The stability of schizotypy across time and instruments

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ABSTRACT

Little is known about the stability of schizotypy across relatively long time periods and instrumentation. This study assesses the degree of stability between schizotypy and its three factor structure as assessed by the Survey of Attitudes and Experiences (SAE) at age 17, and the Schizotypal Personality Questionnaire (SPQ) at age 23. A sample of 678 at ages 17 and 23 years from a birth cohort in Mauritius were split into two random samples, with initial analyses on the first sample independently replicated on the second sample. Cognitive–perceptual, interpersonal, and disorganized factors at age 17 correlated from 0.28 to 0.32 with their respective factors at age 23. Total scores correlated 0.41 ($d = 0.90$) across this six year time period and increased to 0.58 ($d = 1.42$) after correcting for measurement error. Receiver operating characteristic (ROC) analyses showed an area under the curve value of 0.74, confirmed prediction over time. Findings on predictive validity were closely replicated in the second independent sample. In contrast, social anhedonia at age 17 was unrelated to interpersonal deficits at age 23. Results provide replicable support for the moderate stability of cognitive–perceptual, interpersonal, and disorganized schizotypy across time, instrumentation, and a period of rapid developmental change.

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1. Introduction

A growing body of research is being built up on individual differences in schizotypal personality traits in ostensibly normal individuals in the general population (Raine, 2006). A frequently-used instrument is the Schizotypal Personality Questionnaire (SPQ – Raine, 1991). The SPQ was developed in the U.S. and assesses the nine signs and symptoms of schizotypal personality disorder as listed in DSM-III-R (American Psychiatric Association, 1987) in both adults (Raine, 1991) and children (Raine et al., 2011). This definition of schizotypal personality disorder has remained essentially unchanged from DSM-III-R to DSM 5 (American Psychiatric Association, 2013). A three-factor structure to the SPQ (cognitive–perceptual, interpersonal, and disorganized) has been confirmed in both adolescents (Fossati et al., 2003) adults (Wuthrich and Bates, 2006), mature adults (Badcock and Dragović, 2006), and even children (Raine et al., 2011). Other instruments have also reported a three-factor structure. Cella et al., (2013) using the O-LIFE scale (Mason, 1995) reported three classes of schizotypy traits which resemble the factor structure of the SPQ, in addition to a fourth "impulsive non-conformity" factor. Nevertheless, other researchers have argued that more cross-cultural research needs

to be conducted to establish the robustness of this finding (Schiffman, 2004).

A much shorter instrument to assess schizotypy is the Survey of Attitudes and Experiences (SAE – Venables et al., 1990b). This self-report instrument has a different conceptual basis from DSM, is considerably shorter (30 versus 74 items), and was developed on a relatively homogenous English population (versus an ethnically mixed Californian population). It also contained positively and negatively worded items (versus all positive SPQ items), and used more subtle, less clinically obvious questions in an attempt to avoid defensive responding compared to the DSM-oriented SPQ items (Venables, 1990a). Furthermore, in contrast to the SPQ, the SAE has been found to have a two factor structure (positive and negative schizotypy – Venables et al., 1990b), with negative schizotypy consisting of social and physical anhedonia. Social (but not physical) anhedonia has been associated with the interpersonal factor of the SPQ (which includes no close friends and constricted affect), but not the cognitive–perceptual and disorganized factors (Wang et al., 2014).

A key issue in the field concerns the stability of schizotypal personality over time. In dizygotic twins, stability over three years from ages 12 to 15 years ranges from 0.26 to 0.48 (Ericson et al., 2011). In young adults two-year test–retest reliability for the SPQ total score (74 items) was 0.53, although stability coefficients for the shorter individual scales were lower (e.g. 0.29 for unusual perceptual experiences – Stefanis et al., 2006). Both studies used the same instrument (the SPQ) at both time-points. To our

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knowledge there have been no longer-term assessments of the stability of schizotypal traits in community samples, particularly the time-period moving from adolescence into adulthood which is characterized by significant environmental and brain changes. Furthermore, little is known on long-term stability in non-Western countries, or stability across different instruments.

This study aims to address the issue of the stability of schizotypal personality across time and instrumentation in the context of a longitudinal study in a non-Western country. The primary goal was to assess degree of association between total SAE scores measured at age 17 and total SPQ scores assessed six years later in the same population at age 23, and to assess degree of prediction using receiver operator characteristic (ROC) curve analysis. The secondary goal, given the level of interest in the three factor structure of schizotypy, was to assess the degree of stability/change for three factors derived empirically from the SAE which could then be cross-correlated over time with the three corresponding factors of the SPQ. Thirdly, we examined whether social anhedonia at 17 is selectively associated with interpersonal schizotypy at age 23. It was hypothesized that some degree of temporal stability could be documented across a six-year time period from ages 17 to 23 years for schizotypal personality, with somewhat lower stability for each of the three schizotypy factors. It was also hypothesized that correcting for measurement error would result in increased stability coefficients, and that findings would replicate across independent samples.

2. Method

2.1. Participants

Participants were drawn from a birth cohort of 1795 children from the Mauritius Child Health Project. Full details of the study are given elsewhere (Raine et al., 2010). All children born between 1969 and 1970 in two main towns in Mauritius were recruited into the study when they were 3 years old. The ethnic distribution of the sample was Indian 68.5%, Creole (African Origin) 25.7%, and others (Chinese, English and French origin) 5.8%. Boys constituted 51.4% and girls 48.6% of the sample. After receiving a full description of the study, written informed consent was obtained from the participants at ages 17 and 23. Research activities were conducted in accordance with the principles outlined in the Belmont (1979) report. Institutional review board approval was obtained from the University of Southern California.

To compare longitudinal associations between anhedonia and schizotypy with concurrent associations, the SAE and SPQ were assessed in 302 male and female undergraduates (mean age 19.28 years) from the U.S. at the same point in time (see Raine, 1991 for further details). The SAE and SPQ correlate 0.65 ($p < 0001$) in this sample, indicating that these instruments are broadly measuring a similar construct of schizotypy.

2.2. Schedule of Attitudes and Experiences (SAE) at age 17

The SAE consisted of 30 binary items (scored 1=no, 2=yes) drawn from multiple sources. It is predicated on the concepts of social and physical anhedonia, perceptual aberration, magical thinking (Chapman et al., 1976, 1978, 1980) and also "schizophrenism" (Nielsen and Petersen, 1976). For use in Mauritius, questions were translated into "patois creole", checked by back-translation, vetted for wording by local psychiatrists, and administered by trained research assistants. Full details of the construction of this schizotypy measure together with its two-factor structure and construct and convergent validity are reported elsewhere (Venables, 1990a; Venables et al., 1990b). Internal reliability for the scale in the current sample is 0.55.

2.3. The Schizotypal Personality Questionnaire (SPQ) at age 23

The SPQ (Raine, 1991) assesses the nine DSM features of Schizotypal Personality Disorder, and was constructed using a face validity approach. A point-biserial correlation of 0.60 between clinically-diagnosed schizotypal personality disorder and SPQ scores supports criterion validity for this self-report instrument (Raine, 1991). Confirmatory factor analysis of this scale has shown that three main factors – cognitive–perceptual, interpersonal, and disorganized – underlie individual differences in schizotypal personality (Raine et al., 1994). This same structure has been

confirmed on the Mauritius sample used here, and generalizes across different gender and ethnic groups (Reynolds et al., 2000). For use in Mauritius, questions were translated into "patois creole", checked by back-translation, and vetted by a clinical psychologist for wording. Internal reliability (coefficient alpha) in this sample is high (0.92). See Raine (1991) for full details on reliability and validity.

2.4. Procedures and statistical analyses

The SAE was administered at age 17 while the SPQ was administered at age 23. Only those participants ($N=678$) with complete data at ages 17 and 23 were retained for analyses. Those with complete data on both questionnaires did not differ to those without complete data on gender ($\chi^2=3.12$, d.f.=1, $p=0.08$), ethnicity ($\chi^2=1.08$, d.f.=1, $p=0.30$), social adversity ($t=-0.32$, d.f.=1101, $p=0.74$), and intelligence ((IQ) – $t=0.79$, d.f.=956, $p=0.43$). Participants were randomly assigned using the random allocation method in SPSS into two independent samples, the first "test" sample consisting of 339 participants, and the second "replication" sample also consisting of 339 participants. All initial analyses were conducted on the test sample, and then repeated on the replication sample to assess robustness of findings.

Several procedures were used with the test sample to select appropriate items from the SAE to form a putative three-factor structure that would be further tested in the replication sample, and which would parallel the three factors of the SPQ. First, relationships between the 30 SAE age 17 items and the three SPQ schizotypy factors at age 23 were assessed using multivariate analysis of variance, with each SAE item used as the independent variable and the three SPQ factors forming the dependent variables. Only those age 17 SAE items from the test sample which were significantly associated with at least one SPQ schizotypy factor at age 23 in the predicted direction on a one-tailed test were retained for further analyses. Fifteen of the 30 items were retained. Excluded items constituted the physical and social anhedonia scales of the SAE. Secondly, classification of items into the three factors was made based on results of a prior factor analysis of the original version of the SAE (Venables and Bailes, 1994) and also a face validity approach which had been used in the construction of the SPQ. On this basis, 12 of the 15 retained items were allocated into the three cognitive–perceptual, interpersonal, and disorganized factors, with 4 items representing each factor (see Table 1). The three remaining items were dropped due to lack of face validity or prior factor fit. All reference to the SAE and its factors from hereon are made with reference to this shorter 12-item instrument.

The final 12 items were then subjected to Confirmatory Factor Analysis (CFA) using the AMOS program (Arbuckle, 2010). A putative two factor model (Kendler and Hewitt, 1992) had the items defining the cognitive–perceptual factor as "positive schizotypy" and those defining the interpersonal and disorganized factors combined as "negative schizotypy". The fit of one, two and three factor structures were examined using recommended criteria which are more stringent that those previously employed (Hu and Bentler, 1999). Specifically, for a good fit the comparative fit index (CFI) should exceed 0.95 and the value of the root mean square error of approximation (RMSEA) should be less than 0.06. Finally, the recommendation that the Akaike information criterion (AIC) should be used for comparison between models was implemented.

Groups of high scoring subjects (top 10%) and low scoring subjects (bottom 50%) were created for each of the three factors from the age 23 SPQ data. Receiver operator characteristic (ROC) curve analysis was conducted to assess the extent to which High and Low scorers at age 23 could be predicted from age 17 schizotypy factors. Mean values for areas under the ROC curve (AUC) should be significantly greater than 0.5, and the lower 95% bound should not be below 0.5 for significant prediction (Faraone et al., 2005).

To correct for measurement error in assessing the stability of schizotypy from ages 17 to 23, two procedures were adopted. First, a disattenuated correlation, free of measurement error, was calculated by dividing the raw correlation between schizotypy at both ages by the square root of the geometric mean of the reliabilities of the two measures (Murphy and Davidshofer, 2004). Secondly, structural equation modelling which corrects for measurement error (Byrne, 2009) was used to model the association between the two latent SAE and SPQ constructs of schizotypy from their respective three factors using the Amos 18 program (Arbuckle, 2010). Reliabilities (Chronbach's alpha) for the SAE were 0.55 (sample 1), 0.56 (sample 2), and 0.56 (total sample). Reliabilities for the SPQ were 0.93 (sample 1), 0.92 (sample 2), and 0.92 (total sample).

3. Results

3.1. Three factors of the age 17 SAE and their interrelationships

Table 1 shows items from the SAE retained to represent the cognitive–perceptual, interpersonal, and disorganized factors, together with standardised factor loadings from the CFA analyses for both test sample and replication samples. Table 2 shows the CFA model fitting results. The three factor solution gave the best fit to the SAE by virtue of having CFI values of 0.99 (test sample) and