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## Religiosity in young adolescents with auditory vocal hallucinations



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## ABSTRACT

The current exploratory study examined the associations between auditory vocal hallucinations (AVH) and delusions and religiosity in young adolescents. 337 children from a population-based case-control study with and without AVH, were assessed after five years at age 12 and 13, on the presence and appraisal of AVH, delusions and religiosity. AVH status (persistent, remittent, incident or control) was examined in relationship to religiosity. Results demonstrated a non-linear association between AVH and religiosity. Moderately religious adolescents were more likely to report AVH than non-religious adolescents (O.R.=2.6). Prospectively, moderately religious adolescents were more likely to have recently developed AVH than non-religious adolescents (O.R.=3.6) and strongly religious adolescents (O.R.=7.9). Of the adolescents reporting voices in this sample (16.3%), more than half reported positive voices. Religious beliefs were often described as supportive, useful or neutral (82%), regardless of the level of religiosity, for both adolescents with and without AVH. Co-occurrence of AVH and delusions, and severity of AVH were not related to religiosity. The present findings suggest there may be a non-linear association between religiosity and hearing voices in young adolescents. A speculative explanation may be that religious practices were adopted in response to AVH as a method of coping.

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## 1. Introduction

Auditory vocal hallucinations (AVH) occur relatively frequent in the general population in children, adolescents and adults, yet commonly disappear over time (Altman et al., 1997; Van Os et al., 2009; Bartels-Velthuis et al., 2011a, 2011b). Studies using large pediatric samples in England (5–15 year olds, Egdeell and Kolvin, 1972; 11 year olds, McGee et al., 2000) and the Netherlands (7–8 year olds, Bartels-Velthuis et al., 2010) have found prevalence rates of AVH in children and adolescents varying from 8 to 9% (for a review see: Jardri et al. (2014)). In a proportion of these adolescents AVH were persistent two years later (27% in Dutch 15–16 year olds; De Loore et al., 2011) and five years later (23.5% in Dutch 12–13 year olds; Bartels-Velthuis et al., 2011b). The course of AVH over time depends on various individual and environmental factors (van Os et al., 2009). One of these factors might be religiosity, since several studies have demonstrated that religiosity is associated with a higher prevalence of psychotic experiences (Mohr

et al., 2006), both in adults in the general population (Aird et al., 2010) and in adult patient samples (Getz et al., 2001; Suhail and Ghauri, 2010). Explanations for this association have ranged from using religion as a coping strategy (Mohr et al., 2006), through the notion that religion may promote distorted perceptions and distrust of others (Aird et al., 2010), to the idea that a connection with an omnipotent force (God) yields a conviction of ‘super human’ abilities (Suhail and Ghauri, 2010). The consensus in these notions is that religion may have both a positive and negative effect on mental health and well-being in adults (Pargament et al., 1998; Koenig, 2009).

Little is known about the association between AVH, delusions and religiosity during adolescence. There are studies that have examined the relationship between religiosity and other mental health aspects in adolescent samples, such as depressive episodes, anxiety, suicidal ideation, behavioural problems, and substance abuse (12–21 year olds, Dew et al., 2008). Reviews conclude that religion mostly has a positive relationship with mental health in children/adolescents (Dew et al., 2008; 10–20 year olds, Wong et al., 2010), yet some studies report a negative relationship (20 year olds, Exline et al., 2000) or none at all (e.g. Evans et al. (1996); for a review see: Dew et al. (2008)). One study reported a

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curvilinear relationship between religiosity and emotional problems (11–19 year olds, Meltzer et al., 2011). Adolescents with weakly held religious beliefs were more likely to have emotional problems in relation to adolescents with no or strongly held beliefs. Overall, there is some evidence for a relationship between religiosity and mental health during adolescence, yet the direction is still equivocal.

Several studies examined the association between religiosity and psychotic experiences in adult samples. Religious adults from the general population who experience and appraise their AVH within the context of their religion, tend to experience them more positively and less stressful compared to non-religious psychotic patients and non-religious healthy controls (Davies et al., 2001). In clinical samples, patients can report both positive (as a resource for coping) and negative (as an aggravation of psychopathology) influences of religion (Koenig, 2009; Cottam et al., 2011). The valence of religious influences on psychopathology has been related to outcomes (e.g. Shah et al. (2011)). For patients, negative religious coping in response to life stressors (indicative of a 'spiritual struggle') has been found to be related to increased suicidal ideation, depression and anxiety, whilst positive religious coping was related to decreased depression and anxiety (Rosmarin et al., 2013). Similarly, Mohr and colleagues (Mohr et al., 2011) reported that 83 percent of patients with psychosis found religion helpful, which was predictive of decreased negative symptoms and improved quality of life. Notably, the aforementioned studies were conducted in both Western (Britain, Davies et al., 2001; Switzerland, Mohr et al., 2006) and non-Western (India, Shah et al., 2011) countries.

Factors that have been identified as important for the course of AVH during childhood, are (amongst others) the co-occurrence of AVH with delusions (Smeets et al., 2012a,b) and the persistence of voices over time (Bartels-Velthuis et al., 2011b). AVH severity is positively associated with delusions (Bartels-Velthuis et al., 2012b), and compared to experiencing hallucinations or delusions in isolation, a combination of these experiences is more persistent and associated with more help seeking (Smeets et al., 2012a,b). Moreover, persistent and incident AVH during childhood in itself are also associated with more problem behaviour and worse school performance (Bartels-Velthuis et al., 2011b). It is both interesting and important to explore how religiosity is related to the course of AVH and the co-occurrence with delusions. If religion is indeed a source of comfort and hope for individuals who are faced with psychotic symptoms (Koenig, 2009; Rosmarin et al., 2013) and improves quality of life (Shah et al., 2011), adolescents reporting AVH might be more likely to report religious activity, as a method of coping. However, if religiosity is experienced negatively as a 'spiritual struggle', it could also aggravate psychopathology and instead be related to severity of AVH in adolescents.

Here, in a 5-year follow-up study of the case-control sample of 7- and 8-year-old children with and without AVH (Bartels-Velthuis et al. 2010), religiosity is examined in relation to the (i) frequency, (ii) course, (iii) co-occurrence with delusions, (iv) positivity, (v) usefulness, and (vi) severity of AVH. Given that previous studies have used heterogeneous methods of conceptualizing religiosity (Dew et al., 2008) and the literature indicates that (a) religiosity is best captured as a multidimensional concept (Meltzer et al., 2011), and (b) different degrees of religiosity have different effects on, for example, the degree of delusional ideation (Getz et al., 2001), the current study will conceptualize religiosity in both a continuous (more or less religious) and categorical (non-, moderate or strongly religious) manner. In line with these recommendations, religiosity will be assessed in terms of multiple facets (religious beliefs, activities and upbringing), whilst tapping into the conceptualisations of previous studies (Meltzer et al., 2011). Given that previous studies have yielded mixed findings

and that this study is, to the best of our knowledge, the first to examine these relationships in a young sample of non-clinical adolescents, our analyses are exploratory.

## 2. Methods

### 2.1. Subjects

The current study included 337 young adolescents, derived from a case-control sample of children with and without AVH ( $n=694$ ; 50% with AVH) from a general population study on auditory hallucinations (Bartels-Velthuis et al., 2010). The original sample was composed five years earlier, from a survey on AVH in 3870 7- and 8-year-old children attending primary school in the province of Groningen, the Netherlands. Participants were thus assessed twice, at baseline (T0: age 7–8) and at 5-year follow-up (T1: age 12–13). Data from both time points were used.

T1 represented 56% ( $n=337$ ) of the T0 sample with parental consent to follow-up ( $n=605$ ). Participation at T1 was not associated with baseline AVH or control status. The mean age of the participants was 13.1 years (S.D.=0.5) and 46.7% of the participants were male. At T1, 55 adolescents reported AVH (16.3%), see also Table 1.

### 2.2. Procedures

Approval for the current study was obtained from the Medical Ethics Committee of the University of Medical Center Groningen. Parents who gave informed consent for being approached for their child's participation in the follow-up study were sent a notification letter via mail. In case of non-response, parents were reminded with a second letter, and if necessary they were later contacted by telephone.

Seven interviewers conducted the interviews at the adolescents home, in the absence of parents. The interviewers all followed a comprehensive training and booster sessions were arranged to prevent interviewer 'drift' (for more details see Bartels-Velthuis et al. (2011b)). To prevent bias, the interviewers were blind to adolescents' AVH status at baseline. Before the interviews took place, written informed consent was obtained by both the adolescents and one of their parents. In case parents or adolescents had questions as a result of the interviewing procedure, they could contact the research team.

### 2.3. Measures

#### 2.3.1. Auditory vocal hallucinations

Consistent with studies investigating AVH (e.g. De Loore et al. (2011) and Fujita et al. (2015)), all adolescents were asked about the presence of AVH in the past five years: 'In the past five years, have you heard one or more voices that only you and no one else could hear?'. Those scoring positive on AVH in this period were interviewed with the Auditory Vocal Hallucination Rating Scale (AVHRS; Jenner and van de Willige, 2002; Bartels-Velthuis et al., 2012a), a structured interview to assess the characteristics and severity of AVH, in terms of frequency, duration, loudness, negative content, distress, anxiety, control, and interference with thinking and daily life. Scores range from 0 (not applicable) to 4 (most applicable). The AVHRS was developed in Dutch language for adult patients and in a later study (Bartels-Velthuis et al., 2010) the language was adapted for children/adolescents. The AVHRS has good inter-rater reliability, internal consistency and discriminative validity (Bartels-Velthuis et al., 2012a). All AVH variables were constructed in agreement with previous research (Bartels-Velthuis et al., 2010). A dichotomous variable was constructed indicating

**Table 1**  
Associations of religiosity with AVH, delusions, the combination of AVH and delusions, AVH status, and positive voices ( $n=335$ ).

		Not religious	Moderately religious	Strongly religious	Total	$\chi^2$	df
<b>AVH</b>	Yes	16 (11.0%)	27 (24.5%)	12 (15.2%)	55	<b>8.55*</b>	2
	No	130 (89.0%)	83 (75.5%)	67 (84.8%)	280		
	Total	146 (100.0%)	110 (100.0%)	79 (100.0%)	335		
<b>AVH Severity</b>	Mild	11 (68.8%)	17 (63.0%)	8 (66.7%)	36	8.72	4
	Severe	5 (31.3%)	10 (37.0%)	4 (33.3%)	19		
	Total	16 (100.0%)	27 (100.0%)	12 (100.0%)	55		
<b>DEL</b>	Yes	36 (24.7%)	40 (36.3%)	25 (31.6%)	101	8.72	4
	No	110 (75.3%)	70 (63.6%)	54 (68.4%)	234		
	Total	146 (100.0%)	110 (100.0%)	79 (100.0%)	335		
<b>AVH + DEL</b>	AVH & DEL	11 (7.5%)	18 (16.4%)	8 (10.1%)	37	8.72	4
	AVH	5 (3.4%)	9 (8.2%)	4 (5.1%)	18		
	DEL	25 (17.1%)	22 (20.0%)	17 (21.5%)	64		
	None	105 (71.9%)	61 (55.5%)	50 (63.3%)	216		
	Total	146 (100.0%)	110 (100.0%)	79 (100.0%)	335		
<b>AVH status</b>	Incident	4 (2.7%)	10 (9.1%)	1 (1.3%)	15	<b>13.11*</b>	6
	Persistent	12 (8.2%)	17 (15.5%)	11 (13.9%)	40		
	Remitted	63 (43.2%)	36 (32.7%)	30 (38.0%)	129		
	Referent	67 (45.9%)	47 (42.7%)	37 (46.8%)	151		
	Total	146 (100.0%)	110 (100.0%)	79 (100.0%)	335		
<b>Positive voices</b>	Yes	9 (56.3%)	15 (55.6%)	8 (66.7%)	32	0.46	2
	No	7 (43.8%)	12 (44.4%)	4 (33.3%)	23		
	Total	16 (100.0%)	27 (100.0%)	12 (100.0%)	55		
<b>Useful voices</b>	Yes	2 (22.2%)	9 (60%)	4 (50%)	15	2.10	2
	No	7 (77.8%)	6 (40%)	4 (50%)	17		
	Total	9 (100%)	15 (100%)	8 (100%)	32		

\* $p < 0.05$

AVH, auditory vocal hallucinations; DEL, delusions.

whether the child reported AVH (1) or not (0) at the T0 and T1 assessments. The AVHRS items were recoded into 0 (none or mild consequences) and 1 (considerable to severe consequences), after which a severity index (ranging from 0 to 12) was composed. The adolescents were divided into two groups: 'severe AVH' (adolescents who scored in the highest quartile of the severity index; 5 or more) and 'mild AVH' (the remainder of adolescents, score of 4 or less).

### 2.3.2. Delusions

Delusional ideation was assessed with three items enquiring about 'mind reading', 'paranoid ideas' and 'receiving media messages', originating from the Diagnostic Interview Schedule for Children (DISC-C; (Costello et al., 1985)) for the DSM-III (American Psychiatric Association, 1980). These items were previously used by Bartels-Velthuis et al. (2011a) and De Loore et al. (2011) and in the Dunedin study by Poulton et al. (2000), developed to investigate delusions in non-clinical samples of children and adolescents. The items were validated by numerous groups (e.g. Kelleher et al. (2011) and Polanczyk et al. (2010)) and found to have good predictive validity for a diagnosis of schizophrenia during adulthood (Poulton et al., 2000). All items were originally in English and directly translated to Dutch for the current study. Delusions were scored as 0 (no), 1 (yes, likely) and 2 (yes, definitely), and were assessed over the lifetime. A dichotomous variable was constructed indicating presence of at least one definite delusion (hereon referred to as: 'delusions' or DEL).

### 2.3.3. Positive and useful voices

Positive and useful voices were assessed with two items from the Positive and Useful Voices Inquiry (PUVI; Jenner et al., 2008). This is a 53-item self-report questionnaire assessing prevalence, course, characteristics and attribution of positive and useful voices, administered at T1. The PUVI was designed in Dutch language for child and adolescent samples. It has two subscales assessing (i) positivity (twelve items) and (ii) usefulness of these voices (nine items), which have a good internal consistency (Cronbach's alpha 0.93 for positive voices and 0.89 for useful voices (Jenner et al., 2008)). For the purpose of this study the two prevalence questions of both subscales of the PUVI were used: (1) 'have you ever heard positive voices' (positivity subscale) and (2) 'have you ever experienced your voices as useful' (usefulness subscale). Questions regarding the course, characteristics and attribution of voices were only asked to adolescents giving a positive response to the two prevalence questions and not included in the analyses. Positive voices were scored as 0 (no, I have never experienced voices as positive) or 1 (yes, I have experienced voices as positive). Useful voices were scored as 0 (no, I have never experienced voices as useful) or 1 (yes, I have experienced voices as useful).

### 2.3.4. Religiosity

Religiosity was assessed with the five questions from the Dutch Spirituality and Religiosity Questionnaire (Jenner, 2006). This Dutch questionnaire was developed for the current study for application in child and adolescent samples. It is developed in line with suggestions from the literature (Getz et al., 2001; Dew et al.,

**Table 2**

Binomial and multinomial regression analyses to examine differences between AVH and AVH status and the religiosity groups ( $n=335$ ).

		Non-religious	Moderately religious	Strongly religious
		OR (95% CI) Count	OR (95% CI) Count	OR (95% CI) Count
AVH <sup>a</sup>	Yes	<sup>b</sup>	<b>2.64 (1.34–5.20)**</b>	1.46 (0.65–3.25)
		0.69 (0.31–1.54) 16	1.82 (0.86–3.85) 27	12 <sup>b</sup>
AVH status <sup>c</sup>	Incident	<sup>b</sup>	<b>3.57 (1.05–12.05)*</b>	0.45 (0.05–4.20)
		2.21 (0.24–20.5) 4	<b>7.87 (1.00–64.31)*</b>	1 <sup>b</sup>
	Persistent	<sup>b</sup>	2.02 (0.88–4.62)	1.66 (0.67–4.13)
		0.60 (0.24–1.50) 12	1.22 (0.51–2.91) 17	11 <sup>b</sup>
Remitted	<sup>b</sup>	0.82 (0.47–1.42)	0.86 (0.48–1.56)	
	1.16 (0.64–2.10) 63	0.95 (0.49–1.81) 36	30 <sup>b</sup>	
			36	

\* $p < 0.05$ , \*\* $p < 0.01$ . OR, odds ratio; AVH, auditory vocal hallucinations.

<sup>a</sup> AVH (no): reference category.

<sup>b</sup> Religiosity group reference category.

<sup>c</sup> AVH status (referent): reference category.

2008) and is consistent with a previous measure (Meltzer et al., 2011). The first four questions, scored with 0 (no) or 1 (yes), were as follows: (1) 'Do you believe in God or a supernatural spiritual force?', (2) 'Do you consider yourself religiously or spiritually active, for example by praying, visiting meetings or rituals?', (3) 'Were you raised with religion?' and (4) 'Are you currently a member of a religious or spiritual community?'. In this sample, a Cronbach's alpha calculation on these four items was 0.87. The last question (5) 'How do you experience your belief?' Was only answered in case of a positive answer to the first question and has the following response categories: (a) 'supportive/helpful', (b) 'oppressive/negative', (c) 'alternating between positive and negative' or (d) 'neither'.

#### 2.4. Data analysis

Analyses were performed using SPSS for Windows, version 20.0. A variable 'AVH status' was constructed for the course of AVH from T0 to T1, based on the screening at both time points (analogue to previous analysis (Bartels-Velthuis et al., 2012b)), yielding four groups: (i) adolescents with AVH at T0 and T1 (the persistent group) (ii) adolescents with AVH at T0 but not at T1 (the remitted group), (iii) adolescents without AVH at T0 but with AVH at T1 (the incident group), and (iv) adolescents without AVH both at T0 and T1 (the referent group).

In line with previous research on this sample (Bartels-Velthuis et al., 2012b) an ordinal variable 'AVH+DEL' was constructed at T1, dividing the adolescents into four groups: (i) adolescents with AVH only, (ii) adolescents with DEL only, (iii) adolescents with both AVH and DEL, and (iv) adolescents without AVH and DEL.

A sum score of religiosity was computed, by adding up the positive responses to questions 1–4. In line with Meltzer et al. (2011) a categorical religiosity variable with three groups was computed to specify the level of religiosity (non-, moderately- and strongly religious). We constructed this variable basis of questions

1–4, whereas question 5 was examined qualitatively. The religiosity categories consisted of 'strongly religious adolescents' (responded 'yes' to all four questions), 'moderately religious adolescents' (responded 'yes' to at least one question and to at most three questions) and 'non-religious adolescents' (responded 'no' to all four questions).

Pearson's chi-square tests were used to examine associations between religiosity (non-, moderately- and strongly religious) and respectively AVH and/or delusions, the presence of positive and useful voices, AVH severity and AVH status. A non-parametric Mann-Whitney U test was also computed to compare religiosity sum scores between adolescents with and without AVH. Cramer's V was computed for significant chi-square associations as a measure of effect size. Significant chi-square associations were followed by logistic regression analyses, in order to calculate odds ratio's and confidence intervals (CIs). Significance tests were two-tailed with alpha set at 0.05.

### 3. Results

#### 3.1. Descriptives

The mean time gap between T0 and T1 was 5.1 years ( $S.D.=0.4$ ). It has been previously examined whether there was any significant or suggestive differential attrition according to demographics at baseline or psychiatric service use in this follow-up sample (Bartels-Velthuis et al., 2011b), finding no evidence for this. Religiosity scores (T1) were missing for two adolescents, yielding a total of 335 religiosity scores. Of the 335 adolescents, 146 (43.6%) were not religious, 110 (32.8%) moderately religious, and 79 (23.6%) strongly religious (Table 1).

#### 3.2. Religiosity and AVH (T1)

AVH were reported by 55 adolescents (16.3%). The mean religiosity sum score for adolescents with AVH was higher (mean=1.69,  $S.D.=1.51$ ) than the mean religiosity sum score for adolescents without AVH (mean=1.49,  $S.D.=1.68$ ), yet this was not significant as evidenced by a non-parametric Mann-Whitney U test. The association between religiosity groups (non-, moderately or strongly religious) and AVH was significant ( $X^2(2)=8.55$ ,  $p < 0.05$ ), with a small to moderate effect size ( $\phi .16$ ,  $p < 0.05$ ). Specifically, moderately religious adolescents had significant higher odds of reporting AVH, compared to non-religious adolescents (O.R.=2.6, 95% C.I.=1.34–5.20) (Table 2).

#### 3.3. Religiosity and AVH status (T0–T1)

Forty adolescents reported persistent AVH (11.9%), 130 remission of AVH (38.5%), 15 incidence of AVH (4.5%) and 152 no AVH (45.1%) over five years' time as measured from T0 to T1 (Bartels-Velthuis et al., 2011b). There was a significant association between the religiosity groups (T1) and AVH status (T0–T1) ( $X^2(6)=13.11$ ,  $p < 0.05$ ), with a moderate effect size ( $\phi .14$ ,  $p < 0.05$ ). Specifically, moderately religious adolescents (compared to strongly religious adolescents) had 7.9 higher odds (95% C.I.=1.00–64.31) of belonging to the incident group rather than to the referent group. In addition, moderately religious adolescents (compared to non-religious adolescents) had 3.6 higher odds (95% C.I.=1.05–12.05) of belonging to the incident group, rather than to the referent group.

#### 3.4. Religiosity and delusions, and the co-occurrence of AVH and delusions (T1)

One hundred and one adolescents reported at least one definite delusion (30.1%). There were no significant differences in delusions

between the religiosity groups ( $X^2(4)=8.72$ , n.s.). A combined occurrence of AVH and delusions was reported by 37 adolescents (11%) in the total sample. There was no significant association between religiosity and combined AVH and DEL ( $X^2(4)=8.72$ , n.s.).

### 3.5. Religiosity and positivity, usefulness and severity of voices, and appraisal of religious beliefs (T1)

The majority ( $n=32$ ; 58.2%) of the adolescents with AVH reported to have experienced positive voices at least once. There was no significant association between the religiosity groups and positive voices ( $X^2(2)=0.46$ , n.s.). Of the adolescents who reported positive voices, 48.6% found these useful. Usefulness of voices was not significantly associated to religiosity ( $X^2(2)=2.10$ , n.s.). There was no significant association between religiosity groups and severity of voices ( $X^2(4)=8.72$ , n.s.). Appraisal of religious beliefs (the Dutch Spirituality and Religiosity Questionnaire, question 5) was reported by 151 adolescents. Of these adolescents, 72 indicated they experienced their religious beliefs in a supportive and helpful manner (47%), 53 reported them to be neither positive or negative (35%), 25 found them alternating between positive and negative (17%), and only one found them oppressive and negative. Of the adolescents who responded to this item and also reported AVH (31; 20.5%), 17 experienced their beliefs in a supportive and helpful manner (54.8%), 8 reported them to be neither positive or negative (25.8%), 5 found them alternating between positive and negative (16.1%) and only one adolescent reported them to be oppressive and negative. Appraisal of religious beliefs was not significantly associated to the reporting of AVH ( $X^2(3)=5.25$ , n.s.).

### 3.6. Qualitative exploration of the moderately religious group

Given that adolescents with AVH (present and incident) were significantly more likely to be belong to the moderately religious group rather than to the other groups, we aimed to qualitatively examine the nature of religiosity in this group. The pattern of responding to the religiosity questions was examined for the moderately religious adolescents with AVH. Our findings demonstrated that of those who believed in a god or a spiritual force and/or practised religion ( $n=22$ ; 81%), only a minority ( $n=7$ ; 32%) was also raised with religion. Thus more than half of the moderately religious voice-hearers who believed in a god/spiritual force and/or practised religion, were not raised with religion, nor were they part of a spiritual community ( $n=15$ ; 55.6%). Of the adolescents who were raised with religion and/or were part of a spiritual community ( $n=12$ ; 44%), 50% did not believe ( $n=6$ ). A minority of the sub-sample ( $n=6$ ; 22%) was raised with religion but did not believe in god/spiritual force themselves.

## 4. Discussion

The current study investigated the association between AVH, delusions, and religiosity in a five-year follow-up of a population based case-control sample of children with and without AVH (Bartels-Velthuis et al., 2010). Our findings demonstrated that the relationship between AVH and religiosity that has been reported in adults (Getz et al., 2001; Mohr et al., 2006; Aird et al., 2010; Suhail and Ghauri, 2010), is also found in young adolescents in the general population. However, we found no evidence for a linear association, but indications for a non-linear association. Specifically, moderately religious adolescents were more likely to report AVH than non-religious adolescents, but there were no differences between strongly religious adolescents and respectively non- or moderately religious adolescents. Prospectively, moderately religious adolescents were more likely to have recently developed

voices than non-religious adolescents and strongly-religious adolescents but there were no differences between strongly- and non-religious adolescents. Interestingly, the majority of moderately religious adolescents with AVH believed and/or practised some sort of religion or spirituality, yet were not raised with religion nor belonged to a religious community. Many adolescents with AVH in this sample had positive voices, unrelated to level of religiosity. Religious beliefs were most often described as supportive and useful, for both adolescents with and without AVH, again unrelated to level of religiosity. In this study, adolescents with concurrent AVH and delusions or severe AVH were not more or less likely to be religious.

In this sample, moderately religious adolescents had a higher likelihood of reporting AVH, both cross-sectionally and over five years' time, in comparison to non- and strongly religious adolescents. This is suggestive of a non-linear relationship between religiosity and AVH in young adolescents. A relationship of this kind has been found previously, i.e. between religiosity and emotional problems in British youth (Meltzer et al., 2011). Being moderately religious was associated with a greater chance of having emotional or anxious complaints, compared to non-religious or strongly religious youth. Meltzer and colleagues noted that moderately religious adolescents may be at a higher risk of psychopathology because they are at odds with their environment and their parents, rendering them more likely to experience a range of emotions, stemming from feelings of guilt, ambivalence and hostility. In line with this were the findings of Kim-Spoon et al. (2012). They found that adolescents with a lower level of religiosity than their parents had an increased risk to develop internalizing and externalizing problems than adolescents whose religiousness matched that of their parents. Adolescents who reported a higher level of religiosity than their parents did not have this risk.

However, the reasoning provided by Meltzer et al. (2011) and Kim-Spoon et al. (2012) is not fully supported by our findings. The majority of the moderately religious adolescents with AVH in our sample, believed in a god or spiritual force and/or practised some form of religion or spirituality, yet were not raised with religion by their parents nor belonged to a religious community. This makes it unlikely that moderately religious adolescents in our study had a lower level of religiousness than their parents. Moreover, given that in other studies a discrepancy between religiousness of the parent and child signified a source of conflict (Meltzer et al., 2011; Kim-Spoon et al., 2012), one may expect the religiousness to be experienced negatively. On the contrary, many adolescents in the current sample reported supportive and helpful religious beliefs and experienced their voices positively and useful, regardless of the level of religiosity or reporting of AVH.

Religion often functions as a coping strategy (Koenig, 2009), is associated with a higher quality of life (Shah et al., 2011), and a better prognosis (Rosmarin et al., 2013). Moderately religious adolescents with AVH may have adopted religious practices and/or beliefs as a method of coping, appraisal or support for their recently developed experiences. In the current study, religiosity was measured at follow-up, whilst the status of AVH captures the development of AVH from baseline to 5-year follow-up. Therefore it is possible that religiosity may be consequential of the recently developed AVH. This indicates that moderately religious adolescents may have been non-religious at baseline and adopted coping methods in the form of spiritual beliefs and practices over time. The notion that the majority reported either solely having a belief and/or praying, yet did not belong to a community or were raised that way, is supportive of this idea. Given that strongly religious adolescents were less likely to report AVH compared to moderately religious adolescents, their strong religiosity may have served as a protective factor over time. This assumption is in line with studies showing a positive impact of religion in adolescents

(Davis et al., 2003; Pearce et al., 2003; Ritt-Olson et al., 2004) on substance abuse, anxiety, and depressive symptoms.

An alternative explanation may be that adolescents who report an anomalous experience are simply more likely to report believing in (or potentially seeing) a spiritual force and thus acquire the label of moderate religiosity. This indicates that the 'label' of moderate religiosity and AVH may coincide, yet not be resultant of one another. Strong religiosity would still serve a protective factor and is therefore not related to AVH. Even though we regard this explanation less likely, it should be kept in mind when interpreting our findings.

In the current sample of adolescents, religious convictions were not related to the experience of delusions, to AVH severity, or to the combination of AVH and delusions. However, religiosity has been associated with more delusions (Suhail and Ghauri, 2010) in adult clinical samples. Perhaps the association between religiosity and delusions and AVH severity is only evident in patients with current psychosis, and is not present in the context of AVH in adolescents in the general population.

This study has several limitations. First, only a relatively small number of adolescents ( $n=55$ ) reported AVH, and an even smaller amount reported hearing positive voices ( $n=32$ ). This may have reduced statistical power of the analyses, limiting robust inferences. Second, religiosity was measured cross-sectionally at follow-up, hampering solid conclusions about a possible causal relationship. A third limitation is that we did not explicitly measure whether religiosity was used as a coping mechanism. Based on the literature, we merely speculate that the moderately religious adolescents might have used their religious beliefs as a way of coping with AVH. Fourth, as delusions can consist of themes other than mind reading, paranoid ideas or receiving media messages (e.g. delusions of grandiosity), the full scope of delusional ideation may not have been covered in this study. Fifth, the inclusion of our sample was limited to one geographical area, namely Groningen. The adolescents from the rural province of Groningen may differ from adolescents living in more urbanized areas in the prevalence of psychotic experiences, and also in level and form of religiosity (Van Os et al., 2001). Groningen is known as the least religious province in the Netherlands, and those who are religious regard themselves mostly as Protestant-Calvinist (Peltenbarg and Van Steen, 2015). Other areas of the Netherlands (e.g. Limburg or Brabant) are more religious and consist largely of Roman-Catholics. Therefore this study needs replication in urbanized and religiously more diverse areas, with religiosity measurements at two time points.

More generally, it should be noted that AVH in itself are also a phenomenon related to other non-psychotic psychopathology (Askenazy et al., 2007), or not to psychopathology at all (Jardri et al., 2014). The occurrence of AVH is considered to be of non-pathological nature providing it occurs within an appropriate cultural context (American Psychiatric Association, 2013). An indirect indication that AVH reported in this sample are not of psychotic nature lies in the fact that religiosity is not related to the co-occurrence of AVH and delusions; a potential indicator of more severe underlying psychopathology (Smeets et al., 2012a,b).

Last, little is known about cultural influences on the reporting and development of AVH during childhood and adolescence, for both clinical and non-clinical samples (Laroi et al., 2014). The literature implies that there is a lower reporting of AVH in non-western cultures, as it is less culturally accepted to do so and is often seen as an indicator of psychopathology (Al-Issa, 1995). In addition, non-western cultures often (though not always) experience AVH as more positive and less distressing in comparison to western cultures (Laroi et al., 2014). Although many adolescents in this study reported positive voices, a substantial amount reported AVH as neutral; a finding which may be altered in a different (non-

western) cultural context. Future research should aim to replicate this study in a non-western context as to examine to what extent these findings are culture-dependent.

In conclusion, although religiosity and psychotic experiences have frequently been examined in adults in the general population (Mohr et al., 2006) and in adult patient samples (Suhail and Ghauri, 2010), to the best of our knowledge, such an examination in young adolescents is novel. The current study provides evidence that moderately religious adolescents are more likely to report current and incident AVH, compared to non- or strongly religious adolescents. Based on our data we argue that religiosity may be utilized positively and as a method of appraisal and coping in response to the AVH. If this is the case, these findings may have important implications for clinical practice. Although the current sample consists of non-clinical adolescents and the majority of their reported AVH may be transitory over time, some adolescents with more persistent AVH may in a later stage be referred to clinical services. In that case, clinicians need to be aware of potential religious beliefs and practices as factors that may relate to coping with AVH. Finding the most appropriate and sensitive manner of adopting these factors into treatment in a way that also fits with the mental health service, is both challenging and crucial.

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