Received: 7 September 2020 | Accepted: 16 January 2022

DOI: 10.1111/papt.12384

the british psychological society
promoting excellence in psychology

RESEARCH ARTICLE

From core schemas about the self and others to voice phenomenology: Anxiety and depression affect voice hearers differently

Isabella Kusztrits[1,2] | **Wei Lin Toh**[3] | **Neil Thomas**[3] | **Frank Larøi**[1,2,4] | **Denny Meyers**[3] | **Marco Hirnstein**[1,2] | **Susan Rossell**[3,5]

[1]Department of Biological and Medical Psychology, University of Bergen, Bergen, Norway

[2]NORMENT Norwegian Centre for Mental Disorders Research, University of Bergen & Haukeland University Hospital, Bergen, Norway

[3]Centre for Mental Health, Swinburne University of Technology, Melbourne, Victoria, Australia

[4]Psychology and Neuroscience of Cognition Research Unit, University of Liège, Liège, Belgium

[5]Psychiatry, St Vincent's Hospital, Melbourne, Victoria, Australia

Correspondence
Isabella Kusztrits, Jonas Lies vei 91, 5009 Bergen, Norway.
Email: isabella_kusztrits@hotmail.com

Funding information
Bergen Research Foundation, Grant/Award Number: BFS2016REK03; Australian National Health and Medical Research Council, Grant/Award Number: GNT1154651 and GNT1060664; Barbara Dicker Brain Sciences Foundation

Abstract

Objectives: Auditory verbal hallucinations (AVHs) occur as a symptom in various mental disorders, and show different phenomenological aspects, depending on their underlying psychopathology. Anxiety and depression, which are known to be involved in the development of AVHs, are suggested to amplify a vicious cycle in which negative interpretations of daily experiences feed into the formation of negative core schemas about the self and others. However, the way in which these variables interrelate is still unknown. Therefore, our aim was to determine the specific roles of anxiety and depression in the relationship between core schemas and emotional aspects of AVHs for three groups (non-clinical voice hearers, affective voice hearers and non-affective voice hearers).

Methods: Positive and negative core schemas of the self and others were tested as predictors of emotional distress due to AVHs, examining anxiety and depression separately as potential mediators.

Results: Results showed full mediating effects of depression in non-affective voice hearers in the relationship between negative core schemas and AVH distress, but not in affective voice hearers. Anxiety was not a mediator in any of the groups.

Conclusions: These findings suggest different emotional mechanisms depending on the underlying psychopathology.

KEYWORDS
bipolar disorder, distress, emotional valence, impact on functioning, major depression, schizoaffective disorder, schizophrenia

Practitioner points

- Negative core schemas are positively associated with the amount and intensity of voice-related distress due to AVHs.
- Affective and non-affective voice hearers differ in terms of voice frequency and the impact on functioning, but not in terms of depression, anxiety, AVH distress and core schemas about the self and others.
- The core schemas–AVH distress relationship is mediated by depression in non-affective voice hearers.

BACKGROUND

Even though auditory verbal hallucinations (AVHs) are still a hallmark symptom of psychosis and schizophrenia, they are increasingly recognized as being transdiagnostic, and suggested to exist on a continuum, where symptom severity and persistence vary on a spectrum from healthy individuals to patients with psychotic disorders (for a review, see Baumeister et al., 2017; Linscott & van Os, 2013). While non-clinical voice hearers differ from clinical voice hearers in terms of degree of negative content, perceived control, frequency and affective difficulties related to their voices, it is previous mood problems and voice distress that predict the transition to clinically relevant mental health difficulties (Baumeister et al., 2017). During episodes of AVHs, voice hearers in clinical populations have been shown to have increased levels of negative emotions (Oorschot et al., 2012) and they are more likely to have associated symptoms of depression and anxiety compared to voice hearers in non-clinical populations (Andrew et al., 2008; Lawrence et al., 2010).

In general, characteristics of AVHs and their phenomenology have been well studied across a range of clinical populations (for a review see Waters & Fernyhough, 2017), however, it is less well understood how the experience of voices may manifest in relation to schemas about the self and others. Schemas, which start to form early in life (Young, 1999), refer to the developed mental representation of the world and oneself within it. Schemas influence our interpretations about our social environment and about ourselves, and shape reactions to daily experiences (Eshkohl et al., 2010; Young et al., 2006). Negative interpretations of social experiences from the environment are thought to feed into the formation of negative core schemas about the self and others (Fowler et al., 2006; Garety et al., 2001). This is suggested to be especially so after adverse experiences and traumas (Appiah-Kusi et al., 2017), which are known to be associated with psychotic symptoms, such as AVHs (for a review see Williams et al., 2018).

Negative core schemas have been shown to be associated with phenomenological aspects of AVHs. Voice-related distress was found to be independently linked to negative social schemas, with voice hearers feeling inferior in relation to their voices, when they perceived a lower social rank of self relative to others (Paulik, 2012). Both the amount and intensity of voice-related distress are positively associated with negative core schemas about the self (Smith et al., 2006). In addition, the amount and degree of

negative content have also been found to correlate positively with negative core schemas about the self in the same study (Smith et al., 2006). Although not consistently found (Thomas et al., 2015), Scott et al. (2020) corroborated this association, and found that negative AVH content was predicted by negative core schemas about the self in a mixed sample of voice hearers with mood disorders and schizophrenia spectrum disorders.

Negative affect is an additional predictor of emotional aspects of AVH phenomenology such as emotional valence and distress about voices, and their impact on functioning. More severe depression has been associated with a higher amount and degree of negative voice content, more voice-related distress and more disruption to life (Rosen et al., 2018; Smith et al., 2006). In addition, a recent study by Toh et al. (2020) showed that voice hearers with mania-mixed symptoms report that their experience of AVHs led to severe disruption to daily psychosocial functioning compared to voice hearers with current depressed or euthymic mood states who claimed minimal disruption. In contrast, by grouping patients according to their diagnosis (and not their mood), the same study also found that voice hearers with a mood disorder showed a moderate disruption to life compared to voice hearers with a schizophrenia spectrum disorder who reported severe disruption (Toh et al., 2020). This discrepancy suggests that affect influences voice hearers differently, depending on their current mood status.

The literature outlined above suggests that there is an interdependence of negative schemas with negative affect (i.e. anxiety and depression), which is involved in the development of AVHs, but it is unclear how anxiety and depression may separately mediate this relationship and how they may affect the phenomenology of AVHs. To our knowledge, only two studies have looked at mediation effects of emotions on the relationship between core schemas and psychotic symptoms. Jaya et al. (2018) showed that negative affect longitudinally mediated the path from negative self-schemas to positive psychotic symptoms. The authors also reported bidirectional pathways between negative self-schemas and negative affect, which suggested that these concepts influence each other over several time points (Jaya et al., 2018). However, Jaya et al. (2018) defined negative affect as a sum of depression and anxiety taken together, leaving open whether anxiety or depression or both are crucial mediators. Another study (Oliver et al., 2012) looked at the mediating role of anxiety and depression separately in the relationship between negative schemas and delusional ideation. The authors found that anxiety, but not depression, mediated the effects of negative schemas on delusional ideation. Yet, they did not distinguish between negative schemas about the self and others, and potential mediation effects of anxiety and depression on AVHs remain unclear. In addition, it is unknown whether this association differs across voice hearers with a different psychopathology, and how it affects emotional valence, levels of distress and the impact on functioning related to voices.

The aim of this study was therefore to examine if anxiety and depression mediate the relationship between core schemas about the self and others and emotional aspects of voice phenomenology separately. We hypothesized that emotional aspects of voice phenomenology in affective voice hearers would be affected differently by anxiety and depression compared to non-affective or non-clinical voice hearers. We assumed also that this mediation effect would be stronger for negative core schemas as compared to positive core schemas.

METHODS

Participants and procedure

Participants were recruited as part of a broader study on hallucination phenomenology (Scott, Rossell, et al., 2020b; Toh et al., 2020). All participants had voice hearing experiences and included: 76 non-affective voice hearers (46 females) with a current or past diagnosis of schizophrenia or schizoaffective disorder; 65 affective voice hearers (35 females) with a past or current diagnosis of major depressive disorder or bipolar disorder and 33 non-clinical voice hearers (18 females).

Participant diagnosis was confirmed using the Mini International Neuropsychiatric Interview Screen (MINI, Sheehan et al., 1997). Criteria for inclusion were as follows: (a) endorsing two or more screening questions from the Launay–Slade Hallucinations Scale (Bentall & Slade, 1985), (b) having experienced AVH episodes on at least three discrete occasions over the lifetime, (c) an age range from 18 to 65, (d) adequate English language abilities to impart meaningful information, (e) an estimated premorbid IQ > 70 assessed with the Wechsler Test of Adult Reading; (WTAR; Wechsler, 2001), (f) no history of neurological disorders, (g) no hearing impairments, (h) no electroconvulsive therapy within the last 5 months and (i) no alcohol or substance use disorders over the last 12 months. Affective and non-affective voice hearers were recruited from the inpatient and outpatient services of two public and one private psychiatric hospital in Melbourne, Australia, a participant registry associated with a specialist Voices Clinic, and from online and print advertising. Participants provided written, informed consent. Clinical interviews for the original study typically took up to 3 h to complete and were conducted by one of three trained researchers using the measures detailed below.

Non-clinical voice hearers were recruited via advertising at community venues in Melbourne, Australia (e.g. cafes, neighbourhood noticeboards and university campuses) and research participation forums (e.g. Facebook and Gumtree). In addition to the above-mentioned inclusion criteria, non-clinical voice hearers needed to have no current prescribed psychiatric medications and no current mental health diagnosis. In terms of past mental health diagnosis, we applied a lifetime exclusion for psychotic disorders. During an initial semi-structured screening interview via telephone, a brief mental health history was assessed. This was followed by an in-person session where a complete mental health status was assessed using the MINI (Sheehan et al., 1997).

Procedures were in line with the Declaration of Helsinki (Association, 2014). The current study was approved by the human research ethics committee at Swinburne University of Technology, Melbourne, Australia.

Measures

Basic demographic and *clinical information* collected included gender, age, illness duration in years, number of hospital stays and mood episodes.

Beck Depression Inventory II (BDI-II; Beck et al., 1996). The BDI-II is a 21-item self-report measure of depressive symptomatology. Items are scored on 4-point Likert scales and summed to create a total score ranging from 0 to 63, with higher scores indicating more severe depressive symptoms. A total score of 0–13 is interpreted as a minimal level of depression, 14–19 as mild, 20–28 as moderate and 29–63 as severe.

Beck Anxiety Inventory (BAI; Beck et al., 1988). The BAI is a 21-item self-report measure of anxiety severity. Items are scored on a 4-point Likert scale and summed to generate a total score ranging from 0 to 63, with higher scores indicating more severe anxiety symptomatology. A total score of 0–7 is interpreted as a minimal level of anxiety, 8–15 as mild, 16–25 as moderate and 26–63 as severe.

Brief Core Schema Scale (BCSS; Fowler et al., 2006). The BCSS is a self-report questionnaire that assesses negative and positive core beliefs about the self and others. It consists of 24 items, which form four subscales including negative self (*BCSS-NS*; six items), positive self (*BCSS-PS*, six items), negative other (*BCSS-NO*, six items) and positive other (*BCSS-PO*, six items). Respondents are asked to indicate whether they hold each belief (Yes/No), and if so, their degree of conviction from 1 (believe it slightly) to 4 (believe it totally). Reponses for the six items are summed, with a total score of 24 for each of the four subscales.

Questionnaire for Psychotic Experiences (QPE; Rossell et al., 2019). The QPE is a transdiagnostic semi-structured interview that assesses the presence, severity and phenomenological characteristics of hallucinations and delusions. It consists of four subscales, including *auditory hallucinations*, *visual hallucinations*, *hallucinations in other modalities* and *delusions*. We used four items in total: one item that represents *AVHs frequency*, and three items that represent emotional aspects of AVH phenomenology: *emotional valence of*

AVHs (i.e. the proportion of voices with negative content), *distress due to AVHs* (i.e. the experienced distress and discomfort due to AVHs) and *impact of AVHs on functioning*. The items are part of the subscale *auditory hallucinations*, which shows good internal consistency (Cronbach's $\alpha = .88$; Rossell et al., 2019). Used items are measured on scales ranging from 0 to 5, where 0 represents the least severe outcome and 5 the worst outcome (Rossell et al., 2019).

Described measures are the ones relevant for our study. Detailed information about the measures of the original study can be found elsewhere (Toh et al., 2020).

Statistical analyses

All analyses were conducted using IBM SPSS v.25 for Windows (IBM Corporation, Armonk, NY, USA). We performed analyses of variance (ANOVAs) for continuous variables to investigate group differences between non-clinical, affective and non-affective voice hearers for demographic and clinical characteristics, and for our variables of interest (i.e. BAI, BDI-II, BCSS subscales and QPE items). As the assumption of homogeneity of variances was not met in all variables, we reported Welch's ANOVAs. To account for multiple comparisons, we used Dunnett's T3 post-hoc tests (Lee & Lee, 2018). For categorical variables, we conducted Chi-squared tests for independence. To determine if our outcome variables are independent of each other, we calculated Spearman correlations with the ordinal scaled QPE items *emotional valence of AVHs*, *distress due to AVHs* and *impact of AVHs on functioning*.

We hypothesized that positive and negative core schemas (X) would predict emotional aspects of AVH phenomenology (Y), mediated by anxiety (M_1) and depression (M_2), differently for all voice hearing groups. To conduct the corresponding mediation analyses, we first dichotomized the QPE items *emotional valence of AVHs* (mainly negative vs. mainly positive voices), *distress due to AVHs* (mainly non-distressing vs. mainly distressing voices) and *impact of AVHs on functioning* (mainly low impact vs. mainly high impact), using a median split, to categorize items into classes of high and low expression. Then, we calculated correlations among BAI, BDI-II, BCSS subscales and the dichotomized QPE items using Kendall's τ (for correlation between continuous variables) and point-biserial correlation (for correlations between continuous and dichotomous variables). To account for multiple testing of correlations, we chose a Bonferroni-corrected significance value of .008 due to the number of conducted correlations.

As mediators have to be significantly correlated with both the predictor (X) and the outcome variable (Y) (Baron & Kenny, 1986), we only fitted mediation models for mediators with significant associations, and omitted models for mediators without significant correlations. According to Hayes (2009), a direct association between X and Y is not necessary to test hypotheses about indirect effects. Prior to mediation analyses, we also tested assumptions for each regression that was computed. No violations of independence of observations, homoscedasticity, multicollinearity or linear relationship was observed. Not all variables were normally distributed, but this is not a necessity for conducting mediation analyses when bootstrap analyses are employed (Yzerbyt et al., 2018).

The SPSS-macro PROCESS v3.4 by Hayes (2018) was used to fit the mediation models, with the moderator variable affecting the whole indirect path (using PROCESS model 4). We used a bootstrapping method to generate a confidence interval (CI) for direct and indirect mediation effects, as recommended by Preacher and Hayes (2008) to be most effective with small sample sizes and the least vulnerable to Type I error. Furthermore, it does not assume normal distributions for variables, and is therefore also recommended by Yzerbyt et al. (2018). As recommended by Hayes (2018), we resampled the data 10,000 times and used 95% bias-corrected CIs. As we have dichotomous outcome variables, we reported Nagelkerke R^2 values for the mediation models and odds ratios in addition to unstandardized path coefficients. We also conducted power analyses for indirect paths using the online tool 'Monte Carlo Power Analysis for Indirect Effects' (Schoemann et al., 2020), with 1000 replications, 20,000 Monte Carlo draws per replication and a confidence level of 95%. All analyses were carried out separately for each voice hearing group.

RESULTS

Participants

We included 174 participants, aged 18–65 years (M = 35.27; SD = 12.63). The affective voice hearers group consisted of 31 patients with a diagnosis of major depressive disorder and 34 patients with a diagnosis of bipolar disorder. The non-affective voice hearers group consisted of 50 patients with schizophrenia, and 26 patients with schizoaffective disorder. The remaining 33 participants were non-clinical voice hearers. The majority of clinical voice hearers were outpatients (affective voice hearers: 93.8%, non-affective voice hearers: 78.9%).

A Chi-square test of independence revealed no statistically significant association between gender and the different groups of voice hearers, $\chi^2(2) = 0.729$, $p = .694$. Welch's ANOVAs revealed significant group differences between the voice hearing groups in terms of age, duration of illness, number of mood episodes, number of hospital stays, AVHs frequency and emotional aspects of AVH phenomenology. Results from the following Dunnett's T3 post-hoc tests showed differences between the groups: As an overall observation, affective and non-affective voice hearers only differed with regards to anxiety. Affective voice hearers had the highest scores for negative core schemas, and the lowest scores for positive core schemas, but did not differ significantly from non-affective voice hearers.

Mean scores, standard deviations and results from Welch's ANOVAs and Dunnett's T3 post-hoc tests are presented in Table 1.

Non-clinical voice hearers showed moderate positive correlations between *emotional valence of AVHs* and *distress due to AVHs* ($r = .682$, $p = <.001$), between *emotional valence of AVHs* and *impact of AVHs on functioning* ($r = .539$, $p = .001$) and between *distress due to AVHs* and *impact of AVHs on functioning* ($r = .648$, $p = <.001$). Affective voice hearers showed moderate positive correlations between *emotional valence of AVHs* and *distress due to AVHs* ($r = .516$, $p = <.001$), between *emotional valence of AVHs* and *impact of AVHs on functioning* ($r = .512$, $p = <.001$) and between *distress due to AVHs* and *impact of AVHs on functioning* ($r = .591$, $p = <.001$). Non-affective voice hearers showed weak-to-moderate positive correlations between *emotional valence of AVHs* and *distress due to AVHs* ($r = .401$, $p = <.001$), between *emotional valence of AVHs* and *impact of AVHs on functioning* ($r = .344$, $p = .002$) and between *distress due to AVHs* and *impact of AVHs on functioning* ($r = .414$, $p = <.001$).

Associations of anxiety and depression on core schemas and emotional aspects of AVHs

Correlations between our variables of interest are shown in Tables 2 and 3 for each of the voice hearing groups independently.

We only calculated mediation models for non-affective voice hearers, as emotional aspects of AVH phenomenology did not show significant associations with either anxiety or depression in non-clinical and affective voice hearers.

We calculated four simple mediation analyses for non-affective voice hearers, with depression (BDI-II) as mediator, distress due to AVHs (mainly low vs. high distress) as outcome variable and the four core schema scales (1: negative self, 2: negative other, 3: positive self and 4: positive other) as predictors in the four separate models. The median split divided non-affective participants into less distressed (n = 31) and more distressed (n = 45) subgroups. All models were significant, and path coefficients can be found in Table 4. In all models, the direct paths (c') were not significant, indicating full mediation.

The first model included the negative self core schema subscale (X), BDI-II scores (M) and the dichotomized QPE item experienced distress (Y), and showed a significant Nagelkerke R of .15 ($p = .011$). The non-significant ab-path had a power of 0.46 and corresponded to an odds ratio of 1.05 (CI: 0.98, 1.17), which indicates that one unit increase in the score of negative self core schemas comes with an expected 5% increase in the odds of experiencing high distress (see also Figure 1).

TABLE 1 Sample description with means (Schoemann et al.) for demographic and clinical characteristics as well as variables of interest

	M (SD)			Welch's ANOVA					Dunnett's T3 (*p*-values)		
	Non-clinical voice hearers	Affective voice hearers	Non-affective voice hearers	F	df1	df2	η^2	p	Non-clinical vs. affective	Non-clinical vs. non-affective	Affective vs. non-affective
Age	29.39 (9.93)	31.14 (12.70)	41.36 (10.99)	20.70	2	90.46	.184	**<.001**	.839	**<.001**	**<.001**
Duration of illness since diagnosis	0.14 (0.54)	9.24 (9.95)	15.56 (10.07)	102.83	2	85.3	.210	**<.001**	**<.001**	**<.001**	**.002**
Number of mood episodes	0.15 (0.87)	11.50 (34.78)	9.81 (19.54)	4.78	2	36.99	.049	**.014**	.234	.054	.994
Number of hospital stays	0.06 (0.35)	1.59 (2.32)	5.98 (9.40)	20.15	2	82.43	.147	**<.001**	**<.001**	**<.001**	**.003**
BAI	9.03 (8.12)	23.91 (15.61)	17.91 (12.14)	21.24	2	101.80	.145	**<.001**	**<.001**	**<.001**	**.039**
BDI-II	6.48 (7.29)	21.34 (15.30)	18.52 (12.09)	30.01	2	105.12	.155	**<.001**	**<.001**	**<.001**	.548
BCSS-NS	2.42 (2.22)	8.83 (6.63)	7.37 (6.30)	35.76	2	112.68	.134	**<.001**	**<.001**	**<.001**	.454
BCSS-PS	15.48 (5.61)	10.83 (5.89)	11.59 (6.49)	7.69	2	89.75	.073	**.001**	**.001**	**.007**	.847
BCSS-NO	5.67 (6.29)	9.42 (6.19)	7.33 (6.26)	4.30	2	86.11	.048	**.017**	**.020**	.501	.140
BCSS-PO	14.03 (5.73)	9.69 (5.12)	11.71 (6.56)	7.03	2	87.01	.067	**.001**	**.002**	.187	.121
QPE – AVHs frequency	2.12 (1.08)	3.35 (1.32)	4.03 (1.25)	32.06	2	91.39	.240	**<.001**	**<.001**	**<.001**	**.007**
QPE – emotional valence	1.09 (1.61)	3.58 (1.69)	3.50 (1.70)	30.19	2	87.94	.250	**<.001**	**<.001**	**<.001**	.987
QPE – experienced distress	1.64 (1.58)	3.72 (1.67)	4.18 (1.30)	33.05	2	81.96	.284	**<.001**	**<.001**	**<.001**	.205
QPE – impact on functioning	0.45 (0.79)	2.60 (1.95)	4.12 (1.63)	128.93	2	110.45	.406	**<.001**	**<.001**	**<.001**	**<.001**

Note: The bold values are the significant values.

Abbreviations: BAI, Beck Anxiety Inventory; BCSS-PS, Brief Core Schema Scale – positive self; BCSS-NO, Brief Core Schema Scale – negative other; BCSS-NS, Brief Core Schema Scale – negative self; BCSS-PO, Brief Core Schema Scale – positive other; BDI-II, Beck Depression Inventory II.

TABLE 2 Correlations among core schema, anxiety and depression measures

	BCSS-NS	BCSS-PS	BCSS-NO	BCSS-PO
Non-clinical voice hearers				
BDI-II	.336 (.012)	−.097 (.452)	.193 (.138)	−.247 (.054)
BAI	.175 (.184)	−.038 (.767)	.206 (.109)	−.061 (.629)
BCSS-NS	–	−.242 (.068)	.071 (.598)	−.145 (.274)
BCSS-PS	–	–	−.086 (.508)	**.383 (.003)**
BCSS-NO	–	–	–	.096 (.459)
Affective voice hearers				
BDI-II	**.623 (<.001)**	**−.377 (<.001)**	**.288 (.001)**	−.092 (.297)
BAI	**.376 (<.001)**	−.118 (.178)	**.312 (<.001)**	.005 (.959)
BCSS-NS	–	**−.421 (<.001)**	**.377 (<.001)**	−.175 (.051)
BCSS-PS	–	–	−.115 (.194)	**.306 (.001)**
BCSS-NO	–	–	–	−.046 (.604)
Non-affective voice hearers				
BDI-II	**.477 (<.001)**	**−.282 (.001)**	**.327 (<.001)**	**−.243 (.003)**
BAI	**.329 (<.001)**	−.124 (.123)	**.238 (.004)**	−.010 (.903)
BCSS-NS	–	**−.403 (<.001)**	**.421 (<.001)**	−.077 (.346)
BCSS-PS	–	–	−.111 (.177)	**.358 (<.001)**
BCSS-NO	–	–	–	−.118 (.154)

Note: The bold values are the significant values.

Correlation coefficients among BDI-II, BAI and BCSS subscales are *Kendall's τ*; correlation coefficients between BCSS are Pearson *r*, *p*-values are provided in parentheses.

Abbreviations: BAI, Beck Anxiety Inventory; BCSS-NO, Brief Core Schema Scale – negative other; BCSS-NS, Brief Core Schema Scale – negative self; BCSS-PO, Brief Core Schema Scale – positive other; BCSS-PS, Brief Core Schema Scale – positive self; BDI-II, Beck Depression Inventory II.

TABLE 3 Correlations among anxiety, depression and emotional aspects of AVH

	QPE – emotional valence	QPE – experienced distress	QPE – impact on functioning
Non-clinical voice hearers			
BDI-II	.198 (.269)	−.070 (.698)	.042 (.817)
BAI	−.049 (.785)	−.072 (.691)	.134 (.457)
Affective voice hearers			
BDI-II	.181 (.148)	.054 (.671)	.119 (.344)
BAI	.193 (.124)	.155 (.218)	.192 (.126)
Non-affective voice hearers			
BDI-II	.216 (.063)	**.303 (.008)**	−.019 (.871)
BAI	.178 (.124)	.209 (.070)	.075 (.521)

Note: The bold values are the significant values.

Correlation coefficients are point biserial, *p*-values are provided in parentheses.

Abbreviations: BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory II.

The second model included the negative other core schema subscale (X), BDI-II scores (M) and the dichotomized QPE item experienced distress (Y), and showed a significant Nagelkerke R^2 of .13 (p = .024). The significant ab-path showed a power of 0.57, and corresponded to an odds ratio of 1.05 (CI: 1.01, 1.23), which indicates that one unit increase in the score of negative other core schemas comes with an expected 5% increase in the odds of experiencing high distress (see also Figure 2).

TABLE 4 Path coefficients for simple mediation models

Path Coefficients for Simple Mediation Models

							CI	
			B	SE	t	p	lower	upper
Negative Self Core Schema	direct	**a**	**1.31**	**0.17**	**7.80**	**<.001**	**0.98**	**1.65**
					Z			
		b	0.04	0.03	1.30	.193	-0.02	0.10
		c'	0.07	0.06	1.20	.229	-0.04	0.18
							BootCI	
				BootSE		power	lower	upper
	indirect	ab	0.05	0.05		0.46	-0.02	0.15
							CI	
			B	SE	t	p	lower	upper
Negative Other Core Schema	direct	**a**	**0.85**	**0.20**	**4.19**	**<.001**	**0.45**	**1.26**
					Z			
		b	**0.06**	**0.03**	**2.26**	**.024**	**0.01**	**0.12**
		c'	0.01	0.05	0.02	.987	-0.09	0.09
							BootCI	
				BootSE		power	lower	upper
	indirect	**ab**	**0.05**	**0.03**		**0.57**	**0.01**	**0.12**

Note: The bold values indicates for the direct paths have a significance level (p-value), and the significance of the indirect path is shown by the confidence interval being between 0 and 1.

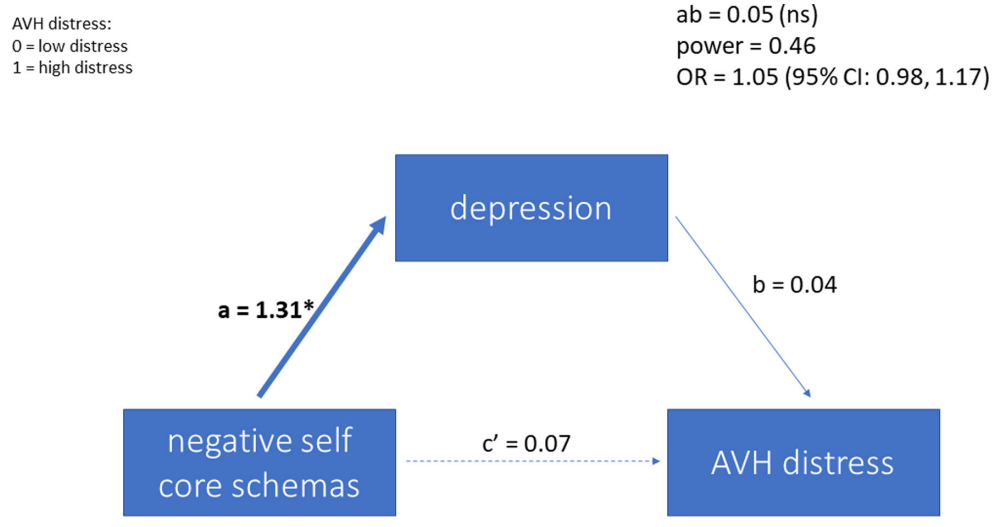

FIGURE 1 Mediation model for negative self core schemas

The third model included the positive self core schema subscale (X), BDI-II scores (M) and the dichotomized QPE item experienced distress (Y), and showed a significant Nagelkerke R^2 of .13 (p = .024). The significant ab-path showed a power of 0.51, and corresponded to an odds ratio of 0.96 (CI: 0.91, 0.99), which indicates that one unit increase in scores of positive self core schemas comes with an expected 4% decrease in the odds of experiencing high distress (see also Figure 3).

The fourth model included the positive other core schema subscale (X), BDI-II scores (M) and the dichotomized QPE item experienced distress (Y), and showed a significant Nagelkerke R^2 of .14 (p = .014). The significant ab-path showed a power of 0.46, and corresponded to an odds ratio of 0.96 (CI: 0.91, 0.99), which indicates that one unit increase in positive other core schemas comes with an expected 4% decrease in the odds of experiencing high distress (see also Figure 4).

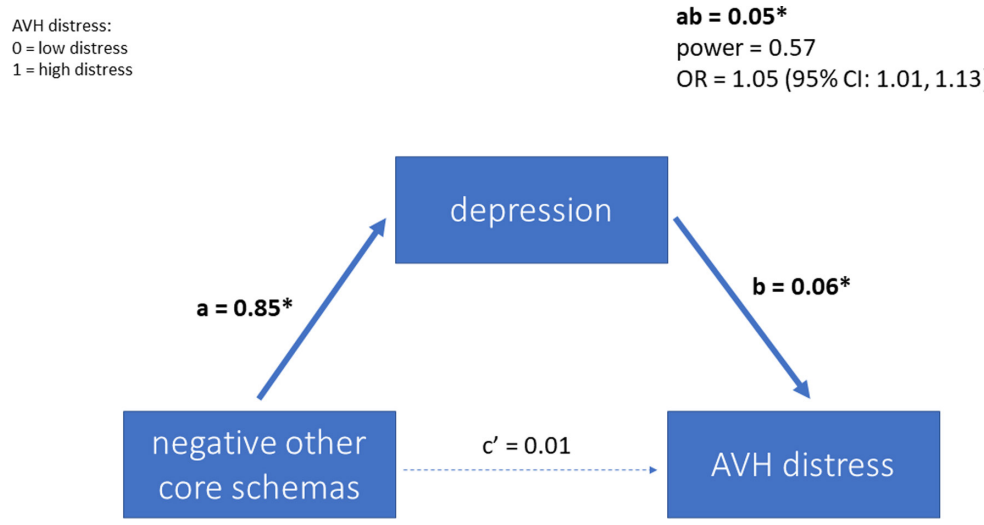

FIGURE 2 Mediation model for negative other core schemas

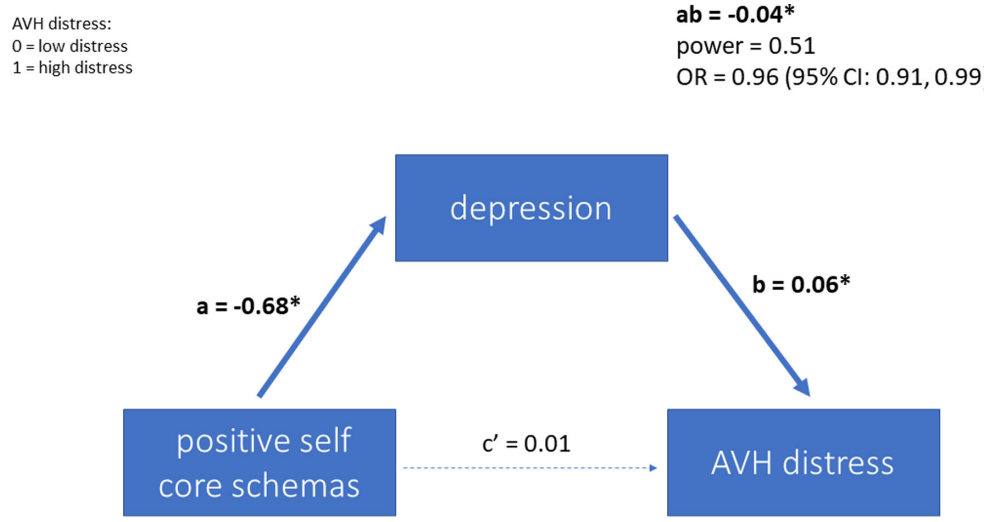

FIGURE 3 Mediation model for positive self core schema

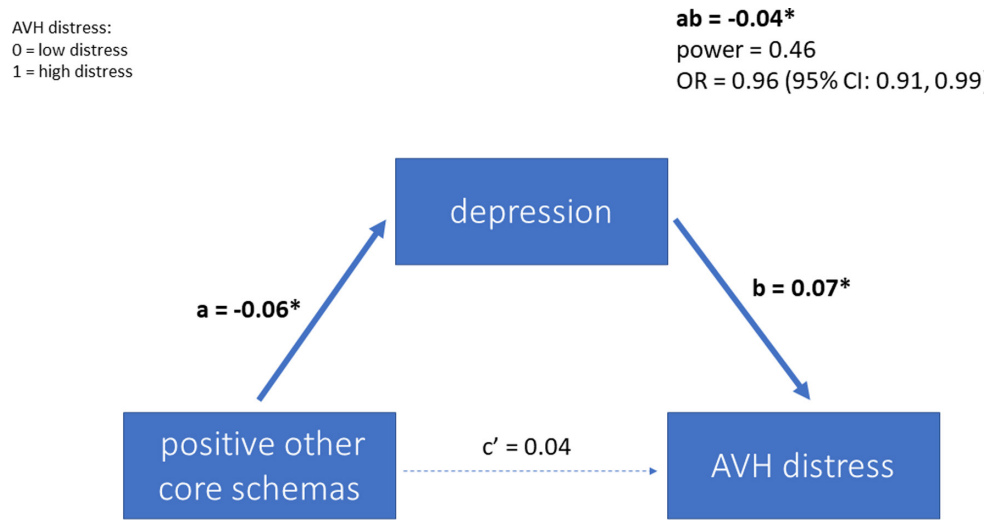

FIGURE 4 Mediation model for positive other core schemas

DISCUSSION

The aim of our study was to determine if core schemas about the self and others predicted emotional aspects of AVH phenomenology differently for voice hearers with different diagnoses, and if this prediction was mediated by anxiety and depression.

In our sample, non-clinical voice hearers were characterized by having the lowest scores for negative, and the highest scores for positive core schemas. In addition, this group had minimal depression levels, very mild anxiety levels and mostly non-distressing positive voices with low impact on functioning in everyday life. There were no significant correlations between core schemas and anxiety or depression, and between anxiety or depression and emotional aspects of AVH phenomenology in the non-clinical voice hearers. The absence of correlations in this group might be due to their non-help-seeking status, and possible floor effects of the measures. This finding is consistent with other reports from the literature that non-clinical voice hearers experience more positive voices, lower distress and their voices also have minimal impact on functioning in comparison to clinical voice hearers (Baumeister et al., 2017; Toh et al., 2020).

Affective and non-affective voice hearers did not differ significantly from each other when it came to negative and positive core schemas, depression and anxiety. The latter is not in line with previous research that suggested that affective voice hearers experience more depression and anxiety than non-affective voice hearers (Scott, Rossell, et al., 2020a), even though the average age and duration of illness of both groups were comparable to those of our sample.

In affective voice hearers, only depression, but not anxiety, mediated the relationship between core schemas about the self/others and experienced distress due to AVHs. Having more positive schemas about the self and others predicted lower depression and decreased the odds of experiencing more distressing AVHs (see Figures 3 and 4). On the other hand, having more negative schemas about others predicted higher depression and increased the odds of experiencing more distressing AVHs (see Figure 2).

In general, these findings are mostly in line with the main theoretical assumption of the development of core schemas, that negative affect plays a key role (Garety et al., 2001), and also with empirical evidence (Jaya et al., 2018), even though the authors did not differentiate between anxiety and depression. However, our finding is not in line with Oliver et al. (2012), who found that negative schemas predicted the level of delusional ideation, and were not mediated by depression, but anxiety. Barrowclough et al.

(2003) also found that core schemas in patients with psychosis were independent of depression. A possible explanation for the difference between affective and non-affective voice hearers might be that AVHs were more frequent in non-affective voice hearers and had a bigger impact on functioning as compared to affective voice hearers.

In non-affective voice hearers, it appears that positive core schemas about the self and others seemed to be a small but significant protective factor against depression and distressing voices. This is a notable finding because other authors did not suggest that positive core schemas about the self and others had an impact in clinical or non-clinical groups (Cole et al., 2017; Fowler et al., 2006; Scott, Rossell, et al., 2020b; Smith et al., 2006; Thomas et al., 2015). While most research has focused on negative schemas, an emphasis should be placed on positive core schemas about the self and others to uncover additional protective factors. For example, Cole et al. (2017), has suggested a path model in a transdiagnostic sample of voice hearers, where voice distress arises from anxious and avoidant attachment style, leading to negative schemas via persecutory beliefs about voices. As Hayward et al. (2021) found a positive association between positive self schemas and benevolent beliefs about voices, a similar pathway to that of Cole et al. (2017) might exist for protective factors.

Our study was the first that compared the mediating effects of anxiety and depression in the relationship between core schemas and phenomenological aspects of AVHs in different groups of voice hearers, using a transdiagnostic approach. However, our study comes with some limitations. First, even though we had a sizeable sample, the number of participants in the different voice hearing groups were not equal. This reduced statistical power and might explain why we failed to detect significant associations in non-clinical and affective voice hearers. In addition, we used a rather conservative threshold for finding significant correlations, and the dichotomization of our variables of interest and their interaction with each other could have reduced the observed power. Second, we analysed the indicators for emotional distress (QPE items) as though they were independent from each other – only one QPE item was entered into mediation analyses due to the Bonferroni-corrected significance level. However, correlations between the QPE items were moderate to strong ($r = .344$ to .682). Future research should therefore address the interactions between different emotional distress variables. Third, our results were based on cross-sectional analyses of the data. Therefore, it is not possible to establish any causal relationships. Fourth, the odds ratios for the significant indirect paths in the mediation models were rather low, suggesting that other factors are likely to be involved in these processes as well. The significance of mediation models might also be driven by very strong direct effects between two variables (i.e. the strong association between negative core schemas about the self and depression, Figure 1). Fifth, non-clinical voice hearers were excluded if they had a lifetime diagnose of psychotic disorders, but other lifetime mental health disorders were included. Excluding other mental health disorders might reduce the generalizability of our findings, given that high prevalence disorders do exist in this cohort. In addition, there was only one participant with a former diagnosis of depression; the likelihood is low that this might have influenced our findings.

Future studies are needed to uncover the complex dynamic between core schemas and the various consequences of AVHs. Especially longitudinal study designs are encouraged to further investigate the role of depression in the development and maintenance of transdiagnostic AVHs and their effects over time. A broader study design that integrates other important factors, such as childhood adversity, emotion regulation and coping strategies, might uncover the mechanisms behind these different aspects of core schemas.

Taken together, our findings suggest that schemas influence emotional aspects of AVH phenomenology differently depending on the underlying psychopathology. Future integrative approaches will be useful to uncover the complex influence of emotions and their related processes to reveal potential targets for the treatment of transdiagnostic AVHs arising from different underlying psychopathologies.

ACKNOWLEDGEMENTS

This work was supported by a research grant from the Bergen Research Foundation (BFS2016REK03) to MH, the Australian National Health and Medical Research Council (NHMRC; senior fellowship to

S.L.R (GNT1154651) and a project grant to S.L.R and N.T. (GNT1060664)) as well as a Barbara Dicker Brain Sciences Foundation to S.L.R., N.T. and W.L.T.

CONFLICTS OF INTEREST

All authors declare no conflict of interest.

AUTHOR CONTRIBUTION

Isabella Kusztrits: Conceptualization, Formal analysis, Methodology, Writing – original draft, Writing – review & editing; Wei Lin Toh: Data curation, Writing – review & editing, Funding acquisition; Neil Thomas: Writing – review & editing, Funding acqusition; Frank Larøi: Writing – review & editing; Denny Meyers: Methodology, Writing – review & editing; Marco Hirnstein: Writing – review & editing, Funding acqusition, Supervision; Susan Rossell: Conceptualization, Methodology, Data Writing – review & editing, Funding acquisition, Supervision.

DATA AVAILABILITY STATEMENT

Data available on request due to privacy/ethical restrictions.

ORCID

Isabella Kusztrits https://orcid.org/0000-0003-3678-2860
Wei Lin Toh https://orcid.org/0000-0002-4187-1182
Neil Thomas https://orcid.org/0000-0001-7006-6361
Frank Larøi https://orcid.org/0000-0002-9876-7407
Marco Hirnstein https://orcid.org/0000-0002-6291-0929
Susan Rossell https://orcid.org/0000-0002-7415-8252

REFERENCES

Andrew, E. M., Gray, N. S., & Snowden, R. J. (2008). The relationship between trauma and beliefs about hearing voices: A study of psychiatric and non-psychiatric voice hearers. *Psychological Medicine*, *38*(10), 1409–1417. https://doi.org/10.1017/S0033291707002537X

Appiah-Kusi, E., Fisher, H., Petros, N., Wilson, R., Mondelli, V., Garety, P., Mcguire, P., & Bhattacharyya, S. (2017). Do cognitive schema mediate the association between childhood trauma and being at ultra-high risk for psychosis? *Journal of Psychiatric Research*, *88*, 89–96. https://doi.org/10.1016/j.jpsychires.2017.01.003

Association, G. A. o. t. W. M. (2014). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *The Journal of the American College of Dentists*, *81*(3), 14.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173. https://doi.org/10.1037/0022-3514.51.6.1173

Barrowclough, C., Tarrier, N., Humphreys, L., Ward, J., Gregg, L., & Andrews, B. (2003). Self-esteem in schizophrenia: Relationships between self-evaluation, family attitudes, and symptomatology. *Journal of Abnormal Psychology*, *112*(1), 92. https://doi.org/10.1037/0021-843X.112.1.92

Baumeister, D., Sedgwick, O., Howes, O., & Peters, E. (2017). Auditory verbal hallucinations and continuum models of psychosis: A systematic review of the healthy voice-hearer literature. *Clinical Psychology Review*, *51*, 125–141. https://doi.org/10.1016/j.cpr.2016.10.010

Beck, A. T., Epstein, N., Brown, G., & Steer, R. A. (1988). An inventory for measuring clinical anxiety: Psychometric properties. *Journal of Consulting and Clinical Psychology*, *56*(6), 893. https://doi.org/10.1037/0022-006X.56.6.893

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck depression inventory-II. *San Antonio*, *78*(2), 490–498.

Bentall, R., & Slade, P. D. (1985). Reliability of a scale measuring disposition towards hallucination: A brief report. *Personality and Individual Differences*, *6*(4), 527–529. https://doi.org/10.1016/0191-8869(85)90151-5

Cole, E. R., Strauss, C., Fife-Schaw, C., & McCarthy-Jones, S. (2017). Echoes of others: A path analytic examination of an interpersonal–cognitive model of voice-related distress. *Psychology and Psychotherapy: Theory, Research and Practice*, *90*(4), 617–632. https://doi.org/10.1111/papt.12129

Eshkohl, R., Bernstein, D. P., & Young, J. (2010). *Schema therapy. Distinctive features*. Routledge.

Fowler, D., Freeman, D., Smith, B., Kuipers, E., Bebbington, P., Bashforth, H., Coker, S., Hodgekins, J., Gracie, A., Dunn, G., & Garety, P. (2006). The Brief Core Schema Scales (BCSS): Psychometric properties and associations with paranoia and grandiosity in non-clinical and psychosis samples. *Psychological Medicine*, *36*(6), 749–759. https://doi.org/10.1017/S0033291706007355

Garety, P. A., Kuipers, E., Fowler, D., Freeman, D., & Bebbington, P. (2001). A cognitive model of the positive symptoms of psychosis. *Psychological Medicine*, *31*(2), 189–195. https://doi.org/10.1017/S0033291701003312

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, *76*(4), 408–420. https://doi.org/10.1080/03637750903310360

Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford publications.

Hayward, M., Jones, A.-M., Strawson, W. H., Quadt, L., Larsson, D. E. O., Silva, M., Davies, G., Fielding-Smith, S., Hazell, C. M., Critchley, H. D., & Garfinkel, S. N. (2021). A cross-sectional study of auditory verbal hallucinations experienced by people with a diagnosis of borderline personality disorder. *Clinical Psychology and Psychotherapy*, 1–11. https://doi.org/10.1002/cpp.2655

Jaya, E. S., Ascone, L., & Lincoln, T. M. (2018). A longitudinal mediation analysis of the effect of negative-self-schemas on positive symptoms via negative affect. *Psychological Medicine*, *48*(8), 1299–1307. https://doi.org/10.1017/S003329171700277X

Lawrence, C., Jones, J., & Cooper, M. (2010). Hearing voices in a non-psychiatric population. *Behavioural and Cognitive Psychotherapy*, *38*(3), 363–373. https://doi.org/10.1017/S1352465810000172

Lee, S., & Lee, D. K. (2018). What is the proper way to apply the multiple comparison test? *Korean Journal of Anesthesiology*, *71*(5), 353. https://doi.org/10.4097/kja.d.18.00242

Linscott, R. J., & van Os, J. (2013). An updated and conservative systematic review and meta-analysis of epidemiological evidence on psychotic experiences in children and adults: On the pathway from proneness to persistence to dimensional expression across mental disorders. *Psychological Medicine*, *43*(6), 1133–1149. https://doi.org/10.1017/S0033291712001626

Oliver, J. E., O'Connor, J. A., Jose, P. E., McLachlan, K., & Peters, E. (2012). The impact of negative schemas, mood and psychological flexibility on delusional ideation–mediating and moderating effects. *Psychosis*, *4*(1), 6–18. https://doi.org/10.1080/17522439.2011.637117

Oorschot, M., Lataster, T., Thewissen, V., Bentall, R., Delespaul, P., & Myin-Germeys, I. (2012). Temporal dynamics of visual and auditory hallucinations in psychosis. *Schizophrenia Research*, *140*(1–3), 77–82. https://doi.org/10.1016/j.schres.2012.06.010

Paulik, G. (2012). The role of social schema in the experience of auditory hallucinations: A systematic review and a proposal for the inclusion of social schema in a cognitive behavioural model of voice hearing. *Clinical Psychology and Psychotherapy*, *19*(6), 459–472. https://doi.org/10.1002/cpp.768

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Rosen, C., McCarthy-Jones, S., Jones, N., Chase, K. A., & Sharma, R. P. (2018). Negative voice-content as a full mediator of a relation between childhood adversity and distress ensuing from hearing voices. *Schizophrenia Research*, *199*, 361–366. https://doi.org/10.1016/j.schres.2018.03.030

Rossell, S. L., Schutte, M. J. L., Toh, W. L., Thomas, N., Strauss, C., Linszen, M. M. J., van Dellen, E., Heringa, S. M., Teunisse, R., Slotema, C. W., & Sommer, I. E. C. (2019). The questionnaire for psychotic experiences: An examination of the validity and reliability. *Schizophrenia Bulletin*, *45*(Supplement_1), S78–S87. https://doi.org/10.1093/schbul/sby148

Schoemann, A., Boulton, A., & Short, S. (2020). Monte Carlo power analysis for indirect effects. Retrieved from https://schoemanna.shinyapps.io/mc_power_med/

Scott, M., Rossell, S. L., Meyer, D., Toh, W. L., & Thomas, N. (2020). Childhood trauma, attachment and negative schemas in relation to negative auditory verbal hallucination (AVH) content. *Psychiatry Research*, *290*, 112997. https://doi.org/10.1016/j.psychres.2020.112997

Scott, M., Rossell, S. L., Toh, W. L., & Thomas, N. (2020a). The relationship between anxiety, depression, and subtypes of negative auditory verbal hallucination (AVH) content in affective and non-affective psychosis. *Psychiatry Research*, *294*, 113500. https://doi.org/10.1016/j.psychres.2020.113500

Scott, M., Rossell, S. L., Toh, W. L., & Thomas, N. (2020b). Understanding the role of self in auditory verbal hallucinations using a self-discrepancy paradigm. *Psychology and Psychotherapy: Theory, Research and Practice*, *94*(S2), 268–285. https://doi.org/10.1111/papt.12276

Sheehan, D., Lecrubier, Y., Sheehan, K. H., Janavs, J., Weiller, E., Keskiner, A., Schinka, J., Knapp, E., Sheehan, M., & Dunbar, G. (1997). The validity of the Mini International Neuropsychiatric Interview (MINI) according to the SCID-P and its reliability. *European Psychiatry*, *12*(5), 232–241. https://doi.org/10.1016/S0924-9338(97)83297-X

Smith, B., Fowler, D. G., Freeman, D., Bebbington, P., Bashforth, H., Garety, P., Dunn, G., & Kuipers, E. (2006). Emotion and psychosis: Links between depression, self-esteem, negative schematic beliefs and delusions and hallucinations. *Schizophrenia Research*, *86*(1–3), 181–188. https://doi.org/10.1016/j.schres.2006.06.018

Thomas, N., Farhall, J., & Shawyer, F. (2015). Beliefs about voices and schemas about self and others in psychosis. *Behavioural and Cognitive Psychotherapy*, *43*(2), 209–223. https://doi.org/10.1017/S1352465813000817

Toh, W. L., Thomas, N., Hollander, Y., & Rossell, S. L. (2020). On the phenomenology of auditory verbal hallucinations in affective and non-affective psychosis. *Psychiatry Research*, *290*, 113147. https://doi.org/10.1016/j.psychres.2020.113147

Toh, W. L., Thomas, N., Robertson, M., & Rossell, S. L. (2020). Characteristics of non-clinical hallucinations: A mixed-methods analysis of auditory, visual, tactile and olfactory hallucinations in a primary voice-hearing cohort. *Psychiatry Research*, *289*, 112987. https://doi.org/10.1016/j.psychres.2020.112987

Waters, F., & Fernyhough, C. (2017). Hallucinations: A systematic review of points of similarity and difference across diagnostic classes. *Schizophrenia Bulletin*, *43*(1), 32–43. https://doi.org/10.1093/schbul/sbw132

Wechsler, D. (2001). *Wechsler test of adult reading: WTAR*. Psychological Corporation.

Williams, J., Bucci, S., Berry, K., & Varese, F. (2018). Psychological mediators of the association between childhood adversities and psychosis: A systematic review. *Clinical Psychology Review*, *65*, 175–196. https://doi.org/10.1016/j.cpr.2018.05.009

Young, J. E. (1999). *Cognitive therapy for personality disorders: A schema-focused approach*. Professional Resource Press/Professional Resource Exchange.

Young, J. E., Klosko, J. S., & Weishaar, M. E. (2006). *Schema therapy: A practitioner's guide*. Guilford Press.

Yzerbyt, V., Muller, D., Batailler, C., & Judd, C. M. (2018). New recommendations for testing indirect effects in mediational models: The need to report and test component paths. *Journal of Personality and Social Psychology*, *115*(6), 929–943. https://doi.org/10.1037/pspa0000132

How to cite this article: Kusztrits, I., Toh, W. L., Thomas, N., Larøi, F., Meyers, D., Hirnstein, M., & Rossell, S. (2022). From core schemas about the self and others to voice phenomenology: Anxiety and depression affect voice hearers differently. *Psychology and Psychotherapy: Theory, Research and Practice*, 95, 493–507. https://doi.org/10.1111/papt.12384