, the present findings could thus be considered consistent with previous results. More research is required, however, to determine the nature of this association more fully.

While the significance of Neuroticism in predicting hallucination proneness disappeared when schizotypy was controlled for, the same is not true for NSRD. NSRD was found to be more strongly positively associated with hallucination proneness than Neuroticism was, and was the only trait to retain significance when schizotypy was partialled out. This trait also predicted schizotypy more generally. NSRD is a trait that measures aspects of how an individual relates to others that would be considered undesirable within society (Fetvadjiev et al., 2015). The trait is made up of sub-factors such as arrogance, conflict-seeking and hostility-egoism. Items measure tendencies towards maliciousness, cruelty, selfishness and indignation (Fetvadjiev et al., 2015; Valchev et al., 2014). In exploring the possible reasons for this trait reaching significance, it may be useful to draw parallels to a trait on the FFM. As alluded to earlier, NSRD shares some similarity with one pole of

Agreeableness (Valchev et al., 2014). Though usually discussed in terms of high Agreeableness, low Agreeableness, or perhaps disagreeableness, indicates tendencies to be deceptive, egotistical, disloyal and noncompliant. There is considerable theoretical overlap between low Agreeableness and NSRD, and research has shown convergence statistically as well (Fetvadjiev et al., 2015).

With this parallel drawn, examining the literature yields some studies which have found an association between lower Agreeableness symptoms and increased psychotic symptoms (Camisa et al., 2005; Gleeson, Rawlings, Jackson, & McGorry, 2005; Lysaker et al., 2003). Some have proposed that this link could be explained by characteristics of low Agreeableness leading to social isolation, increased stress levels and fewer opportunities for disconfirming psychotic explanations for anomalous experiences (Shi et al., 2018). For instance, Gleeson et al. (2005) found that in psychotic patients, lower Agreeableness scores were associated with a higher risk of relapsing after one psychotic episode. The authors suggested that this could be due to those with lower Agreeableness having more interpersonal conflict with others and consequently less social support to rely on in times of stress. Interpersonal conflict could also confirm paranoid interpretations of interpersonal events. For example, where someone with low Agreeableness believes another will cause them harm, they may react with hostility and defensiveness, which is then confirmed by people around them, leading to an increase in paranoid thinking (Gleeson et al., 2005). Moreover, low Agreeableness and the interpersonal difficulties associated with it may mean more isolation during stressful events, which decreases protective functions of social interaction such as reality testing (Gleeson et al., 2005).

Given the overlap between low Agreeableness and NSRD, this could underlie the significance of NSRD in predicting schizotypy the current study. Despite some of these studies being conducted in clinical samples, similar findings have come from non-clinical samples when assessing schizotypy (Shi et al., 2018; Wiltink et al., 2015). However, as has been noted by Camisa et al. (2005), low Agreeableness is less consistently linked to schizotypy than it is to paranoid or schizoid symptoms. Moreover, these explanations do not account for the present finding that NSRD is a significant predictor of hallucination proneness specifically, controlling for schizotypy. Since the present study is the first of its kind to find characteristics of NSRD (or, indeed, some aspects of low Agreeableness) associated with hallucination proneness in particular, isolated from other schizotypy

symptoms, more research is needed to investigate the mechanisms underlying this association.

Limitations and Future Research

This study has a number of limitations relating to its design. The sample, gathered by convenience, is homogenous in many ways. The vast majority of participants were female, and all were undergraduate psychology students from one university, in a relatively small age range. Consequently, these findings are by no means generalisable to wider populations. However, the novel findings of this research lay the foundation for future studies to be conducted with larger, more representative samples. Another limitation is that although a personality inventory developed specifically for South Africa was used, the schizotypy and hallucination proneness scales used were not normed for South Africa, and have not been evaluated for their usefulness in South African samples. It is possible that these scales, developed in the global North, are not appropriate in some way for the present sample. That being said, as noted earlier, all three of the scales (O-LIFE, LSHS-R and CAPS) have been tested for suitability in other non-Western contexts and found to be appropriate (Aleman et al., 2001; Fonseca-Pedrero et al., 2015; Kao et al., 2013; Yaghoubi & Mohammadzadeh, 2012).

A further limitation is that this study, despite controlling for some variables, is correlational in design, and so causal relationships cannot be inferred . Moreover, the purpose of the study was to hone in on one specific variable, personality. Undoubtedly, no single factor leads to hallucination proneness, and a complex combination of forces likely at play in bringing about hallucinations in any given individual. This study merely lays the foundation for a particular line of inquiry into the nature of one of these forces. Finally, though some attempt has been made at interpreting these results along the lines of what has been found in studies looking at low Agreeableness, the fact remains that low Agreeableness and NSRD are not synonymous. Future studies would benefit from the use of both a measure of the FFM and the SAPI in order to make comparisons of this kind. Such research should also incorporate more controls in isolating the influence of personality, such as history of drug use, family history and stressful life events. Moreover, the incorporation of qualitative elements such as interviews in addition to self-reports may allow researchers to gain a richer understanding of the association between personality and hallucination proneness.

Significance and Contribution

Despite these limitations, the present findings constitute a unique contribution to scientific literature in various ways. Firstly, there are few studies in non-clinical samples that investigate the relationship between personality traits and proneness to hallucinations specifically. Where this research exists, it has not controlled for the influence of schizotypy, making the present study unique. As such, these findings allow a more specific understanding of how personality contributes to the psychosis continuum. Additionally, this is one of the first studies to look at hallucination proneness in non-clinical samples outside of the global North, and the first of its kind in South Africa. As such, these findings add to existing knowledge about the prevalence of schizotypal features and hallucinatory tendencies in a South African context. Moreover, this study's novel use of a culturally unbiased measure of personality to investigate the personality-hallucination link assures the usefulness of these findings in relation to the body of literature on hallucinations in South African samples.

Conclusion

Though a noticeable portion of the general population experiences hallucinations, little is known about the role of personality in predicting individual susceptibility to such perceptions. Moreover, there is a dearth of research in the global South on hallucinations and schizotypy in general, and this is especially true in South Africa. The present study, using a culturally fair measure of personality, indicated that in this sample, prevalence toward hallucination proneness and schizotypy were on par with what has been found in other parts of the world. The study also suggests the importance of Neuroticism, Negative Social Relational Disposition and Openness/Intellect in predicting schizotypy, from the Cardiff Anomalous Perceptions Scale and the Oxford-Liverpool Inventory of Feelings and Experiences. Further, it found that higher levels of Neuroticism, consistent with previous research, is linked with higher hallucination proneness, as measured by the revised Launay-Slade Hallucinations Scale. However, it also found that this association was no longer significant when the influence of schizotypy was controlled for, a finding that is unique to this study. Finally, the study found that the Negative Social Relational Disposition trait appears to be an important part of the relationship between the psychosis continuum and personality. Higher levels of this trait were associated with both schizotypy and proneness to hallucinations, and was the only trait to remain a significant predictor of the latter when schizotypy was controlled for. These findings lay the foundation for future studies to more

fully explore the relationship between schizotypy, hallucination proneness and individual characteristics such as personality, and in so doing contribute to the growing body of literature on the psychosis continuum.

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APPENDIX A

Reliability and Correlations Tables

Table 1

Reliability Statistics

Scale	Cronbach's Alpha	No. of Items
LSHS-R	.820	12
CAPS	.826	32
O-LIFE	.825	43
SAPI	.933	188

Table 2

Pearson Correlations Among Schizotypy and Hallucination Proneness Scales

	LSHS-R	CAPS	O-LIFE
LSHS-R	1	.439**	.482**
CAPS	.439**	1	.685**
O-LIFE	.482**	.685**	1

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

APPENDIX B

Tables and Figures for Parsimonious Model:

NSRD and Neuroticism Predict Hallucination Proneness

Table 3

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-3.678	4.564		-.806	.422					
	Negative Social Relational Disposition	5.160	1.548	.281	3.334	.001	.351	.278	.265	.889	1.125
	Neuroticism	3.566	1.424	.211	2.503	.014	.304	.212	.199	.889	1.125

a. Dependent Variable: LSHSR

Table 4

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1642.048	2	821.024	12.911	.000[b]
	Residual	8457.834	133	63.593		
	Total	10099.882	135			

a. Dependent Variable: LSHSR

b. Predictors: (Constant), Neuroticism, Negative Social Relational Disposition

Figure 1

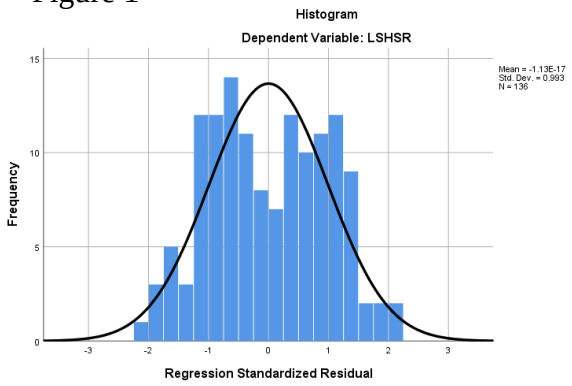


Figure 2

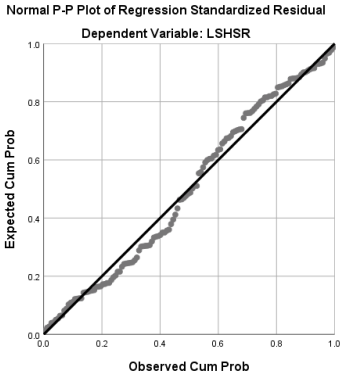


Figure 3

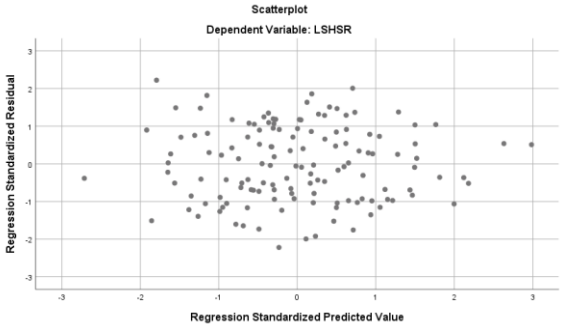


Figure 4

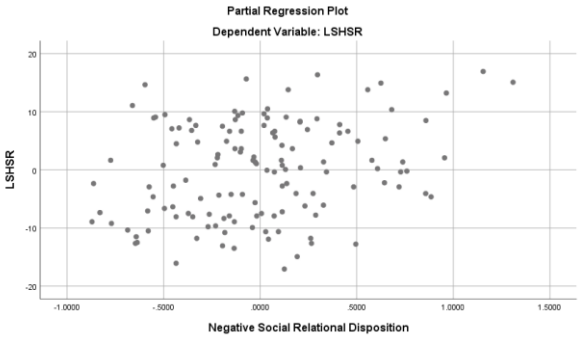
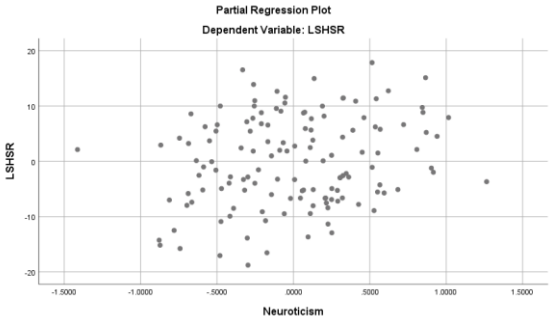


Figure 5



Tables and Figures for Parsimonious Model:

Openness/Intellect and Neuroticism Predict Schizotypy (CAPS Scores)

Table 5

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-13.924	5.260		-2.647	.009					
	Neuroticism	3.595	.851	.350	4.225	.000	.295	.344	.340	.943	1.060
	Openness/Intellect	2.924	1.045	.232	2.798	.006	.148	.236	.225	.943	1.060

a. Dependent Variable: CAPS

Table 6

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	511.728	2	255.864	10.628	.000[b]
	Residual	3202.030	133	24.075		
	Total	3713.757	135			

a. Dependent Variable: CAPS

b. Predictors: (Constant), Openness/Intellect, Neuroticism

Figure 6

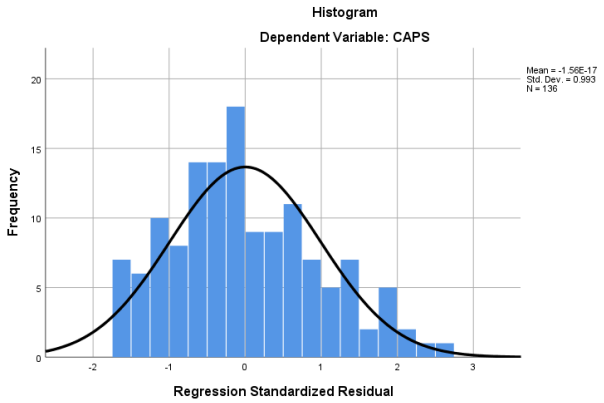


Figure 7

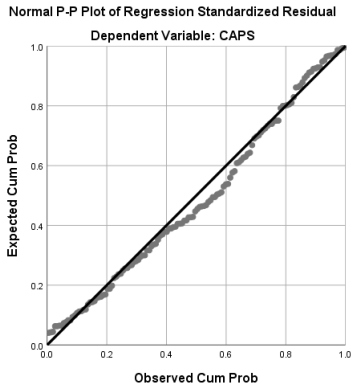


Figure 8

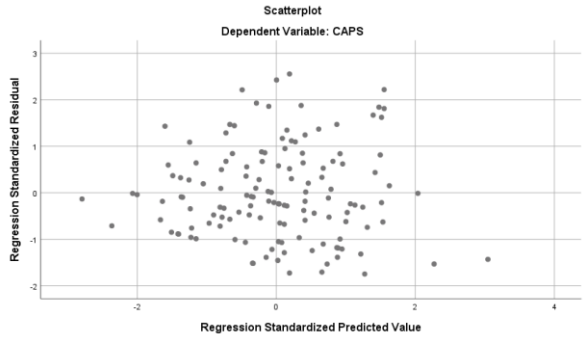


Figure 9

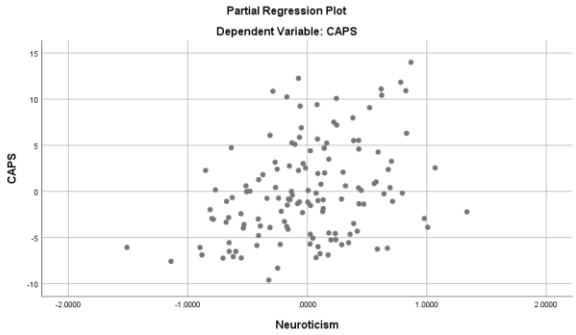
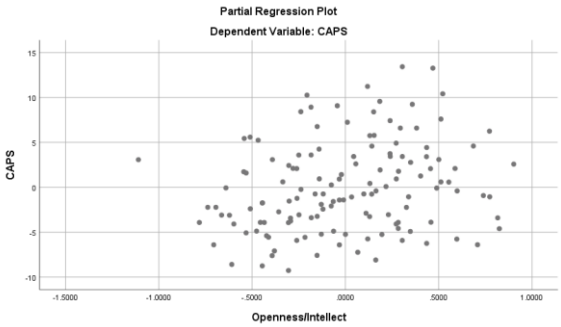


Figure 10



Tables and Figures for Parsimonious Model:

NSRD and Neuroticism Predict Schizotypy (O-LIFE Scores)

Table 7

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-6.071	3.336		-1.820	.071					
	Negative Social Relational Disposition	2.866	1.131	.204	2.534	.012	.330	.215	.192	.889	1.125
	Neuroticism	4.916	1.041	.379	4.722	.000	.447	.379	.358	.889	1.125

a. Dependent Variable: OLIFE

Table 8

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1402.723	2	701.361	20.646	.000[b]
	Residual	4518.219	133	33.972		
	Total	5920.941	135			

a. Dependent Variable: OLIFE

b. Predictors: (Constant), Neuroticism, Negative Social Relational Disposition

Figure 11

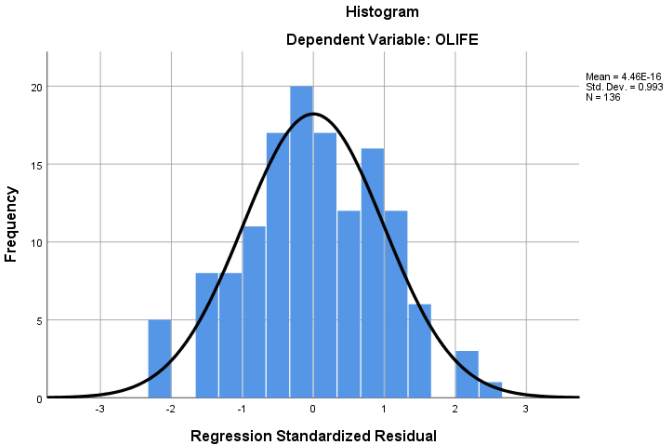


Figure 12

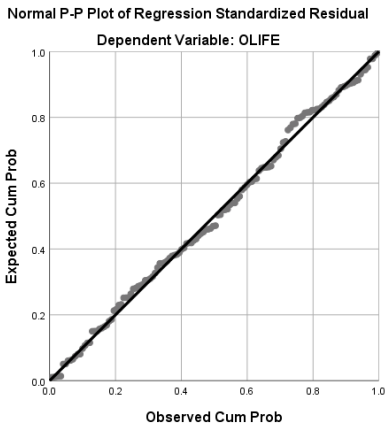


Figure 13

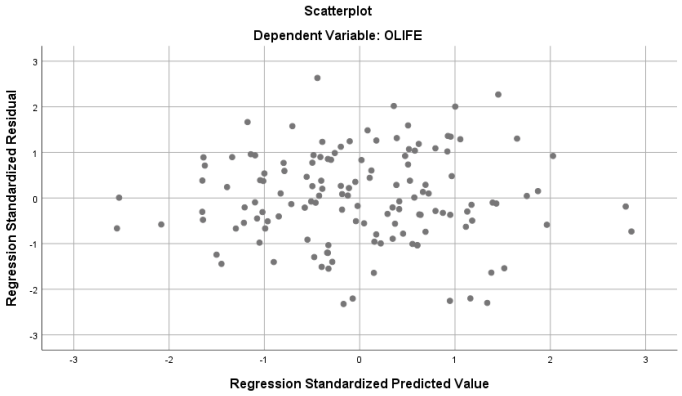


Figure 14

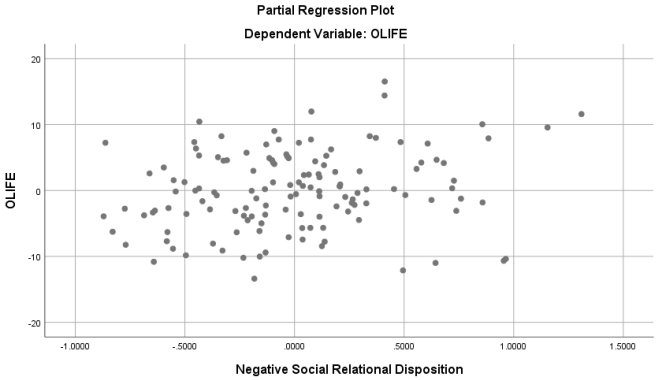
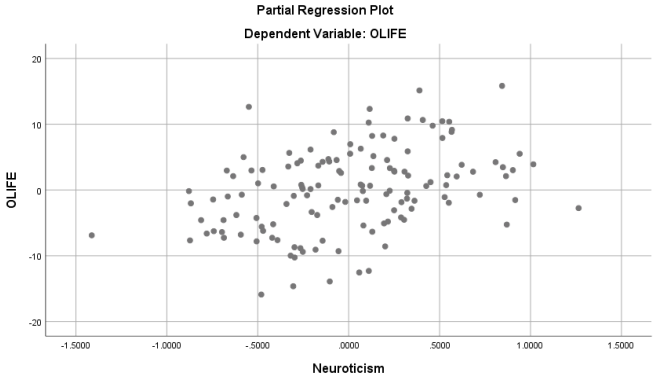


Figure 15



Tables and Figures for Parsimonious Model:

NSRD Predicts Hallucination Proneness, Controlling for Schizotypy

Table 9

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	9.056	1.610		5.626	.000					
	OLIFE	.446	.134	.342	3.324	.001	.482	.277	.249	.531	1.885
	CAPS	.339	.169	.205	1.999	.048	.439	.171	.150	.531	1.885
2	(Constant)	1.845	3.099		.595	.553					
	OLIFE	.365	.135	.280	2.715	.008	.482	.230	.199	.504	1.983
	CAPS	.322	.166	.195	1.940	.054	.439	.167	.142	.530	1.888
	Negative Social Relational Disposition	3.849	1.426	.209	2.700	.008	.351	.229	.197	.890	1.124

a. Dependent Variable: LSHSR

Table 10

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2575.336	2	1287.668	22.760	.000[b]
	Residual	7524.546	133	56.576		
	Total	10099.882	135			
2	Regression	2969.182	3	989.727	18.321	.000[c]
	Residual	7130.700	132	54.020		
	Total	10099.882	135			

a. Dependent Variable: LSHSR

b. Predictors: (Constant), CAPS, OLIFE

c. Predictors: (Constant), CAPS, OLIFE, Negative Social Relational Disposition

Figure 16

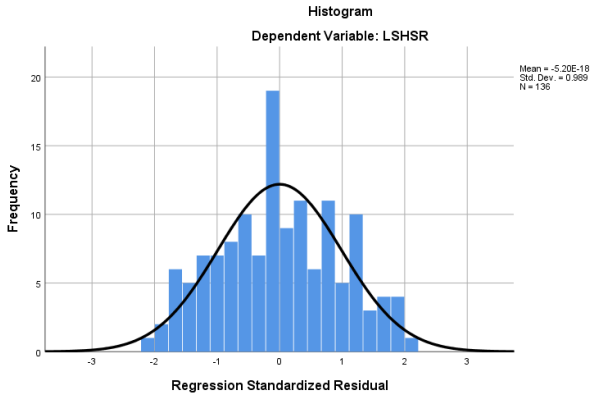
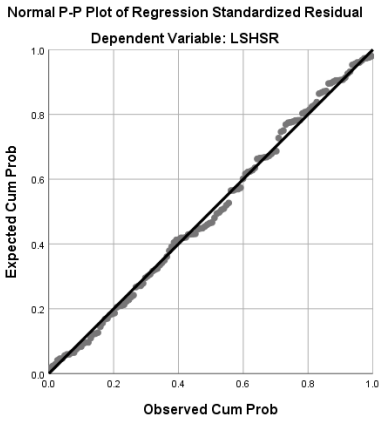


Figure 17



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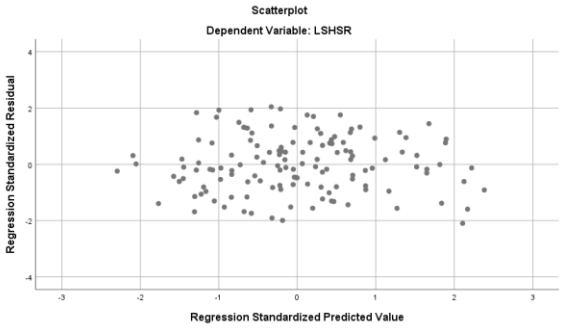
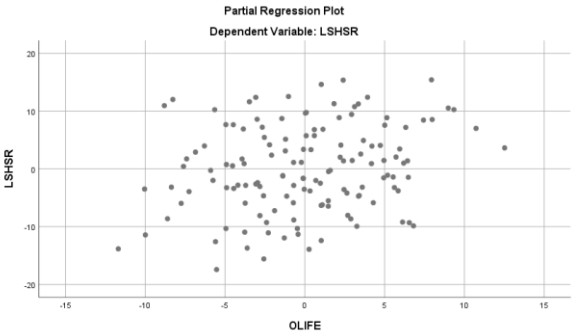


Figure 19



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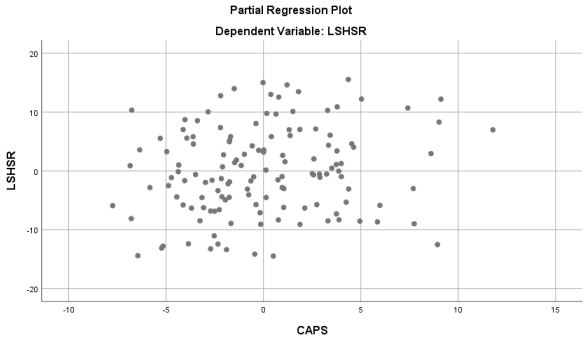
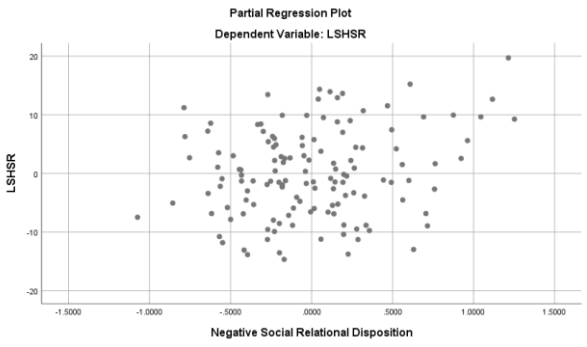


Figure 21



Appendix C

Informed Consent Form (Online)

You have been invited to participate in a study looking at personality and perception, which aims to find out what the relationship is between personality and various forms of perception, in the hopes of understanding more about how perception and personality function in healthy adults.

The study will involve filling out surveys online, in two parts. These will ask you various questions about how you view yourself, and how you view and interact with the world around you.

All the information you provide in the session will be kept confidential, meaning it will not be shared with anyone who isn't involved in conducting the experiment. The information will be protected, and it will be anonymised so that you cannot be personally identified in any reports. Participating in this study is completely voluntary, and if you change your mind later you can withdraw your participation, with no penalty.

If you complete BOTH parts of the survey, you will be awarded with 1 SRPP point. There will be no cost to you, and the study only requires that you have access to a computer with a reliable internet connection for the duration of filling out the surveys (approximately 20-40 minutes). There are no foreseeable risks posed to you as a participant. You can fill out the surveys at your own pace.

If you have any questions or concerns, or if you feel that your rights as a study participant have not been upheld, you can contact the Research Ethics Committee in the psychology department:

076 338 7365 or csskir001@myuct.ac.za – Kirsten Cosser (experimenter)

021 650 3417 or Rosalind.Adams@uct.ac.za – Rosalind Adams (Research Ethics Committee Administrator)

If you have read and understand the text above, and you would like you provide your consent and begin the surveys, please type your full name below, and click 'submit'

Appendix D

Invitation to Participate

Dear Student

You are invited to participate in a research study looking at personality traits and how they relate to perception. If you choose to participate, you will be asked to fill out some **surveys online**, which in total should take approximately 20-40 minutes. If you complete the surveys, you will be rewarded with **1 SRPP point**.

Anyone can take part in the study, as long as you are at least 18 and you don't have any diagnosis of a psychiatric condition. Participation is voluntary, and if you change your mind later, you can withdraw from the study without any penalty.

If you'd like to take part, you will be asked to sign a form giving your consent, and then you will be directed to a website to fill out the surveys.

If you have any questions about the study or participation, you can contact the experimenter (Kirsten) on 076 338 7365 or csskir001@uct.ac.za

If you would like to participate, go to [insert survey site here].

Appendix E

Debriefing Letter

Dear Participant

Thank you for participating in this study. The aim of the study was to look at how personality traits relate to people's perceptions, but specifically to people's tendencies to hallucinate. Previous research has found that many healthy people experience hallucinations and other similar perceptual experiences, and that some personality traits are linked with a tendency to hallucinate.

When the study was originally explained to you, we did not mention that we were looking at hallucinations specifically. This was because it may have affected your responses if you had known this beforehand.

You were invited to participate because you are a UCT student and met the inclusion criteria of being over the age of 18 and not having a diagnosed psychiatric condition. These criteria were chosen because they are necessary for the aims of the study – we wanted to look specifically at the tendencies to hallucinate among healthy adults.

In the study, you were asked to perform four tasks. One questionnaire was to measure personality traits on a survey developed specifically for South Africans (the South African Personality Inventory). Two other surveys were to measure your proneness to hallucinations and other perceptual experiences (the Cardiff Anomalous Perceptions Scale and the revised Launay-Slade Hallucinations Scale). The other survey was to assess schizotypal tendencies (the Oxford-Liverpool Inventory of Feelings and Experiences).

If any part of the study has caused you concern, or you feel that your rights as a study participant were not upheld, you can contact the Research Ethics Committee Administrator in the psychology department, Rosalind Adams, on 021 650 3417 or Rosalind.Adams@uct.ac.za

If any part of the study has caused you distress, you can also contact the UCT Student Wellness Service, which provides psychological counselling to students, on 021 650 1017

If you have any further questions about the study, you can contact the experimenter, Kirsten Cosser, on 076 338 7365 or csskir001@myuct.ac.za

Appendix F

Revised Launay-Slade Hallucination Scale (LSHS-R)

	Certainly Applies	Possibly Applies	Unsure	Possibly Does Not Apply	Certainly Does Not Apply
1. No matter how hard I try to concentrate, unrelated thoughts always creep into my mind					
2. In my daydreams I can hear the sound of a tune almost as clearly as if I were actually listening to it					
3. Sometimes my thoughts seem as real as actual events in my life					
4. Sometimes a passing thought will seem so real that it frightens me					
5. The sounds I hear in my daydreams are generally clear and distinct					
6. The people in my daydreams seem so true to life that sometimes I think they are					
7. I often hear a voice speaking my thoughts aloud					
8. In the past, I have had the experience of hearing a person's voice and then found that no-one was there					
9. On occasions, I have seen a person's face in front of me when no-one was in fact there					
10. I have heard the voice of the Devil					
11. In the past, I have heard the voice of God speaking to me					
12. I have been troubled by hearing voices in my head					

Appendix G

Cardiff Anomalous Perceptions Scale (CAPS)

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

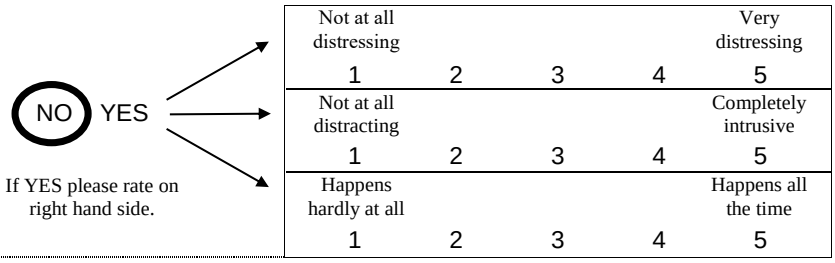
- If you circle **NO** please move straight on to the next question.
- If you circle **YES** please rate the experience *in all of the three boxes* on the right hand side of the item by circling a number between 1 and 5.

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

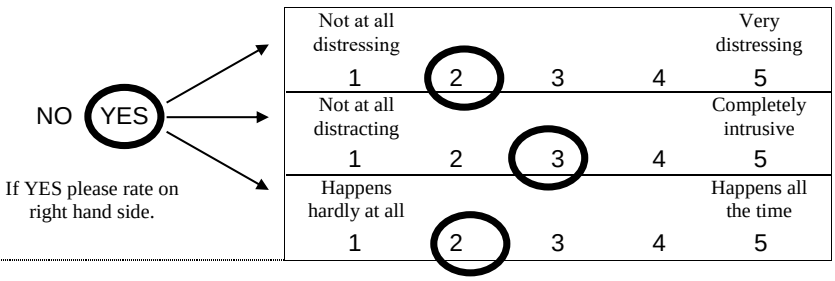
Example questions

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

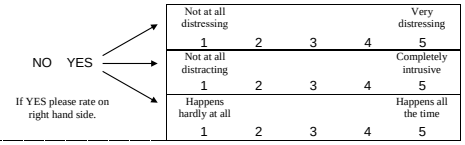
Do you ever notice that lights seem to flicker on and off for no reason ?



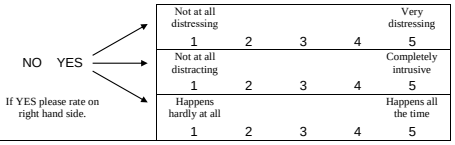
Do you ever feel that the sound on the TV or radio seems unusually quiet ?



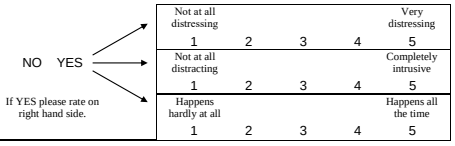
1) Do you ever notice that sounds are much louder than they normally would be ?



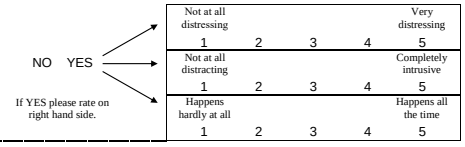
2) Do you ever sense the presence of another being, despite being unable to see any evidence ?



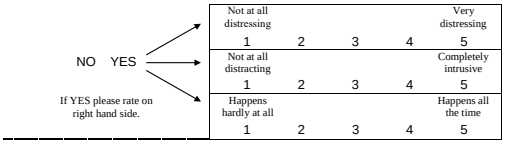
3) Do you ever hear your own thoughts repeated or echoed ?



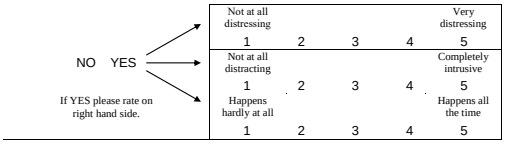
4) Do you ever see shapes, lights or colours even though there is nothing really there ?



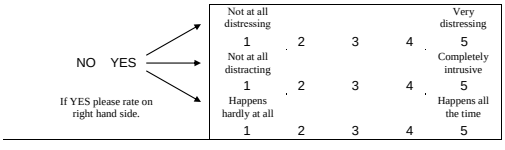
5) Do you ever experience unusual burning sensations or other strange feelings in or on your body ?



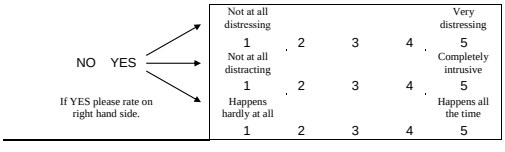
6) Do you ever hear noises or sounds when there is nothing about to explain them ?



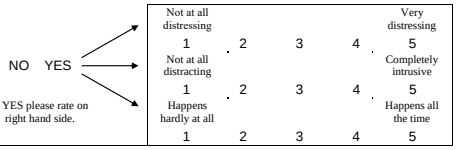
7) Do you ever hear your own thoughts spoken aloud in your head, so that someone near might be able to hear them ?



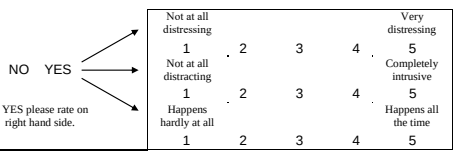
8) Do you ever detect smells which don't seem to come from your surroundings ?



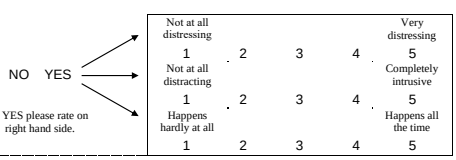
9) Do you ever have the sensation that your body, or a part of it, is changing or has changed shape ?



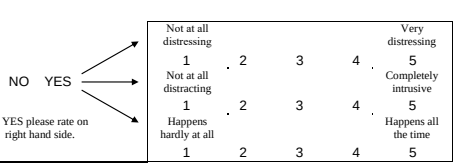
10) Do you ever have the sensation that your limbs might not be your own or might not be properly connected to your body?



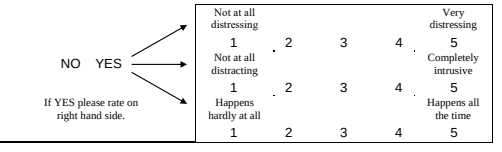
11) Do you ever hear voices commenting on what you are thinking or doing ?



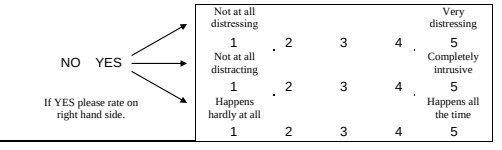
12) Do you ever feel that someone is touching you, but when you look nobody is there ?



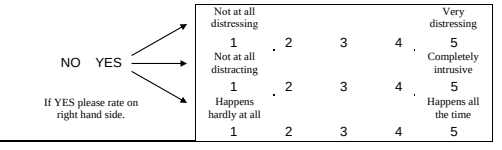
13) Do you ever hear voices saying words or sentences when there is no-one around that might account for it ?



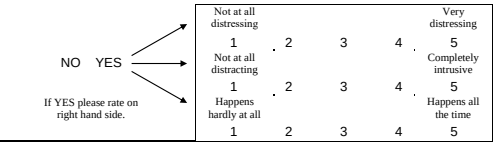
14) Do you ever experience unexplained tastes in your mouth ?



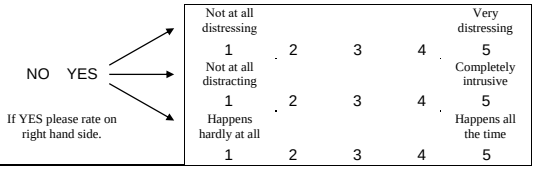
15) Do you ever find that sensations happen all at once and flood you with information ?



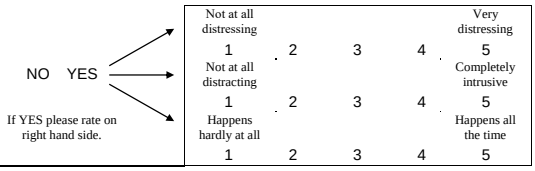
16) Do you ever find that sounds are distorted in strange or unusual ways ?



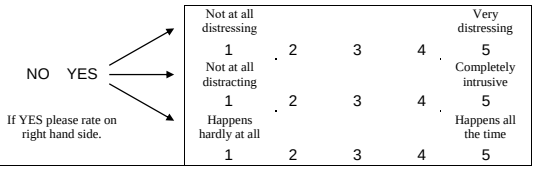
17) Do you ever have difficulty distinguishing one sensation from another ?



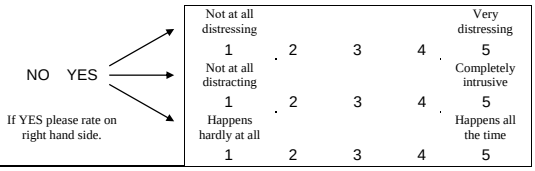
18) Do you ever smell everyday odours and think that they are unusually strong ?



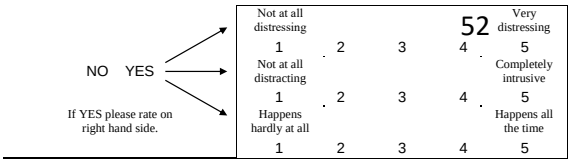
19) Do you ever find the appearance of things or people seems to change in a puzzling way, e.g. distorted shapes or sizes or colour ?



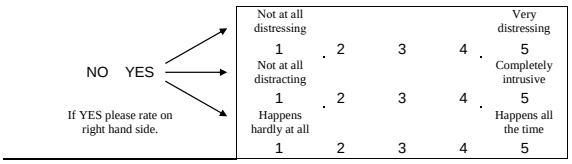
20) Do you ever find that your skin is more sensitive to touch, heat or cold than usual ?



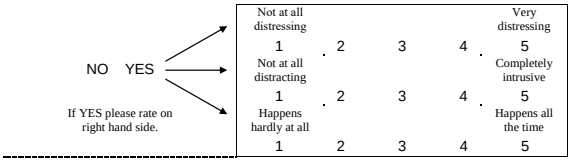
21) Do you ever think that food or drink tastes much stronger than it normally would ?



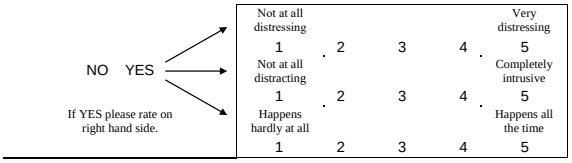
22) Do you ever look in the mirror and think that your face seems different from usual ?



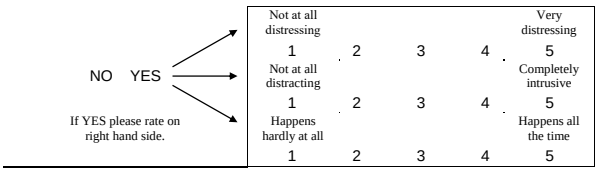
23) Do you ever have days where lights or colours seem brighter or more intense than usual ?



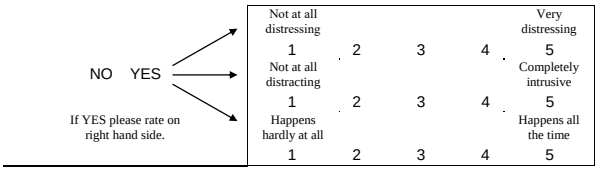
24) Do you ever have the feeling that of being uplifted, as if driving or rolling over a road while sitting quietly ?



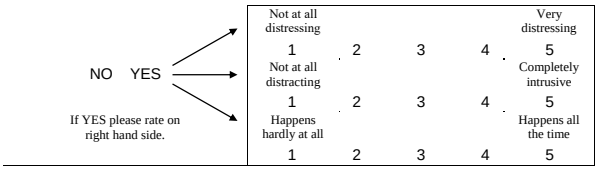
25) Do you ever find that common smells sometimes seem unusually different ?



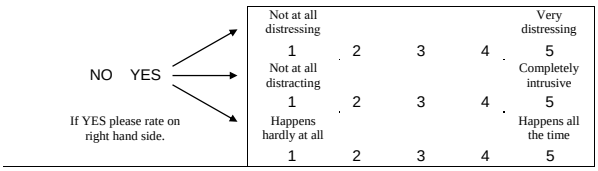
26) Do you ever think that everyday things look abnormal to you ?



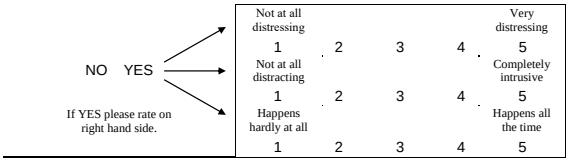
27) Do you ever find that your experience of time changes dramatically ?



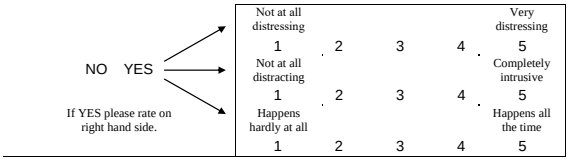
28) Have you ever heard two or more unexplained voices talking with each other ?



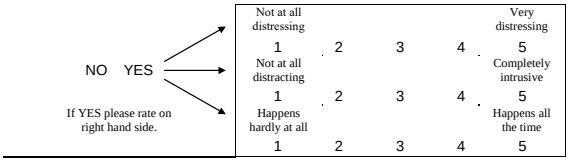
29) Do you ever notice smells or odours that people next to you seem unaware of ?



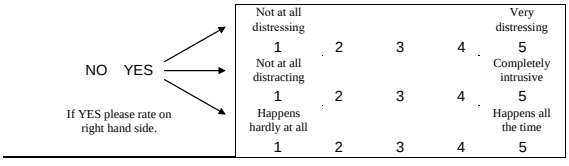
30) Do you ever notice that food or drink seems to have an unusual taste ?



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 ?



Appendix H

The Oxford-Liverpool Inventory of Feelings and Experiences (O-LIFE)

Unusual Experiences (12 items)

1. When in the dark do you often see shapes and forms even though there is nothing there?
2. Are your thoughts sometimes so strong that you can almost hear them?
3. Have you ever thought that you had special, almost magical powers?
4. Have you sometimes sensed an evil presence around you, even though you could not see it?
5. Do you think that you could learn to read other's minds if you wanted to?
6. When you look in the mirror does your face sometimes seem quite different from usual?
7. Do ideas and insights sometimes come to you so fast that you cannot express them all?
8. Can some people make you aware of them just by thinking about you?
9. Does a passing thought ever seem so real it frightens you?
10. Do you feel that your accidents are caused by mysterious forces?
11. Do you ever have a sense of vague danger or sudden dread for reasons that you do not understand?
12. Does your sense of smell sometimes become unusually strong?

Cognitive Disorganisation (11 items)

1. Are you easily confused if too much happens at the same time?
2. Do you frequently have difficulty in starting to do things?
3. Are you a person whose mood goes up and down easily?
4. Do you dread going into a room by yourself where other people have already gathered and are talking?
5. Do you find it difficult to keep interested in the same thing for a long time?
6. Do you often have difficulties in controlling your thoughts?
7. Are you easily distracted from work by daydreams?
8. Do you ever feel that your speech is difficult to understand because the words are all mixed up and don't make sense?
9. Are you easily distracted when you read or talk to someone?
10. Is it hard for you to make decisions?
11. When in a crowded room, do you often have difficulty in following a conversation?

Introvertive Anhedonia (10 items)

1. Are there very few things that you have ever enjoyed doing?
2. Are you much too independent to get involved with other people?
3. Do you love having your back massaged?
4. Do you find the bright lights of a city exciting to look at?
5. Do you feel very close to your friends?
6. Has dancing or the idea of it always seemed dull to you?
7. Do you like mixing with people?
8. Is trying new foods something you have always enjoyed?
9. Have you often felt uncomfortable when your friends touch you?
10. Do you prefer watching television to going out with people?

Impulsive Nonconformity (10 items)

1. Do you consider yourself to be pretty much an average sort of person?
2. Would you like other people to be afraid of you?
3. Do you often feel the impulse to spend money which you know you can't afford?
4. Are you usually in an average kind of mood, not too high and not too low?
5. Do you at times have an urge to do something harmful or shocking?
6. Do you stop to think things over before doing anything?
7. Do you often overindulge in alcohol or food?
8. Do you ever have the urge to break or smash things?
9. Have you ever felt the urge to injure yourself?
10. Do you often feel like doing the opposite of what other people suggest even though you know they are right?

Appendix I

Ethics Approval Letter

UNIVERSITY OF CAPE TOWN

Department of Psychology

University of Cape Town Rondebosch 7701 South Africa
Telephone (021) 650 3417
Fax No. (021) 650 4104

16 August 2019

Ms K.M. Cosser
Department of Psychology
University of Cape Town
Rondebosch 7701

Dear Kirsten

I am pleased to inform you that ethical clearance has been given by an Ethics Review Committee of the Faculty of Humanities for the amended protocol, submitted 14 August 2019, to your study, *Examining the relationship between hallucination proneness and personality in a nonclinical sample*. The reference number remains PSY2019-032.

I wish you all the best for your study.

Yours sincerely

Lauren Wild (PhD)
Associate Professor
Chair: Ethics Review Committee