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Do Thoughts Have Sound? Differences between Thoughts and Auditory Hallucinations in Schizophrenia

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Abstract. Cognitive theories about auditory hallucinations maintain that inner speech is erroneously interpreted as coming from an external source. Few first-hand accounts of patients' experiences have been made, so there is limited knowledge of the process through which patients distinguish their auditory verbal hallucinations (AVHs) from ordinary thoughts. 89 individuals diagnosed with schizophrenia, some experiencing acute hallucinatory symptomatology (*Sz-AVHs*) and some who were not (*Sz-noAVHs*), were assessed along with 48 individuals from the general population using the Auditory Hallucinations Assessment Questionnaire (AHAQ; Cuevas-Yust, Rodríguez Martín, Ductor Recuerda, Salas Azcona, & León Gómez, 2006). The *Schz-AVHs* group reported hearing ordinary thoughts at the same volume as their auditory hallucinations (p = .53) and spoken words (p = .89). In contrast, the *Sz-noAVHs* and general population samples reported hearing spoken words louder than their own thoughts (p = .002; p = .04). In comparison to these last two groups, the *Sz-AVHs* group described the sound of their thoughts as louder. These findings are consistent with the cognitive hypothesis of auditory verbal hallucinations. Confusion identifying the source of auditory hallucinations could be due, in part, to "hearing" one's thoughts at the same volume as auditory hallucinations and spoken words.

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Auditory verbal hallucinations, or *hearing voices*, is one of the experiences that produces greatest suffering in people diagnosed with schizophrenia. Nonetheless, this experience is not exclusive to people with severe psychological disorders. There is evidence that auditory hallucinations occur in the general population, too (Johns & van Os, 2001), but there is a qualitative difference between those and schizophrenic hallucinations (Stanghellini, Langer, Ambrosini, & Cangas, 2012).

The current diagnostic manual of psychological disorders, or DSM-IV TR (American Psychiatric Association, 2000), defines hallucination as a perceptual alteration, "a sensory perception that has the compelling sense of reality of a true perception, but that occurs without external stimulation of the relevant sensory organ," and auditory hallucinations as "false perceptions of sound, usually voices" (p. 823). This type of definition, which describes psychopathology from a third-person, observer perspective, is in a way poorer than capturing how patients themselves experience this phenomenon.

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From a phenomenological perspective, it would be interesting to determine what hallucinations are like first-hand, that is, for the person experiencing them. To phenomenologically analyze auditory verbal hallucinations (AVHs hereafter) could improve methodology, theory, and clinical practice (Larøi, de Haan, Jones, & Raballo, 2010). Prior studies have demonstrated the reliability of self-report in measuring phenomenological aspects related to this phenomenon (e.g., Junginger & Frame, 1985).

Authors such as Stanghellini and Cutter (2003) question the notion that AVHs are perceptions occuring in the absence of appropriate external stimuli. Instead, they consider them "disorders of self-consciousness" (p. 120) where one becomes aware of inner dialog. Normally, the subconscious, automatic process of inner dialog is experienced as a sort of partnership between various, distinct parts integrated into one's experience of *self*. Thus, inner dialog is experienced as one's own. *Voices*, then, are the manifestation of a breakdown in the process of inner conversation, in the feeling of unity in the duality of the *self*. The sense of unity gets weaker, and the sense of duality (there are two parts inside me) more pronounced. Stanghellini and Cutter posit that this crisis of *sense of self* occurs in tangent with a process of hyperreflexivity, or excessively taking a part of the self as a "focal object of

awareness" (p. 120), particularly functions involved in mental life. Hyperreflexivity further objectifies the feeling of duality, and further reduces one's sense of ownership of their inner speech. They argue that "AVHs arise through its morbid objectification: inner speech comes to the foreground in the concrete fashion of alien 'voices'" (p. 120). More than perceptual alterations or errors in attribution, those authors conceptualize *voices* as "breaking the silence of inner dialog" (p.120) and more importantly, as functional substitutes for interpersonal problems in times of crisis, that is, in contexts where a person's relationship to the world is fractured.

From the perspective of cognitive psychology, the phenomenon of hallucination is the result of an error in the ability to discriminate whether a source of information, or experience, is internal or external (Bentall, 1990). Therefore, AVHs occur when information transmitted from within is mistakenly attributed to an outside source. According to Frith (1992), AVHs result from dysfunction in the areas of the brain involved in generating and monitoring inner language. If such monitoring were impaired, the sense of intentionality that normally accompanies thought activity, in the form of inner speech, might not occur and self-generated thoughts would not be recognized as such (hallucinations). Similarly, data from neuroscience research has linked hallucinatory experiences to dysfunction in several areas of the brain. According to one proposed neurocognitive model, the interaction between bottom-up and top-down processing is responsible for these perceptual errors (Allen, Larøi, McGuire, & Aleman, 2008). AVHs arise from abnormal interaction between patterns of neuronal activation that generate salient auditory signals, and top-down mechanisms: signal detection errors, impaired inhibition or executive functioning, expectation-setting, memory, or mood insofar as it could affect how such experiences are interpreted (Waters et al., 2012). Wang, Metzak, and Woodward (2011), meanwhile, conducted neuroimaging studies and proposed that a connection between the medial prefrontal cortex and the left superior temporal gyrus is responsible for our ability to discern the source of a stimulus. In their view, that connection would be altered in people with schizophrenia, such that when processing self-generated information, circuits intervene that are normally involved in gathering other-generated information. In other words, they suggest a possible biological correlate with confusion in source discrimination.

Bentall (1996), meanwhile, emphasized the influence of people's expectations and beliefs, and those of their cultural reference groups, when judging whether a phenomenon comes from the outer or inner sphere. To explain failure in source discrimination processes, Morrison, Haddock, and Tarrier (1995) pointed to metacognitive variables, and to cognitive dissonance. Cognitive dissonance (Festinger, 1957) occurs when certain thoughts are incompatible with one's metacognitive beliefs, so they are experienced as intrusive, upsetting, and unacceptable. Under such circumstances, one way to avoid dissonance is to attribute intrusive thoughts to an outside source, thereby converting them into verbal hallucinations. Therefore, the function of AVHs would be to avoid cognitive dissonance. Wells (2007), likewise, attributed AVHs to metacognition about regulating and synchronizing thoughts that leads them to be experienced as *voices*; ergo, for that author, the experience would better be referred to as *hearing thoughts*, not *hearing voices*.

In summary, from the viewpoint of cognitive psychology, AVHs are private events (thoughts, images) that are erroneously attributed to external agents.

For people who *hear voices*, what features distinguish AVHs from verbal thoughts? What is it like for them to experience inner events that are sometimes not recognized as self-generated, that they erroneously attribute to an outside source? Moreover, what phenomenological similarities or differences do they observe between their thoughts, AVHs, and hearing actual voices?

To gain a deeper understanding of the nature of these *voices* and how they differ from ordinary verbal thoughts, Hoffman, Varanko, Gilmore, and Kishara (2008) studied people with schizophrenia and schizoaffective disorders. They expected ordinary verbal thoughts to lack volume, and that AVHs would be voices not recognized as one's own. The differences they observed between the two phenomena suggested AVHs had peculiar content, were uncontrollable, and that their sound differed in tonality from participants' own voices. Surprisingly, though, the apparent volume of the sound of AVHs was only *occasionally* (or *never*) higher than that of thoughts; volume was not a distinguishing feature. Localization in space did not play a significant role in distinguishing thoughts from *voices* either.

Taking a different approach, Langdon, Jones, Connaughton, and Fernyhough (2009) proposed that if *voices* are inner speech erroneously attributed to others, then the two ought to have features in common. First, they compared the phenomenology of inner speech, understood as inner dialog in: a) people with schizophrenia or schizoaffective disorders presently exhibiting AVHs and in out-patient treatment; and b) control/healthy participants. They observed no differences between the two groups in terms of complete sentences versus loose words, speed of inner speech, or intelligibility. Nor were there significant differences in pragmatic features. Participants in the two groups used "I" (1st person) and "you" (2nd person)

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equally. In short, patients' inner language did not turn out to be strange. As for use of the 3rd person (he/she), only a low, statistically insignificant percentage of patients with AVHs reported this. Regarding vocal features, 38% of patients and 24% of healthy, control participants reported that *sometimes* their inner speech had the sound quality of a voice. Second, studying only individuals with AVHs, similarities were not found between inner speech and *voices*. For example, contrary to expectations, voices and inner speech showed no pattern of second or third-person pronoun use. There were no significant correlations in terms of frequency, velocity, volume, or intelligibility either.

In a study aiming to examine possible differential features of hallucinatory voices and other mental phenomena, Moritz and Larøi (2008) studied 160 participants (60 healthy controls, 55 people with obsessive compulsive disorder [OCD], and 45 with schizophrenia). They found that 20% of healthy participants, 31.7% of those with OCD, and 40% of those with schizophrenia reported that their thoughts had sound.

Mental health professionals generally assume AVHs sound like *real* sentences. From a cognitive standpoint, *voices* are inner speech erroneously attributed to external sources, but it has yet to be confirmed that inner speech has sound. From the perspective of perception, it could be said that since verbal hallucination is acoustic perception through an auditory sensory modality, inner speech as a psychological phenomenon should be soundless. However, the cognitive paradigm regards AVHs as thoughts. This raises the following consideration: AVH (*hearing voices*) is an experience akin to hearing sentences emitted by an actual speaker (Garrett & Silva, 2003). When people hallucinate and describe it as hearing voices, is that to say that those hallucinations have sound? ("I hear them the same as if you were speaking to me right now"). Furthermore, if the voices both have sound, and are thoughts (the cognitive hypothesis), does that mean thoughts have sound? If thoughts do not have sound, how could they possibly be confused with *voices* and be perceived as real? Would they not be harder to confuse?

The level of analysis employed here was individuals' subjective experiences with psychological phenomena. Strauss (1989) posited that advances in scientific understanding must incorporate quantitative methods and systematic, clinical observations focused on what patients say about their own experiences.

The present study's purpose was, first, to explore whether or not there are appreciable phenomenological differences between thoughts, real voices, and AVHs – in particular, a physical characteristic of the acoustic sensory modality: the volume (or intensity) of sound. Volume is how we distinguish strong sounds from weak sounds (Moliner, 1987), in other words, one's subjective perception of a given sound's strength. Comparing the volume with which people perceive thoughts, sentences spoken by a real person, and AVHs, respectively, would provide clues as to whether the phenomenological experience of people with AVHs is consistent with the perspective of perception (hallucinations are perceived as more like hearing real sentences than experiencing thoughts), or with the cognitive premise (hallucinations are perceived more like thoughts).

The study's second purpose is to analyze the reasons people with AVHs give for classifying a given cognitive phenomenon an auditory hallucination rather than an ordinary thought: the *voices'* content, the personal pronouns they use (2nd or 3rd person), a sense of non-intentionality, or the volume with which they hear them.

Method

Participants

This study's sample was made up of 137 participants in total. All consented to participate in the study, and their distribution was the following:

a) 37 people currently experiencing AVHs at the time of the study (*Sz-AVHs*).
b) 52 people not experiencing AVHs at the time of the study (*Sz-noAVHs*). Of those, 27 had never hallucinated before and 25 were not hearing voices at the time of the study, but had in the past (for at least one month).

All 89 individuals included in groups A and B met the diagnostic criteria for schizophrenia (F.20, CIE-10); their clinical histories indicated whether or not they had experienced AVHs. The two groups differed neither in age (averages: 38.32, $SD = 8.72$; and 36.94, $SD = 7.35$; $t = 0.80$, $p = .42$), years of treatment (averages: 15.97, $SD = 6.87$; and 14.08, $SD = 7.56$; $t = 1.21$, $p = .23$), nor gender distribution (31 and 36 men; 6 and 16 women; $\chi^2 = 2.46$, $p = .11$). Their mean total scores on the Social Functioning Scale (SFS; Birchwood, Smith, Cochrane, Wetton, & Copestake, 1990) showed no significant differences (95.44, $SD = 7.57$; and 93.98, $SD = 10.50$; $t = 0.61$, $p = .53$). On the Positive and Negative Syndrome Scale (PANSS; Kay, Fiszben, & Opler, 1987), significant differences were not observed on the Negative Syndrome subscale (13.07, $SD = 4.48$; and 12.56, $SD = 4.20$; $t = 0.44$, $p = .66$). However, on the Positive Syndrome subscale, the groups' means (14.32, $SD = 3.83$; and 9.74, $SD = 3.51$) did differ significantly ($t = 4.16$, $p = .001$). According to the PANSS item tapping hallucinations, Group A's average severity was 4.07 ($SD = 0.97$), which corresponds to moderate severity. All were

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receiving out-patient care at the "Virgen del Rocío" Mental Health Rehabilitation Unit in Seville, Spain, which provides psychological and pharmacological treatment.

c) 48 people from the general population, all healthcare professionals or their relatives. None was receiving psychological or psychiatric treatment and none suffered from auditory hallucinations, but during the interview in which the measurement instrument was administered, 37.5% reported having experienced them occasionally in the past (hearing their name or their baby crying). Group C's average age was 35.10 years-old (*SD* = 12.40; range = 18–66 years) and their gender distribution was 60.42% women and 39.58% men ($\chi^2 = 2.08$, $p = .14$).

Measurement Instruments

Cuestionario de Evaluación de Alucinaciones Auditivas (*CEAA*) (Auditory Hallucination Assessment Questionnaire). (Cuevas-Yust, Rodríguez Martín, Ductor Recuerda, Salas Azcona, & León Gómez, 2006). This questionnaire was created by experts on the items' subject matter to ensure its content validity. It was administered in the context of a semi-structured interview in two parts:

Part 1 assessed the volume with which respondents perceive the sound of: a) a real sentence spoken by the interviewer (*"esta tarde voy al cine"* ["I am going to the movies tonight"]); b) their memory of a sentence recently spoken by the interviewer; c) their memory of a sentence spoke by a relative or friend in the past; d) a thought of their own; and e) their hallucinatory *voices*. All items were independent and each was evaluated on a scale from 0 to 10 points where zero equates to silence and 10 to maximum volume.

Part 2 asked respondents how they experience the phenomenon of hallucination: a) localization as internal vs. external; b) gramatical form the *voices* used; c) beliefs about the identity and purpose of the *voices*; d) level of similarity to real sentences, respondents' own thoughts, and memories; e) identifying and indicating which of the following four aspects (respondents can choose one or more) enable them to differentiate the *voices* from ordinary thoughts: volume, content, the grammatical form with which they are heard – second or third person –, and whether or not respondents have a feeling of intentionality and ownership of them.

For the purposes of the present study, we chose data from Part 1 of the questionnaire assessing the volume of sounds: spoken by the interviewer (a), of people's own thoughts (d), and of hallucinatory voices (e). All three scales were applied a second time one week later to determine the instrument's reliability, which yielded significant, positive correlations: .79, .82, and .88, respectively ($p < .01$). From Part 2, we will present data about aspects the participants viewed as relevant to distinguishing ordinary thoughts from AVHs (e).

Data Analysis

The following groups were compared: Sz-AVHs, Sz-noAVHs, and general population. To conduct our data analysis, we employed the SPSS 15.0 statistical package. Since the study's variables were not normally distributed, non-parametric tests were applied. Accordingly, to draw comparisons at the intra-and inter-group levels, Wilcoxon's test for related samples was utilized, as well as the Kruskal Wallis and Mann-Whitney U tests for independent samples, calculating global alpha values.

Results

First, we found that 121 study participants (88.32% of the total sample) reported hearing their own thoughts. Table 1 displays the means, medians, and intervals of the values with which each of the three groups assessed the *thought volume* variable, as well as the number and proportion of participants who scored above zero (no sound).

Table 2 presents the arithmetic means, standard deviations, and medians of the volume of sound with which the three groups reported perceiving their own thoughts, and a sentence spoken by a real person. For respondents with AVHs, it also shows how they evaluated the *voices*' volume.

The hypotheses below were tested:

a) The three groups will differ in how much volume they perceive their thoughts, and a sentence spoken by a real person, to have.

Table 1. *Descriptive Statistics for the Thought Volume Variable*

Groups	*n*	*M* (SD)	*Mdn*	*Range*	*Thought* > 0 *n′ (percentage)*
General population	48	3.48 (2.02)	3.50	0–7	44 (91.66%)
No current AVHs + schizophrenia	52	2.94 (2.05)	3.00	0–7	42 (80.76%)
Current AVHs + schizophrenia	37	5.32 (2.67)	6.00	0–10	35 (94.59%)

n = number of participants in each group; *M* (*SD*) = mean and standard deviation; *Mdn* = median; *range* = range of thought volume; *n′* = number (and percentage) of participants who assessed thought volume as greater than zero.

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Table 2. *Volume of the Sound of Thoughts, Real Sentences, and Auditory Verbal Hallucinations*

Groups	*n*	Thoughts		Real Sentences		AVHs	
		M (*SD*)	*Mdn*	*M* (*SD*)	*Mdn*	*M* (*SD*)	*Mdn*
General population	48	3.48 (2.02)	3.50	4.19 (1.23)	4.00	n.s.	n.s.
No current AVHs + schizophrenia	52	2.94 (2.05)	3.00	4.12 (1.55)	4.00	n.s.	n.s.
Current AVHs + schizophrenia	37	5.32 (2.67)	6.00	4.54 (1.62)	5.00	5.59 (2.45)	6.00

Note: N = number of participants in each group; AVHs = auditory verbal hallucinations; *M* (*SD*) = mean and standard deviation; *Mdn* = median; n.s.= non-significant.

The results of the Kruskall-Wallis test indicated significant differences on the *thought volume* variable ($\chi^2 = 19.00$, $p = .001$), but not on the *real sentence volume* variable ($\chi^2 = 1.49$, $p = .47$). Therefore, to further examine thought volume, we next applied the Mann-Whitney U test for independent samples comparison, obtaining the following results.

- Our comparison of the general population and Sz-noAVHs groups revealed no significant differences ($U = 1{,}062.00$, $p = .19$).
- Our comparison of the general population and Sz-AVHs groups did yield significant differences ($U = 519.00$, $p = .001$). Likewise, our comparison of the two schizophrenic groups – with and without AVHs – also showed significant differences ($U = 471.50$, $p = .001$). In both of those comparisons, AVH participants' thoughts were perceived with higher volume.

b) The general population group will experience their thoughts with lower volume than sentences spoken by a real person.

Comparing these variables indicated significant differences ($Z = -2.04$, $p = .04$) such that real sentences' volume was higher than thoughts' volume.

c) The Sz-noAVHs group will experience their thoughts' sound as lower-volume than sentences spoken by a real person.

Comparing the two variables produced significant differences ($Z = -3.09$, $p = .002$). Real sentence volume was indeed higher than thought volume.

d) The Sz-AVHs group will notice no volume difference in the sound of their ordinary thoughts, AVHs, and sentences spoken by a real person.

Per the results of Wilcoxon's test, measures of sound volume showed no significant differences when verbal hallucinations and thoughts were compared ($Z = -0.622$, $p = .53$), nor when thoughts and real sentences were compared ($Z = -1.70$, $p = .89$). In other words, their sound had the same strength. Nonetheless, significant differences were observed when verbal hallucinations and real sentences were compared ($Z = 2.60$, $p = .009$); hallucinations sounded higher-volume.

As mentioned above, the Sz-noAVHs group included some individuals who had hallucinated in the past, so in the interest of drawing comparisons to the Sz-AVHs group, we categorized them into two subgroups: with a history of hallucination, and without. Regarding the thought volume variable, the means and medians displayed in Table 3 show that it gradually increased: least in people with no history of AVHs ($M = 2.48$ and $Mdn = 3.00$) followed by those with a reported history of AVHs ($M = 3.44$ and $Mdn = 3.00$), and most in people currently experiencing hallucinations, who scored highest ($M = 5.32$ and $Mdn = 6.00$). The results of the Kruskall-Wallis test indicated significant differences ($\chi^2 = 18.74$, $p = .001$). Next, applying the Mann-Whitney U test yielded the following results:

Table 3. *Descriptive Statistics of Thought Volume in Patients with and without Hallucinations (also with and without a History of Voices)*

Groups	*n*	Thought Volume	
		M (*SD*)	*Mdn*
No current AVHs. Schizophrenia with no prior history of *voices*	27	2.48 (1.71)	3.00
No current AVHs. Schizophrenia with prior history of *voices*	25	3.44 (2.29)	3.00
Current AVHs and schizophrenia	37	5.32 (2.67)	6.00

Note: n = number of participants in each group; *M* (*SD*) = mean and standard deviation; *Mdn* = median.

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- The two Sz-noAVHs subgroups (with and without a history of AVHs) were compared, but no significant differences were found (U = 262.500, p = .16); their thoughts sounded the same.
- Significant differences were, however, discovered when we compared thought volume in the Sz-noAVHs subgroup with a history of hallucination to the SZ-AVHs group (U = 276.00, p = .007). Significant differences were also found when we compared thought volume in the Sz-AVHs subgroup with no history of hallucination to the Sz-AVHs group (U = 573.50, p = .001).

e) Finally, using Part 2 of the questionnaire, we collected data on what aspects people currently experiencing verbal hallucinations use to discern their AVHs from ordinary thoughts. As mentioned above, the 37 individuals with AVHs could select one aspect or more (volume, content, etc.); the choices were not mutually exclusive. Table 4 displays how many participants chose each aspect as relevant.

Discussion

This study's level of analysis was experience from participants' point of view, first-hand experience. Note that ultimately, they are the only ones who can explain, in their own words, what they experience in both their outer and inner worlds (feelings, sensations, thoughts, images, *voices*).

While this study had certain methodological limitations, it employed an interesting approach to determining how people experience cognitive phenomena. It is important not to forget that in the clinical sector, we largely draw conclusions about patients' psychopathology based on their verbal reports. Hence we identify that one has AVHs when they say "I hear voices that insult me" (no need to measure the voices in decibels), or thought insertion if they report that "strange thoughts are put in my head through telepathy," meanwhile establishing that they have no sound, that they do not actually hear them.

We first found that people reportedly experience their thoughts as having sound. That is how almost 90% of participants described their experience, which is much higher than the 31% reported by Langdon et al. (2009) and the 30.56% observed by Moritz and Larøi (2008). This suggests sonority may be a defining feature of how people experience their thoughts, as a sort of inner language. If that is the case, it could open up a new field of study, one of phenomenological experience in relation to the volume of "thought sound." In actuality, no definition of thought refers to its sound, or lack thereof – subjectively- although it could be implicitly assumed to be silent.

The fact that all three groups in the study, members of the general population and people diagnosed with schizophrenia (with and without current, verbal hallucinations), reported the phenomenological experience of thoughts having volume is consistent with the idea that sonority of thought is not a distinct feature of psychopathological states. Now did the three groups perceive their thoughts with similar acoustic volume, or did they differ? We compared non-disordered participants to ones diagnosed with schizophrenia but currently without AVHs, and found no significant differences between them. However, when each of those groups was compared to people currently experiencing hallucinations, significant differences emerged. In those cases, current hallucinators' thought volume was higher, their sound significantly stronger. Therefore, more sonorous thought is not associated with a diagnosis of schizophrenia, but rather the presence of AVHs. Conversely, when actual auditory perceptions (sentences) were subjectively evaluated, no appreciable differences were found between the three groups. They heard the sound of sentences spoken by a real person with similar volume.

Comparing real sentence volume to thought volume in each group, significant differences again occurred. For non-disordered people and patients without AVHs, the sentences sounded louder than their thoughts, while for people with AVHs, sentences and thoughts sounded the same. What to make of this? We propose that hearing external sentences with greater volume

Table 4. *Differential Aspects of AVHs and Thoughts*

Variables	*n*	Percentage
No sense of agency ("I don't say them, they aren't mine")	24	64.86%
V*oices*' content ("They say bad things I don't agree with")	24	64.86%
Grammar structure ("I don't use the 2nd or 3rd person when thinking about myself; that's the voices. I use the 1st person")	14	37.83%
Difference in the volume with which I hear *voices*/thoughts	11	29.72%

Note: n = number of patients with auditory hallucinations who chose each variable.

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than thoughts facilitates source discrimination; conversely, hearing them with the same volume "facilitates" confusion in source discrimination. Similarly, we found that in terms of volume, the Sz-AVHs group's hallucinatory voices did not differ from their thoughts, but did differ from real, external sentences. The real sentence was actually significantly lower-volume than verbal hallucinations. This is consistent with the source confusion hypothesis. In this case, not only did inner events not have less volume than real auditory perceptions; they actually surpassed their volume.

With regard to the Sz-noAVHs group, it included some who had never hallucinated and others with a history of AVHs. Average thought volume in the subgroup with no prior history of AVHs (2.48) was lower than the subgroup with a history of AVHs (3.44). While that difference was not statistically significant, it is important to report that in the subgroup with a history of AVHs, we could not control for the "time without hallucination variable." This is meaningful because surely, a five-year period with no hallucinations is not the same as a five-month such period. Perhaps wide variability in those data is to blame for the lack of statistical significance. On the other hand, in both other groups, average thought volume was significantly lower than in the Sz-AVHs group ($M = 5.32$). That might suggest a gradual decrease in thoughts' perceived sound from hallucinatory states to non-hallucinatory states. Hence, a reported cease in hallucination should coincide with a drop in intensity in the sonority with which people experience thoughts. Conversely, the transition from non-hallucinatory states to hallucinatory states would be accompanied by an increase in the volume with which thoughts are "heard."

However, why would patients report perceiving their thoughts with greater intensity/sonority in periods of hallucination? We know that, generally speaking, people with mental disorders pay attention to perturbing inner events, become more conscious of them (Ingram, 1990). Specifically, hallucinations might be understood as an example of hyperreflexivity, or exaggerated self-awareness associated with a ruptured sense of "myness" (Pérez-Álvarez & García-Montes, 2006). By the same token, a direct link has been found in active hallucinators between AVHs' strength and self-focused attention (Morrison & Haddock, 1997; Perona-Garcelán et al., 2008). Like other cognitive experiences, auditory hallucinations activate the so-called cognitive attentional syndrome, one feature of which is extending intense, inflexible attention to inner events (Wells, 2007). We speculate that this type of personal context, which involves excessive self-consciousness about inner events, tends to heighten perceived sonority.

On the whole, the present study's finding that thoughts and AVHs have similar volume does not contradict the existing cognitive hypotheses about hallucinations; it supports them, in fact. Perceptual alterations do occur and thoughts become gradually louder, but that does not mean such alterations represent a breakdown in perceptual systems. On the contrary, the data suggest – but do not definitively confirm – that thoughts' intensity returns to pre-hallucination levels during periods of non-hallucination.

In keeping with cognitive hypotheses, we believe auditory hallucination is confusion about the source of inner information. Thoughts in the form of inner speech, auditory images, or memories (Seal, Aleman, & McGuire, 2004) are attributed to an agent outside oneself. We propose one factor that might be involved in this postulated confusion is increased thought volume. When it reaches similar levels to that of real, external speech (always in conjunction with other physiological variables [heightened stress or arousal] and psychological variables [self-focused attention and metacognition]), it becomes easy for certain thoughts or auditory memories (unacceptable or painful) to be perceived as others' voices (they have sound, are not experienced with myness, and there is no identification with their content). If one does not distinguish between the acoustic volume of thought – an inner event – and a real sentence – an external event – it stands to reason that a person could sometimes be unable to discriminate their own thoughts from hallucinatory voices.

Likewise, we think that if the volume of thoughts and AVHs had been perceived with significantly different sonority, making it easier to distinguish between the two, we would have assumed that rather than erroneous attribution of inner speech to an external source, two qualitatively distinct phenomena had occurred. This would have been inconsistent with the cognitive perspective on *voices*. Hence, experiencing a thought as not one's own and as lower-volume than real auditory perceptions, while it might seem strange, could not be referred to as *hearing voices*.

We believe that in the general population and among people with schizophrenia not experiencing hallucinatory voices, thoughts will manifest with lower volume than sentences spoken by real people. Furthermore, we believe thought volume will be higher in people with AVHs. On the other hand, active hallucinators will perceive AVHs, thoughts, and sentences spoken by other people, who are physically present, with similar volume.

As for the question posed here to hallucinating patients, what aspects they find most pertinent to discriminating thoughts from *voices*, we found they most often referred to experiencing voices as involuntary intrusions associated with no feeling of myness, and with unacceptable content (due to dissonance from

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one's metacognition). That is all coherent with models proposed by Frith and Morrison. On the other hand, the finding that most hallucinating participants rejected the notion that their *voices*' volume helped them discriminate thoughts from hallucinations, in keeping with the findings of Hoffman et al. (2008), was consistent with other data collected in the present study about the *statistical equivalence* of assessments of the two variables' volume.

According to the body of theory on inner speech and AVHs, inner speech and hallucinations ought to have phenomenological similarities (Langdon et al., 2009). We found there were also differences in how the two phenomena were interpreted. For example, if a person believes "we can only make reflections in first-person" (almost 38% of our sample), when they are aware of a sentence being in second or third-person, it would be harder to recognize as one's own. At the same time, inner language and *voices* could be said to share a phenomenological feature, the perception of heightened sonority, which does not facilitate discrimination.

We are conscious of this study's limitations. Some were due to the realities of conducting research in the context of day-to-day clinical practice; hence all evaluations were conducted by the author of this paper. Next, regarding the real sentence the researcher verbalized to each patient ("I am going to the movies tonight"), surely it was not always spoken with the same volume. In addition, presenting a 10-point scale where one option (-0-) pertained to silence might have influenced participants to respond that their thoughts had sound (then again they also recognized their sonority as similar to the AVHs they were experiencing). Finally, in the general population group, it must be stated that we did not establish the absence of mental pathology through regulated assessment, which is yet another limitation.

We consider these conclusions speculations and, above all, suggestions to researchers conducting new studies that examine psychotic phenomena based on individuals' direct experiences. It would be interesting to explore whether larger samples from the general population would refer to thoughts as having sound, and to try and replicate these findings in patients diagnosed with schizophrenia (with and without AVHs), receiving in-patient as well as out-patient treatment, and in people with other diagnoses and AVHs. It would also be intriguing to study the acoustic quality of thought in people suffering from emotional disorders characterized by self-focused attention mechanisms such as anxiety disorders (Wells & Matthews, 1994) and, more specifically, obsessions.

One possible application of these findings to consider using in clinical treatment of people with psychotic disorders, is to consider the thought volume variable continuously throughout assessment. If it increases, that could predict a segue into a period of hallucination, which in terms of treatment, has certain consequences. Conversely, a drop in thought volume could denote remission in *voices*' severity. In any case, this could be a new topic for investigation, to conduct longitudinal research with follow-up measures in people diagnosed with schizophrenia, with and without *voices*, and observe any changes in how they experience their thoughts' sound during transitions from non-hallucinatory phases into hallucinatory phases, and vice versa. Taking phenomenological aspects into account could boost our understanding of the cognitive hypothesis surrounding thoughts and auditory verbal hallucinations.

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