



## ORIGINAL ARTICLE

# Tracking salience in young people: A psychometric field test of the Aberrant Salience Inventory (ASI)

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**Aim:** To explore the prevalence of Aberrant Salience (AS, an alleged experiential feature of psychosis-proneness) in Italian young people and corroborate the transcultural validity of the Aberrant Salience Inventory (ASI).

**Methods:** Young adults attending an Italian university ( $n = 649$ ) underwent serial evaluations with the ASI together with psychometric proxies for help seeking General Health Questionnaire and attenuated positive and negative symptoms Schizotypal Personality Questionnaire (SPQ). The distribution of ASI scores was explored with latent class analysis (LCA).

**Results:** Reliability of the Italian version of the ASI (I-ASI) was acceptable for all subscales (ordinal alpha  $>.70$ ). Concurrent validity was in the expected direction, with higher correlations with measures of attenuated positive symptoms vs negative symptoms of psychosis (Steigers'  $z$  test,  $P < .005$  in all comparisons). LCA identified three classes, with 217 (33.4%) participants in the "high aberrant salience" class. Gender and age were not related to class membership. Compared to the baseline class, SPQ scores in the schizotypy range were more likely in the "high aberrant salience" class (OR = 39.1; 95%confidence interval: 5.30–288.1).

**Conclusion:** AS is a relatively common experience among Italian young people. The study also confirmed the validity of field-testing ASI as a tool for the real-world characterization of people with vulnerability to psychosis, such as symptomatic help seekers with clinical high-risk states.

## KEYWORDS

aberrant salience, prodrome, psychosis, schizophrenia, screening

*The clinical hallmark of schizophrenia is psychosis. ... Delusions are a cognitive effort by the patient to make sense of these aberrantly salient experiences, whereas hallucinations reflect a direct experience of the aberrant salience of internal representations. (Kapur, 2003)*

## 1 | INTRODUCTION

Partly boosted by its extended semantic halo and its appealing metaphorical value (see, eg, the disambiguation options in Wikipedia, <https://en.wikipedia.org/wiki/Salience>), the notion of aberrant

salience (AS) was systematized at the beginning of this century by an influential overview article, significantly entitled "Psychosis as a state of aberrant salience," by Kapur (2003). In this article, AS was proposed as a conceptual bridge linking "the neurobiology (brain), the phenomenological experience (mind), and pharmacological aspects of psychosis-in-schizophrenia into a unitary framework."

Although the presumed neurobiological and pharmacological (ie mainly dopaminergic) aspects of the proposal have not yet been fully confirmed on an empirical level (Berridge, 2012; Howes & Kapur, 2009; Kambeitz, Abi-Dargham, Kapur, & Howes, 2014; Kapur, 2003), the experiential features of AS (ie the abnormal attribution of significance to otherwise neutral or inconspicuous stimuli resulting in a specific alteration

of the figure-background structure of the experiential field) have been recursively acknowledged as potential catalysers of the development of full-blown psychosis (Bovet & Parnas, 1993; Cicero, Kerns, & McCarthy, 2010; Kapur, 2003; Raballo & Maggini, 2005).

Indeed, since the early descriptions of classical European psychopathology (eg Jaspers, Schneider, Matussek, Gruhle, Conrad and Callieri), it is well known that the prodromal phase of primary delusions is often marked by an impending feeling of meaning that promanates from the experiential background. The experiential background, which was previously tacit and familiar, starts to be filled with self-referential and disturbingly salient details although not yet articulated—for example, as persecutory threats (Conrad, 1959; Jaspers, 1913/1997). With the psychotic transformation of experience, the perceptual background becomes more and more intrusive and saturated with meaningful details that accelerate and trigger the development of abnormal meaning attributions (see Hawkes [2012] for a first-person narrative of such process).

Therefore, AS is a promising and central construct for the profiling of vulnerability to psychosis (Compton, McGlashan, & McGorry, 2007), particularly in the context of a multiple-gate screening strategy targeting young help seekers. There is substantial evidence of a continuum in the risk of psychosis from psychosis proneness and subclinical symptoms towards full-blown episodes (Kaymaz et al., 2012; van Os, Linscott, Myin-Germeys, Delespaul, & Krabbendam, 2009), and mapping AS might enrich the characterization of such a continuum.

Indeed, there is evidence that individual differences or dispositional characteristics—referred to as schizotypal personality or schizotypy—express themselves in a continuum of psychosis proneness from subclinical or attenuated symptoms to more characterized psychotic experiences, such as hallucinations and delusions (Linscott & van Os, 2013). For example, in a recent international study including 31 261 respondents from 18 countries, mean lifetime prevalence of ever having psychotic-like experiences (PLEs) was 5.8%, with delusional experiences being less common than hallucinatory ones (1.3% vs 5.2%) and higher rates in middle- and high-income countries than in low-income countries (McGrath et al., 2015).

The intrusiveness or frequency of such PLEs, combined with psychosocial or biological protective or risk factors, may probabilistically influence the individual progression from subtle pre-clinical experiential anomalies to full-blown psychosis (Preti, Cella, Raballo, & Vellante, 2012; Raballo & Larøi, 2009). AS might be situated at the entry level of such a continuum, with abnormal attribution of significance to otherwise neutral or inconspicuous stimuli, thereby catalysing the onset (and crystallization) of cognitive-perceptual positive symptoms (Preti, Cella, & Raballo, 2011; Raballo et al., 2014).

AS is susceptible to both neurocognitive (ie task-based) and experiential (ie questionnaire-based) evaluation. For example, the Salience Attribution Test (SAT) aims to tap the attribution of salience to task-relevant and task-irrelevant stimuli (Roiser et al., 2008). More specifically, in the SAT, participants are requested to provide a quick response to stimuli in order to earn money. Money is available in only 50% of trials. So, cues may be task-relevant or -irrelevant. In the SAT, adaptive (task-relevant) and aberrant (task-irrelevant) salience attribution is measured with response times (implicit salience attribution) and visual analogue scale ratings (explicit salience attribution). By its nature, the SAT is costly and time consuming and can be applied to

small samples only, whereas large samples are necessary to investigate dispositional AS as a risk factor for PLEs; therefore, more parsimonious and time-saving tools (eg self-report questionnaire) are needed.

At present, only one self-report tool is available that measures trait AS: the Aberrant Salience Inventory (ASI) developed by Cicero et al. (2010). The ASI was initially conceptualized to measure lifetime occurrence of AS, and the reliability and validity of its scores have proved to be good in several US samples (Cicero, Docherty, Becker, Martin, & Kerns, 2015; Cicero et al., 2010). Self-report tools are sensitive to the cultural context and may be affected by differences in language, socioeconomic background and local historical heritage (Beaton, Bombardier, Guillemin, & Ferraz, 2000; Guillemin, Bombardier, & Beaton, 1993). There is evidence that schizotypal personality disorder—a potential dispositional precursor of psychosis—has higher prevalence among African Americans than Caucasians (Chavira et al., 2003). This is reflected in higher scores on self-report tools aimed at measuring schizotypy in American samples compared to European ones (Fonseca-Pedrero et al., 2014). Indeed, some factor-structure models of the Schizotypal Personality Questionnaire (SPQ; Raine, 1991)—the most widely used self-report measure of schizotypy—found that scalar invariance (ie the statistical validity prerequisite for interpreting latent means and correlations across groups) is poor across cultures (Cicero, 2016; Ortuño-Sierra et al., 2013). As the psychometric properties of the ASI have been tested in American samples only so far, the cross-cultural adaptation of the ASI in a different country is a necessary preliminary step to assure its generalizability as a measure of the AS construct. Therefore, we performed the cross-cultural adaptation of the ASI into Italian. Italy speaks a different language than the United States, and its cultural and socioeconomic backgrounds are different as well.

This study investigates the distribution of trait AS in a non-help-seeking population by using the Italian version of the ASI, which proved to possess good reliability and convergent/divergent validity in Italian samples (Raballo, Scanu, Petretto, & Preti, 2014).

The primary aim of the study was to ascertain whether AS is a common experience in the Italian sample, similar to the results of the original studies carried out in US samples (Cicero et al., 2010).

## 2 | METHODS

This study is part of the Cagliari-*Psychosis: Investigation on Risk Emergence (CAPIRE*, which means “to understand” in Italian), an investigation aimed at testing the reliability and validity of the screening tools developed to assess and diagnose the mental states at risk of psychosis. The institutional review board approved the study protocol in accordance with the guidelines of the 1995 Declaration of Helsinki, as revised in Tokyo in 2004 and further revised in Fortaleza, Brazil in 2013 (World Medical Association, 2013). The study was carried out between winter 2011 and spring 2013.

### 2.1 | Participants

The sample included the participants of the first two waves of the CAPIRE study. Young adults attending the Cagliari University

( $n = 31\,729$ ) were invited to take part in the study. These undergraduate samples were enrolled via a snowball procedure (Vogt, 1999), a method that avoids the bias of self-selection that occurs when recruiters only tap their personal social network (Snijders, 1992).

Participants were individually invited to fill in a booklet, including sociodemographic information and the questionnaires that were selected for the study. Participation was voluntary, and no fee or other compensation was given for taking part in the study. All participants provided informed consent. Participants were allowed as much time as they wanted to answer the questionnaires; the time dedicated to answering each questionnaire was not recorded.

Initially, we targeted a sample of 1000 participants. Overall, 962 people were effectively contacted: 120 declined after having a look at the booklet; 842 people agreed to fill in the questionnaire; and 689 participants actually returned the booklet. A total of 40 cases were rejected because their questionnaires were left blank in some essential part (data on age or gender or some items in two or more questionnaires); 649 participants were included in the study out of the 842 people who had accepted to participate (77%) and out of the 962 people who had been asked to take part in the study (67% overall participation rate).

## 2.2 | Measures

The following questionnaires were used in this study: the ASI (Cicero et al., 2010), the 12-item General Health Questionnaire (GHQ-12; Goldberg, 1972; Politi, Piccinelli, & Wilkinson, 1994) and the SPQ (Fossati, Raine, Carretta, Leonardi, & Maffei, 2003; Raine, 1991).

The ASI is a 29-item self-report with a yes–no (1–0) format (Cicero et al., 2010). Items are expected to group into 5 correlated subscales: feelings of increased significance (items: 1, 5, 10, 15, 16, 21 and 27), sense sharpening (items: 3, 9, 12, 18 and 22), impending understanding (items: 2, 6, 11, 17 and 29), heightened emotionality (items: 8, 14, 20, 24, 26 and 28) and heightened cognition (items: 4, 7, 13, 19, 23 and 25). Scores are assigned by summing the “yes” replies. Past studies proved that the ASI is highly correlated with measures of schizotypy and discriminates people at higher risk of psychosis from controls, and its scores are elevated in patients with a history of psychosis (Cicero et al., 2010). Standard procedures were used to translate the ASI (Beaton et al., 2000; Guillemain et al., 1993). AR and AP translated the original English version of the ASI as in Cicero et al. (2010); this Italian version was then back-translated into English, and translation accuracy was confirmed by an English-speaking translator and optimized with the help of Cicero and co-workers (Italian version available in the Appendix S1, Supporting Information).

Cronbach's alpha for the ASI was .89 and ranged from .71 to .87 for the 5 subscales in the original validation study (Cicero et al., 2010). This Italian version of the ASI showed excellent reliability (internal consistency = .91; test–retest stability = .94 [95%confidence interval, CI: .92–.95]), and good convergent, divergent and discriminant validity was found in young people (Raballo et al., 2014). In the first validation study, confirmatory factor analysis provided evidence for the original five-factor structure (Cicero et al., 2010), converging

into a general second-order factor of AS and thus allowing the use of a summary score as a measure of ASI (Raballo et al., 2014).

The GHQ-12 is a screening tool aimed at identifying people in need of clinical attention. The validated Italian version of the GHQ-12 was used in the study (Politi et al., 1994). According to past studies, scores equal or above 4 on the GHQ-12 were considered indicative of clinically relevant psychological distress (ie needing clinical attention) (Politi et al., 1994), whereas scores equal or above 6 were found to distinguish people diagnosed with psychosis from healthy people (Preti, Rocchi, Sisti et al., 2007). Cronbach's alpha of .81 was found for the Italian validation study of the GHQ-12 (Politi et al., 1994).

The SPQ is a 74-item self-report with a true/false format (Raine, 1991), which was developed to assess schizotypal personality disorder according to the *Diagnostic and Statistical Manual of Mental Disorders, Revised, Third Edition* (American Psychiatric Association, 1987). The validated Italian version of the SPQ was used in the study (Fossati et al., 2003). The 74 items of the SPQ are grouped into 9 subscales: 3 addressing positive schizotypy symptoms (ideas of reference, odd beliefs or magical thinking and unusual perceptual experiences), 3 addressing symptoms in the area of social anxiety and anhedonia mainly (excessive social anxiety, no close friends, constricted affect) and 3 pertaining to symptoms that are a reminder of paranoid ideation and eccentric behaviour (odd or eccentric behaviour, odd speech, suspiciousness). The reproducibility of the first-order, 9-subscale structure of the SPQ has been proven (Preti et al., 2015). Cronbach's alpha for the individual subscales ranged from .71 to .78 (mean .74) in the original validation study (Raine, 1991).

General sociodemographic information from self-report data was collected for the following variables: age, gender and socioeconomic status. As a measure of socioeconomic status, we used the highest level of parental education (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006), which was further classified into 3 categories: lower than high school diploma, high school diploma and college graduate or higher.

## 2.3 | Statistics

No data were missing in the final database as the 40 cases with missing information had been excluded. An independent research assistant rechecked the data after they had been entered; error rates were less than 1% and were all corrected on the basis of the questionnaires.

All data were coded and analysed using the Statistical Package for Social Sciences (SPSS) version 20. Additional analyses were carried out in R (R Core Team, 2013) using dedicated packages. All tests were two-tailed. Owing to multiple testing, the significance threshold was set at  $P < .005$ . According to Bayesian interpretations, this threshold has the greatest chance of suggesting evidence against the null (Johnson, 2013).

## 2.4 | Descriptive and exploratory analysis

Mean with standard deviation was reported for continuous variables. Counts and percentage were reported for categorical variables (see Table 1).

Scale scores' reliability was measured by Cronbach's alpha or its ordinal version, which has a better fit for dichotomic items or for

items showing skewness (Gadermann, Guhn, & Zumbo, 2012). Both Cronbach's and ordinal alpha were reported for comparison.

For group comparisons, reliability values of .70 are considered quite satisfactory, and when dealing with subscales derived from a single questionnaire, values around .60 are considered acceptable (Nunnally, 1978).

Continuous variables were tested with Welch's *t*-test, which performs better than the Student's *t*-test whenever sample sizes and variances between groups are unequal. Of note, the figure indicating freedom degrees in Welch's *t*-test is not rounded (see Section 3). An analysis of variance (ANOVA) was used to compare 3 or more groups. Categorical analyses were carried out with the chi-square, using Yates correction whenever necessary. Pearson's correlation coefficient was used to test for associations between variables. Correlation coefficients were compared according to the Steigers' *z* test (Steiger, 1980).

## 2.5 | LCA of the ASI

Distribution of the scores of the ASI is expected to vary continuously across the population. For this reason, the ASI does not have a cut-off. For the purpose of differentiating individuals by their degree of AS, we applied LCA to the ASI dichotomous scores. LCA is a data-driven method; it posits that a heterogeneous group can be reduced to several homogeneous subgroups by evaluating and then minimizing the associations among responses across multiple variables, and it tests for the existence of discrete groups with a similar symptom or item endorsement profile (Lazarsfeld & Henry, 1968; McCutcheon, 1987).

LCA was carried out with the *poLCA* package running in R (Linzer & Lewis, 2011). *poLCA* estimates the latent class model by maximizing the log-likelihood function (Linzer & Lewis, 2011). Parsimony criteria are applied to strike a balance between over- and under-fitting the model to the data by penalizing the log-likelihood by a function of the number of parameters being estimated (Linzer & Lewis, 2011). The preferred models are those that minimize the values of the Akaike information criterion (AIC; Akaike, 1987) and of the Bayesian information criterion (BIC; Schwarz, 1978) and of their derivation—the consistent AIC (CAIC; Bozdogan, 1987) and the sample size-adjusted BIC

(SSBIC; Sclove, 1987). The likelihood ratio chi-square test was also used to determine how well a particular model fits the data with reference to the ratio of the observed cell counts vs the predicted cell counts (Goodman, 1970). A standardized entropy measure was used to assess the accuracy of participants' classification (0–1), with higher values indicating better classification. Entropy values greater than .80 indicate a good separation of the identified groups (Ramaswamy, DeSarbo, Reibstein, & Robinson, 1993).

To minimize problems of non-convergence and local solutions, several starting points ( $n = 10$ ) and repeated iterations ( $n = 5000$ ) were specified to replicate the best log-likelihood values. Participants were assigned to the latent class they had the highest probability of belonging to (average probabilities per class  $\geq 85\%$ ).

There is no clear recommendation to derive the minimum sample size in LCA. There is evidence that the number of items, the expected number of classes and extension of class membership affect LCA results. A sample size of 500 seems suitable according to the best practices (Nylund, Asparouhov, & Muthén, 2007). The sample size in this study was sufficient to ensure adequate discrimination of the classes.

Multinomial logistic regression was used to assess the association between class membership and demographic variables (ie gender and age). Differences between classes were expressed with odds ratio (95%CI). Subjects identified as being at risk of psychosis on the GHQ-12 (cut-off  $\geq 6$ ) or of schizotypy on the SPQ, that is, those with scores in the top tenth percentile (Raine, 1991) were expected to fall more likely into the class with higher scores on the ASI after taking gender and age into account.

## 3 | RESULTS

The final sample included 305 males (47%) and 344 females (53%). Participants were 24 years old (SD = 3.4) on average (range: 19–38 years old). In the sample, 19 participants declared they were married (2.9%), 2 (0.3%) reported they were divorced, and 325 reported they were in a stable relationship (50%). A total of 287 participants'

**TABLE 1** General characteristics of the sample ( $n = 649$ )

Sociodemographic groups	Aberrant Salience Inventory			
	N (%)	Mean (SD)	Median (IQR)	Statistics
Gender				
Male	305 (47%)	12.3 (7.0)	12 (11)	$t = 1.31, df = 621.3, P = .188$
Female	344 (53%)	13.0 (6.5)	13 (10)	
Age				
19–22 (%)	216 (33%)	13.5 (6.6)	14 (8.25)	$t = 2.03, df = 441.6, P = .043$
23–38 (%)	433 (67%)	12.3 (6.8)	12 (11)	
Highest level of parental education				
Lower than high school diploma	276 (43%)	13.2 (6.6)	13 (9)	$F(2\ 646) = 1.28, P = .276$
High school diploma	287 (44%)	12.5 (6.8)	13 (10.5)	
College graduate or higher	86 (13%)	12.0 (7.2)	12 (11.75)	
Having or not having a partner				
Single or divorced	395 (47%)	12.9 (6.9)	13 (10)	$t = 0.64, df = 629.1, P = 0.519$
Married or in a stable relationship	344 (53%)	12.5 (6.6)	13 (10)	

IRQ = interquartile range; SD = standard deviation.

parents had a high school diploma (44%), whereas 86 participants' parents had a university degree or a higher qualification (13%).

Distribution of ASI in the sample departed from normality at the very low values (Figure 1). Mean in the sample was 12.7 (SD = 6.7); median = 13 (interquartile range = 10); skewness = -0.008 (standard error of skewness = 0.096); kurtosis = -0.826 (standard error of kurtosis = 0.192).

No differences were observed in the distribution of ASI total scores by gender ( $t = 1.31$ ,  $df = 621.3$ ,  $P = .188$ ), age (Pearson's  $r = -.094$ ,  $P = .016$ ), being or not being in a stable sentimental relationship ( $t = .64$ ,  $df = 629.1$ ,  $P = .519$ ) or parental education ( $F[2, 646] = 1.28$ ,  $P = .276$ ), our proxy for socioeconomic status (see details in Table 1).

### 3.1 | Reliability of the scores of the questionnaires used in the study

Internal coherence was good for all scales' scores and acceptable for all subscales' scores, with the possible exception of the "Heightened cognition" subscale of the ASI (see Table 2 for details). As expected, ordinal alpha values were better than Cronbach's alpha values.

The ASI was related to SPQ subscales measuring symptoms of positive schizotypy and suspiciousness (Ideas of reference, Odd beliefs or magical thinking, Unusual perceptual experiences and Suspiciousness) more than to SPQ subscales measuring symptoms of social anxiety and anhedonia (Excessive social anxiety, No close friends, Constricted affect) (Steigers'  $z$  test  $P < .005$  in all comparisons).

### 3.2 | Latent class analysis of the Italian ASI scores

The 3-class solution represented the best compromise on the basis of the statistics used to assess comparative model fit. Indeed, the elbow plot indicated that the greater inflection in the information criteria was between the 2-class model and the 3-class model (Figure 2).

There was a further smoothed decrease in the SSBIC and in the likelihood ratio, but this occurred at the expense of a reduction of entropy and hence of the accuracy in classification.

In the 3-class solution, entropy was 0.87, which indicated a good classification of participants in the model.

This solution yielded a baseline class with no or very low endorsement of most ASI items, including 149 (22.9%) participants; an intermediate class, including 283 (43.6%) participants; and a third class of "high aberrant salience," with high endorsement on most ASI items, including 217 (33.4%) participants (Figure 3).

Mean scores of ASI were 3.6 (SD = 2.2) in the baseline, 11.8 (2.7) in the intermediate and 20.2 (2.9) in the "high aberrant salience" class ( $F[2, 646] = 1707.9$ ,  $P < .0001$ ;  $\eta^2 = .18$ ;  $P < .005$  in all post-hoc comparisons).

In the distribution of scores by class, the "increased significance" (Hedges'  $g = 4.92$ ; 95%CI: 4.50–5.33), and the "impending understanding" (3.71; 3.37–4.05) subscales in the "high aberrant salience" class showed a greater departure from the baseline than the "sharpening of senses" (2.26; 2.00–2.53), the "heightened cognition" (3.04; 2.74–3.35) and the "heightened emotionality" (3.08; 2.78–3.39) subscales (see Figure 3).

In the sample, 158 participants (24.3%) scored 6 or higher on the GHQ-12; 70 participants (10.8%) scored in the top tenth percentile on the SPQ.

Gender and age were not related to class membership. Compared to the baseline class, GHQ-12 scores  $\geq 6$  and SPQ scores in the schizotypy range were more likely in the "high aberrant salience" class, whereas the links with the "intermediate" class were marginal or absent (Table 3). A point worth noting is the large confidence interval for the SPQ, indicating more variability in the association between the class and the risk of schizotypy.

## 4 | DISCUSSION

The main finding of this study is that AS is a common experience among young people. The mean in the sample was 12.7 (SD = 6.7), slightly lower than in American samples, as reported in Cicero et al. 2010: 13.7 (SD = 6.6) in study 2, including 348 participants

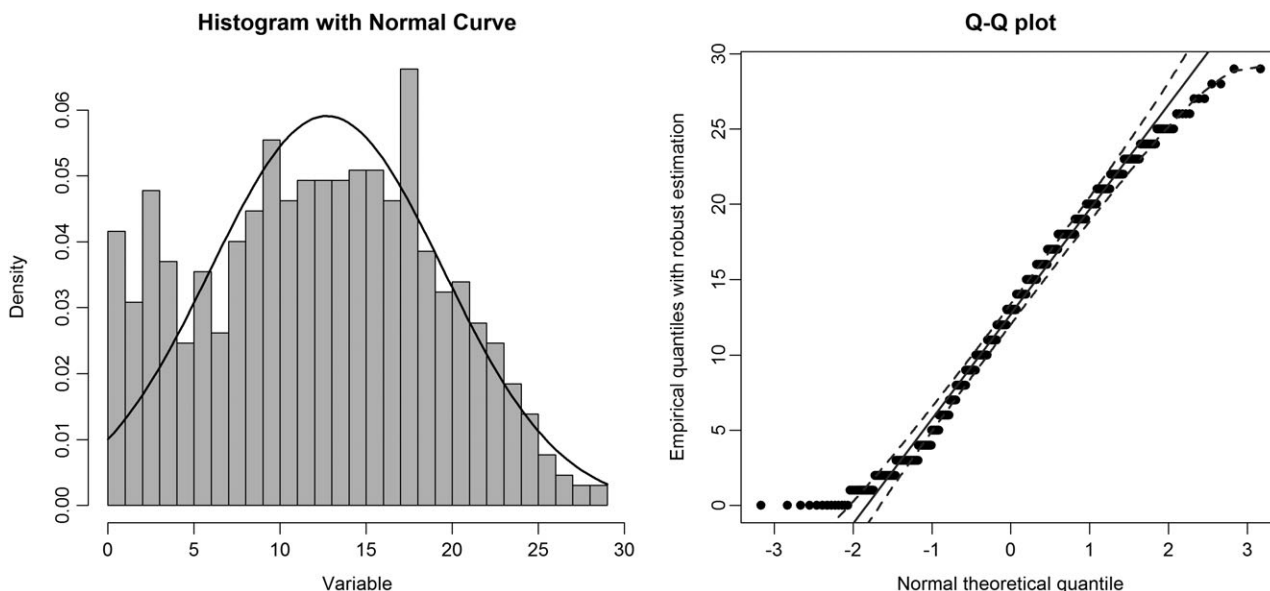


FIGURE 1 Distribution of Aberrant Salience Inventory (ASI) test scores, 29 items ( $n = 649$ ).

**TABLE 2** Mean scores on the measures of psychopathology used in the study and inter-correlation among them and the ASI in the sample ( $n = 649$ )

	No. items	Cronbach's $\alpha$	Ordinal $\alpha$	Mean (SD)	Median (IRQ)	ASI Pearson's $r$ (95%CI)
ASI	29	.90	.95	12.7 (6.7)	13 (10)	
Increased significance	7	.77	.88	3.8 (2.1)	4 (3)	0.899 (0.686–0.916)
Sharpening of senses	5	.64	.82	1.1 (1.3)	1 (2)	0.734 (0.686–0.776)
Impending understanding	5	.65	.80	2.5 (1.5)	3 (3)	0.862 (0.834–0.885)
Heightened emotionality	6	.63	.78	3.2 (1.7)	3 (3)	0.826 (0.792–0.854)
Heightened cognition	6	.58	.75	2.1 (1.5)	2 (2)	0.845 (0.814–0.870)
GHQ-12	12	.85	.94	3.3 (3.1)	2 (4)	0.322 (0.251–0.389)
SPQ	74	.92	.96	16.4 (11.2)	14 (15)	0.586 (0.533–0.635)
Ideas of reference	9	.90	.87	2.2 (2.2)	2 (4)	0.548 (0.492–0.600)
Odd beliefs or magical thinking	7	.74	.88	1.1 (1.5)	0 (2)	0.462 (0.399–0.520)
Unusual perceptual experiences	9	.69	.86	1.5 (1.7)	1 (2)	0.514 (0.455–0.569)
Suspiciousness	8	.77	.88	2.4 (2.0)	2 (3)	0.447 (0.383–0.507)
Excessive social anxiety	8	.79	.86	2.6 (2.2)	2 (3)	<b>0.264 (0.191–0.334)</b>
No close friends	9	.63	.82	1.2 (1.5)	1 (2)	<b>0.219 (0.145–0.291)</b>
Constricted affect	8	.59	.79	1.6 (1.5)	1 (2)	<b>0.138 (0.062–0.212)</b>
Odd or eccentric behaviors	7	.81	.93	1.1 (1.7)	0 (2)	0.405 (0.339–0.468)
Odd speech	9	.80	.90	2.5 (2.4)	2 (3)	0.437 (0.375–0.498)

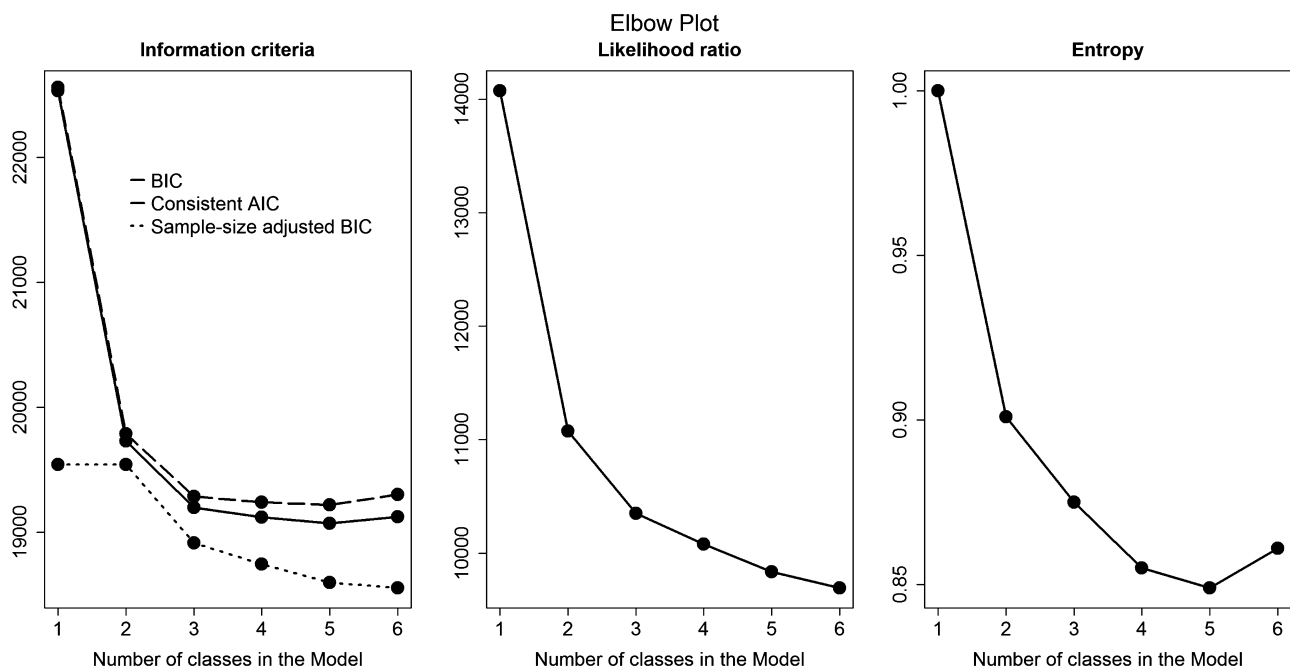
ASI = Aberrant Salience Inventory; IRQ = interquartile range; SD = standard deviation.

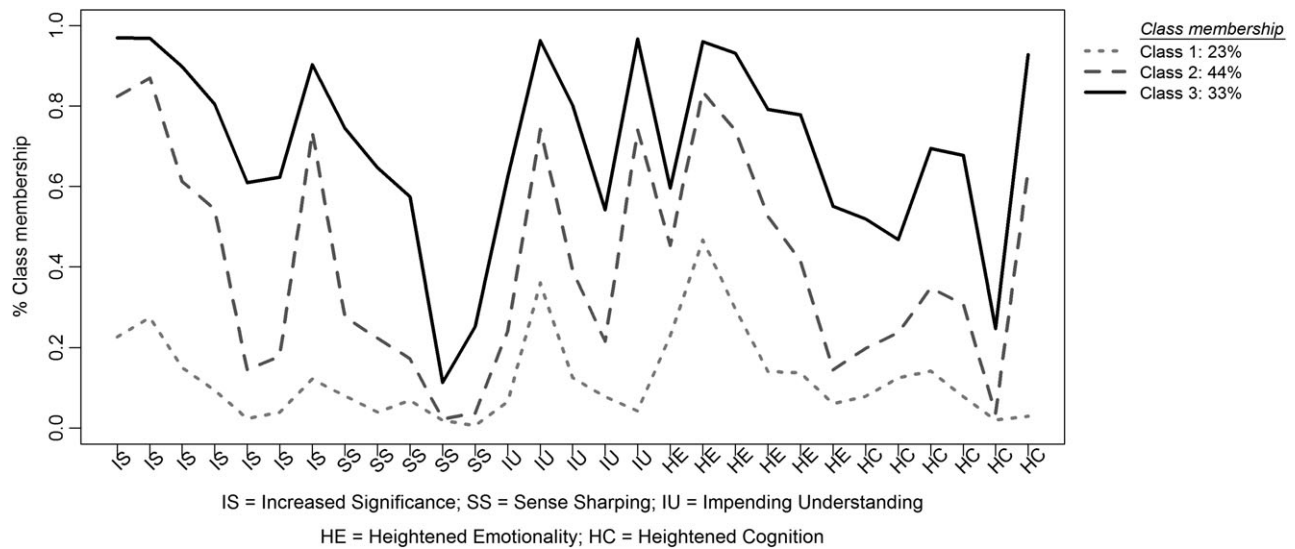
Estimates that differed from the others were reported in bold. Pearson's  $r$   $P < .005$  in all comparisons.

(a difference with a small effect size: Hedges'  $g = 0.15$ ; 95%CI: 0.02–0.28). This was expected on the basis of cross-cultural differences on measures of schizotypy, which are strongly related yet do not overlap with ASI scores. However, the median in the sample was 13, indicating that participants endorsed about a half of the items of the ASI. Around a third of the sample reported very high scores (mean = 20), particularly on the "increased significance" and the "impending understanding" subscales.

The study also provided robust evidence for the cross-cultural validity of the ASI. Reliability of the scores in the Italian

version of the ASI was excellent for the whole scale, with gold-standard values of internal coherence and stability at retest (Raballo et al., 2014) that were acceptable for all subscales' scores, as shown in this study. Actually, this is the first study to show that ASI scores are consistent over time in any language. Concurrent validity was in the expected direction, with higher correlations with symptoms of positive schizotypy and suspiciousness than with symptoms of social anxiety and anhedonia. In community samples, the positive schizotypy dimension was consistently predictive of psychosis (Debbané et al., 2015).

**FIGURE 2** Fit indices for the latent class analysis of the Aberrant Salience Inventory (ASI).



**FIGURE 3** Profile plot for the latent class analysis of the Aberrant Salience Inventory (ASI; 29 items). The Y-axis represents the class-specific mean scores as proportions of the maximum score for the indicator. The X-axis contains the 29-item profile of the ASI.

According to some models (Flückiger et al., 2016) attenuated psychotic symptoms might be considered an exacerbation of the underlying schizotypy, particularly of features of the cognitive-perceptual dimensions (Debbané et al., 2015). The privileged link of measures of AS with positive schizotypy reinforces its value as potential catalysers of the development of PLEs, which may evolve into full-blown psychosis.

#### 4.1 | Clinical and conceptual implications

In this study (as in the original study by Cicero et al. [2010]) the ASI proved to be able to discriminate people scoring within the schizotypy range from controls, thereby confirming that AS is related to

one important precursor of the risk of psychosis (Cicero et al., 2010, 2015; Kapur, 2003; Raballo & Maggini, 2005; Roiser et al., 2008).

LCA revealed a profile of responding on the ASI characterized by greater differences by classes in the “increased significance” and the “impending understanding” subscales, followed by “heightened emotionality.” Notably, the first two dimensions are central in Kapur’s model of AS as a risk factor for psychosis (Kapur, 2003). According to Kapur, impending feelings of significance confer increasing salience to otherwise neutral or innocuous stimuli. Such an experience may then facilitate that abnormal sensation of meaning (ie a subjective feeling of conceptual hyperclarity and quasi-revelatory breakthrough in understanding) that accompanies the development of delusions. Crucially, these subscores (“increased significance,” “impending

**TABLE 3** Association between latent classes of ASI and predictors, taking into account gender and age

All data: <i>n</i> (%); reference term above	LC1 Baseline <i>n</i> = 149 (23.0%)	LC2 Intermediate <i>n</i> = 283 (43.6%)	LC3 High <i>n</i> = 217 (33.4%)
<b>Gender</b>			
Females	72 (48.3%)	154 (54.4%)	118 (54.4%)
Males	77 (51.7%)	129 (45.6%)	99 (45.6%)
OR (95%CI)	1	0.84 (0.56–1.26); <i>P</i> = .414	0.91 (0.58–1.44); <i>P</i> = .714
<b>Age</b>			
Mean (SD)	24.7 (24.7)	24.0 (3.3)	24.3 (3.6)
OR (95%CI)	1	0.97 (0.92–1.03); <i>P</i> = .400	0.95 (0.89–1.02); <i>P</i> = .199
<b>GHQ-12</b>			
Low (scores ≤5)	132 (88.6%)	223 (78.8%)	136 (62.7%)
High (scores ≥6)	17 (11.4%)	60 (21.2%)	81 (37.3%)
OR (95%CI)	1	1.91(1.06–3.44); <i>P</i> = .029	3.54 (1.94–6.45); <i>P</i> < .001
<b>SPQ</b>			
Nominal	148 (99.3%)	269 (95.1%)	162 (74.7%)
Risk of schizotypy	1 (0.7%)	14 (4.9%)	55 (25.3%)
OR (95%CI)	1	6.83 (0.88–52.7); <i>P</i> = .065	39.1 (5.30–288.1); <i>P</i> < .001

ASI = Aberrant Salience Inventory; CI = confidence interval; GHQ = General Health Questionnaire; SD = standard deviation; SPQ = Schizotypal Personality Questionnaire.

Latent Class 1, corresponding to the Baseline class, was used as a reference term.

understanding" and "heightened emotionality") mimic the canonical sequence identified by classical European psychopathology as leading from a pre-delusional mood to fully articulated delusional experiences (Bovet & Parnas, 1993).

## 4.2 | Limitations

Given the project's structure, primary aims and logistics (see Methods), some immanent limitations are to be considered. First, the assessment was conducted through self-report tools, and we could not cross-test AS with convergent laboratory tasks (eg, the SAT; Roiser et al., 2008). On the other hand, self-report measures allow the enrollment of large samples; given their guarantee of anonymity, participants might be more forthcoming when filling in the questionnaires. Second, we had no chance to conduct a follow-up in order to further evaluate people identified as being at potential (psychometric) risk with a detailed interview for clinical risk stratification (eg with dedicated tools such as SIPS/SOPS, CAARMS or SPI-A) (Schultze-Lutter et al., 2015). Moreover, since participants were undergraduates still attending university courses, it is unlikely that they had a full-blown episode of psychosis at the time of the study. Although they might be not representative of the general population, college students are generally in an age range when the risk of developing psychosis is at its highest, and they may be more forthcoming in providing answers on socially undesirable topics, such as symptoms of psychopathology (Lincoln & Keller, 2008). Needless to say, to further corroborate the relevance of AS for the progression of psychosis and the characterization of early at-risk states, a field test on young help seekers in community mental health services is clearly warranted. This study clearly constitutes the necessary methodological premise for a field test. Indeed, it confirms the transcultural validity of the AS construct as well as the psychometric properties of the Italian adaptation of the ASI and contextually provides an age-matched control population to test possible differences in ASI profiles with young help seekers and clinical high-risk subjects.

## 5 | CONCLUSIONS

Similar to the seminal study by Cicero et al., 2010 in the United States, (Cicero et al., 2010) our study confirms that AS is a relatively common experience also among Italian young people. Despite the cultural-historical and linguistic differences between the two populations (ie Anglophone Americans vs Neo-Latin Italians), the results' similarity suggests that AS is a cross-culturally valid construct. Although the ASI was developed to measure the lifetime occurrence of AS in non-clinical populations, its association with alleged indexes of psychosis proneness (eg SPQ) indicates that the ASI may be a useful tool to characterize people with increased subclinical liability to psychosis as well as symptomatic helpseekers with clinical high-risk states (Kaymaz et al., 2012; McGorry, Hickie, Yung, Pantelis, & Jack-son, 2006; Raballo & Larøi, 2009; Schultze-Lutter et al., 2015).

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