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ORIGINAL ARTICLE

The Voice of Depression: Prevalence and Stability Across Time of Perception-Laden Intrusive Thoughts in Depression

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Abstract

Intrusive depressive thoughts are typically defined in terms of their content, frequency, and pervasiveness. The extent to which they carry sensory properties is largely unexplored. In a pilot study, 56.5% of individuals with mild to moderate depressive symptoms experienced depressive thoughts with sensory features. The present study explored the prevalence of sensory thoughts in patients with severe depression and examined the stability of the sensory phenomena across time. A total of 163 participants with severe depression completed an online assessment at baseline and 3 months later. Diagnostic status was established at baseline over the telephone. The primary outcome was the Sensory Properties of Depressive Thoughts Questionnaire (SPD). The frequency of sensory properties of negative thoughts was similar (60.7% reported at least one sensory irritation; thus, 39.3% of the sample reported not a single, even mild sensory irritation) to the pilot study. The highest prevalence was observed for bodily sensations (41.1%; pilot: 39.6%) followed by auditory (37.4%; pilot: 30.6%) and visual (31.3%; pilot: 27.2%) perceptions. Prevalence remained essentially unchanged over time, but test–retest reliability was weak to moderate ($r = .56$). Unlike in the pilot study, no association emerged with quality of life and suicidality. Yet, those reporting sensory phenomena were prescribed more medication, had a similar number of prior hospitalizations despite their younger age, were more frequently in psychotherapy (statistical trend), and had more pain symptoms, which tentatively suggests a more complicated course of illness. Replication in independent samples is needed. Our findings support the notion that depressive thoughts are not "silent" but are commonly accompanied by sensory experiences.

Keywords Depression · Hallucinations · Intrusions · Sensory irritations

No, Lisey. It was her own mind that sent the thought up (of this she was positive) like a flare into a dark sky (well… almost positive), but it came to her in Scott's voice. As if it would gain authority that way. (p. 307) —Stephen King, Lisey's Story: A Novel.

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Introduction

Sensory irritations are phenomena at the border of cognition and perception. Mild forms are source confusion (e.g., confusing whether one has experienced or imagined certain events) and vivid imagination; the most severe form is a hallucination. The present article primarily addresses the former type of experiences. However, to delineate similarities and differences across different forms of sensory irritations we will begin with hallucinations, which the American Psychiatric Association defines as "perception-like experiences that occur without an external stimulus. They are vivid and clear, with the full force and impact of normal perceptions, and not under voluntary control" (APA 2013, p. 87). According to this notion, hallucinations cannot be distinguished from real perceptions (e.g., hearing another person's voice during a conversation) based on their perceptual properties and authenticity. Yet, evidence indicates that in a large subgroup of individuals, hallucinations may lack core features of real perceptions (Moritz and Larøi 2008; Woods et al. 2015).[1] To illustrate, for many voice-hearers, the voices are hardly audible, are at least partly under control, and are experienced with little sense of authenticity (e.g., the voice sounds like a robot).

Another observation complicates the distinction between externally and internally generated perceptions and imagery even further: thoughts—that is, mental acts that the holder attributes to him- or herself (unlike in hallucinations)—can sometimes also carry sensory properties as in the introductory example from the Stephen King novel. In three studies (Moritz et al. 2014a, 2018b; Röhlinger et al. 2015), we demonstrated that approximately three out of four patients with obsessive–compulsive disorder (OCD) with no comorbid psychotic disorder experienced obsessions along with sensory phenomena. In the first study (Moritz et al. 2014a), this was correlated with low insight, indicating that the more compelling the obsession, the less the individual is able to dismiss the experience as meaningless or even absurd. In a follow-up study (Moritz et al. 2018b), the degree to which these thoughts were accompanied by sensory input predicted the severity of subsequent compulsive behavior. This result is noteworthy because factor analyses usually suggests that the severity of obsessions shows little relationship to the severity of compulsions (Boyette et al. 2011; Goodman et al. 1989; Kim et al. 1994; Moritz et al. 2002); a single or short obsession can trigger an *avalanche* of compulsive behavior, whereas—especially at the onset of the disorder—long and severe obsessive thoughts may trigger only short and rare rituals, if any. This suggests that it is not necessarily the content that determines the extent of compulsions but rather the degree to which the thought has sensory properties and is perceived as realistic.

For depression, sensory thoughts have mainly been studied in terms of vivid mental imagery, which is common in mood disorders (Holmes et al. 2007; Newby and Moulds 2012; Patel et al. 2007; Pearson et al. 2008; Williams and Moulds 2008) and which seems to elicit more anxiety than verbal thoughts do (Holmes and Mathews 2010). In a prior study examining individuals with mild to moderate depression (Moritz et al. 2014b), we found sensory intrusive thoughts in 56.5% of participants, particularly in the domain of bodily sensations (39.6%), followed by auditory (30.6%) and visual (27.2%) perception-like experiences (the latter two rates did not differ significantly in prevalence). Most (62%) of these participants experienced sensory-laden depressive thoughts through at least two sensory channels. Patients with sensory perceptions were more symptomatic and had a more severe course in terms of more depressive episodes and more inpatient treatments. Of note, suicidality was significantly higher in the sensory perceptions group based on the relevant item of the Mini International Neuropsychiatric Interview (MINI; Sheehan et al. 1998); on the Suicidal Behavioral Questionnaire-Revised (SBQ-R; Osman et al. 2001), the relationships achieved a trend at a small effect size. The depressive symptoms that were most consistently (i.e., verified by both self-report and expert ratings) associated with sensory intrusions were agitation and motor retardation (Moritz et al. 2014b).

Distinguishing among normal thoughts, (pathological) sensory-laden intrusions, and psychotic hallucinations is important for diagnostic purposes, particularly to prevent misdiagnoses, as hallucinations are considered cardinal symptoms of schizophrenia. Particular caution is warranted before applying this diagnosis given the grave implications for treatment decisions (e.g., antipsychotic medication with potentially severe side effects), prognosis, and social relationships (since the diagnosis may induce a high degree of stigma and self-stigma; Xu et al. 2016). Even though hallucinations and other positive symptoms are common in the general population (Maijer et al. 2018), especially in children and adolescents (approximately 12%), the core psychotic syndrome is present in only 1–2% of the population. Thus, most individuals who experience sensory-laden thoughts or even isolated psychotic symptoms will not develop schizophrenia, pointing once more to the importance of careful differential diagnosis.

Our prior findings with depressed patients are limited by a number of factors (Moritz et al. 2014b). First, the results were obtained cross-sectionally, and thus the stability and reliability of the phenomena could not be explored. Second, the pilot study included only mildly to moderately depressed individuals. To learn about the generalizability

[1] For auditory hallucinations, these core properties are often referred to as the four A's: acoustic, alien, authentic, autonomous.

of our findings, the present study focused on patients with severe depression. We hypothesized that the prevalence of sensory depressive thoughts would be higher in this sample of patients with severe depression in comparison to those with mild to moderate depression we had previously studied. In addition, based on results obtained in OCD patients, we expected a small but significant relationship with suicidality and a more severe course of illness.

Methods

The present study was part of a larger project that encompassed two randomized controlled trials (RCT) examining the effectiveness of a psychological online intervention offered adjunctively to a care-as-usual (CAU) condition versus a CAU-only control condition (Klein et al. 2016; Meyer et al. 2015). The primary RCT (Klein et al. 2016) considered participants with mild to moderate depression on the PHQ-9 (score 5–14). Those with higher symptom severity (PHQ-9 > 14) were excluded from this trial but were invited to take part in a second RCT (Meyer et al. 2015). Data for the present analyses were drawn solely from the second study ($N = 163$). No constraints were imposed as to concurrent treatments, including pharmacological and psychological therapy as well as self-help. Patients with depressive symptoms were recruited from a broad range of settings, including outpatient and inpatient treatment facilities and online forums, and through databases of health insurance companies and newspaper advertisements (Klein et al. 2016).

Exclusion criteria in both studies were as follows: a history of psychosis or bipolar disorder (as determined by a telephone interview), age younger than 18 or older than 65 years, and acute suicidality (as determined by a telephone interview). Ability to read German and written informed consent were also mandatory. Assessments were conducted online and via telephone; no face-to-face contact was required to allow low-threshold inclusion. After providing informed consent, participants were asked to complete several questionnaires online that included information on demographic and treatment-related variables (e.g., number of prior episodes, medication). Following this, they were contacted for a diagnostic telephone interview that included the MINI. Subsequently, participants were randomly allocated to either CAU plus deprexis, an online depression intervention that has been shown to be effective in several trials (Meyer et al. 2009; Twomey et al. 2017), or to CAU only (these participants were sent a voucher for the online program at the end of the study). Three months after randomization, individuals were asked to participate in a follow-up assessment ($n = 134$). In this follow-up assessment, we administered the same scales as in the baseline survey. The data of this study do not overlap with any study conducted by our group on sensory sensations.

The MINI (Sheehan et al. 1998) was employed, which allowed to verify the presence of a current major depressive episode (MDE) or dysthymic disorder (APA 2013; DSM-IV criteria). The interviews also served to confirm the absence of schizophrenia, bipolar disorder, or acute suicidality. All clinician ratings were conducted via telephone by trained raters. These were mostly psychologists (M.Sc.) but also included university students majoring in psychology or medicine. Further details are provided in the main article (Meyer et al. 2015).

The study complied with the Declaration of Helsinki and was approved by the ethics committee of the German Psychological Association (DGPs, reference numbers SM 042012 and 122012). The trial was entered in an international trials registry (NCT02178631 at ClinicalTrials.gov). For the present study, we looked at the baseline and follow-up assessments.

Sensory Properties of Depressive Thoughts Questionnaire (SPD)

The SPD is derived from the Sensory Properties of Obsessions Questionnaire (SPOQ; Moritz et al. 2014a). Both the SPOQ and SPD show good internal consistency [Cronbach's alpha: .76 (SPD) and .81 (SPOQ)]. Presently, the test–retest reliability has only been determined for the SPOQ, and it is acceptable (4 weeks: $r = .74$). Whereas the SPOQ relates to obsessive thoughts (e.g., fear of harming one's children, worrying about transmitting a disease), the SPD explores the sensory properties of depressive thoughts and ruminations. Individuals are instructed as follows:

> Depressive thoughts and ruminations are sometimes described by patients as very strong thoughts that are hard to get rid of but are still just perceived as strong thoughts. Some individuals also report sensory or bodily sensations associated with depressive thoughts and ruminations. An example of an auditory sensation would be hearing an "inner critic" who seems to have an actual voice and may call you a "loser." An example of a visual sensation would be literally seeing (in the "mind's eye") a feared catastrophe taking place. Tactile (touch), bodily (physical), and olfactory (smell) sensations can also occur. Are your depressive thoughts sometimes associated with such sensations?

Participants responded on a five-point response scale (no, weak, medium, strong, and extreme) for five modalities (visual, auditory, tactile (touch), bodily (physical sensations), olfactory (smell), and other). We also posed an open-text question: "If you can perceive your depressive thoughts and ruminations in a sensory way, please describe this."

Web Screening Questionnaire (WSQ)

The WSQ contains 15 self-report items for common mental disorders (Donker et al. 2009). Adequate diagnostic validity has been verified for social phobia, panic disorder with agoraphobia, agoraphobia without panic disorder, OCD, and alcohol abuse/dependence (Donker et al. 2009). Psychometric properties were modest for major depressive disorder, generalized anxiety disorder, post-traumatic stress disorder, specific phobias, and panic disorder without agoraphobia (Donker et al. 2009).

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a self-report measure of depressive symptoms (Gräfe et al. 2004; Kroenke et al. 2001; Löwe et al. 2004; Martin et al. 2006). Its validity and reliability are well established (Kroenke et al. 2010).

Quick Inventory of Depressive Symptomatology (QIDS)

The QIDS is a 16-item scale designed to assess the severity of depressive symptoms (Rush et al. 2003) according to DSM criteria (Rush et al. 2003).

Generalized Anxiety Disorder-7 (GAD-7)

The GAD-7 assesses symptoms of generalized anxiety disorder (Spitzer et al. 2006). The GAD-7 shows high external validity and internal consistency and has good sensitivity and specificity for the detection of generalized anxiety disorder as well as panic disorder, social anxiety disorder, and post-traumatic stress disorder (Kroenke et al. 2010). The GAD-7 is often used as a generic measure of anxiety.

Patient Health Questionnaire-15 (PHQ-15)

The PHQ-15 assesses somatic complaints (Kroenke et al. 2002) that are commonly encountered in the primary care context and in the general population. The psychometric properties of the scale are adequate; internal consistency, convergent validity and sensitivity to change are all good (Kroenke et al. 2010). The PHQ-15 has been employed as a measure of somatic symptom severity as well as possible somatization (Kroenke et al. 2002, 2010).

Short Form Health Survey-12 (SF-12)

The SF-12 assesses health-related quality of life (Ware et al. 1996). Psychometric properties, including test–retest reliability, internal consistency, and validity are good and are comparable to the longer version, the SF-36 (Gandek et al. 1998; Jenkinson et al. 1997). Both a physical and a mental health index can be derived from the SF-12. The SF-12 subscale scores (mental health and physical health) are calculated by comparing them to a norm population with a mean score of 50 and a standard deviation of 10.

Suicide Behaviors Questionnaire-Revised (SBQ-R)

The SBQ-R assesses suicidal thoughts and behavior (Osman et al. 2001), and contains four items. The internal consistency of the SBQ-R is good (Osman et al. 2001).

Other scales pertaining to the efficacy of the online intervention were not considered for the present analysis. The reader is referred to the original publication on deprexis (Meyer et al. 2015).

Results

All participants showed severe depressive symptoms as evidenced by the PHQ-9 (Table 1). A total of 60.7% ($n = 99$; 95% CI 53.2–68.2%) displayed sensory sensations, while 39.3% ($n = 64$; 95% CI 31.7–46.8%) did not report a single, even mild sensory sensation. If bodily sensations are not counted (these are sometimes confused with body reactions to, for example, fear), approximately half of the individuals ($n = 83$, 50.9%; 95% CI 43.3–58.6%) showed perception-laden depressive thoughts. Stability of the phenomena ($M_{pre} = 3.00$ (SD = 3.73), $M_{follow\text{-}up} = 2.85$ (3.54), $t(60) = 0.33$, $p = .742$) and internal consistency were rather high (for both, Cronbach's $\alpha = .75$ for baseline and follow-up assessments). However, the 3-month test–retest reliability was weak to modest ($r = .56$, $p < .001$). The prevalence of sensory properties with depressive thoughts was highest for bodily sensations (bodily: 41.1%; 95% CI 33.6–48.7%, auditory: 37.4%; 95% CI 0.30–0.45%; visual: 31.3%; 95% CI 24.1–38.4%, tactile: 19.6%; 95% CI 13.0–25.0%, olfactory: 13.5%; 95% CI 8.3–18.7%, other: 3.7%; 95% CI 0.8–6.6%). All pairwise comparisons were significant ($p < .05$) except between the bodily and auditory ($p = .249$) and between the tactile and olfactory modalities ($p = .673$; for more details and a comparison of results with the pilot study see Table 2).

Table 1 shows the demographic and clinical characteristics of the sample, split according to the presence versus absence of sensory intrusive thoughts (i.e., binary variable: at least 1 point on the SPD vs. not even a single mild sensory sensation). The two groups differed on a number of treatment-related variables. Those with sensory intrusive thoughts were prescribed medication more often (antidepressants and tranquilizers), had more somatic complaints (a higher score on the PHQ-15), were in psychotherapeutic treatment more frequently (statistical trend), and showed more avoidance (assessed with

Table 1 Demographic and clinical variables

	With sensory properties (n = 99)	Without sensory properties (n = 64)	Statistics (df = 161)
Demographic variables			
Gender (female, male) [% female]	76/23 [76.8%]	46/18 [71.9%]	$\chi^2(1) = 0.48$, $p = .482$
Age in years	25.77 (11.25)	32.03 (10.60)	$t = 3.55$, $p = .001$, $d = 0.57$
Education (lower, middle, higher, highest secondary, other[a])	4/24/19/50/2	3/13/7/40/1	$\chi^2(1) = 3.02$, $p = .554$
Psychopathology and quality of life			
QIDS sleep	2.18 (0.75)	2.55 (0.75)	$t = 3.03$, $p = .003$, $d = .493$
QIDS appetite	1.90 (1.02)	1.61 (1.14)	$t = 1.69$, $p = .093$, $d = .268$
QIDS psychomotor	1.34 (0.96)	1.22 (1.00)	$t = 0.80$, $p = .427$, $d = .122$
QIDS total	15.83 (3.79)	15.47 (3.96)	$t = 0.58$, $p = .562$, $d = .092$
PHQ-9	17.07 (3.76)	16.69 (3.52)	$t = 0.65$, $p = .516$, $d = .104$
GAD-7	12.88 (3.72)	13.80 (3.96)	$t = 1.50$, $p = .135$, $d = .239$
SPQ-R	5.21 (3.54)	4.87 (3.47)	$t = 0.60$, $p = .550$, $d = .096$
Avoidance [WSQ; yes in %]	52/47 [52.5%]	16/48 [25.0%]	$\chi^2(1) = 12.11$, $p = .001$
Fear of specific objects and situations [WSQ]	66/33 [66.7%]	22/42 [34.4%)	$\chi^2(1) = 16.32$, $p < .001$
PHQ-15	12.19 (4.31)	10.23 (4.48)	$t = 2.79$, $p = .006$, $d = .445$
SF-12 physical	43.51 (10.93)	46.18 (9.88)	$t = 1.58$, $p = .115$, $d = .256$
SF-12 mental	25.88 (6.96)	24.30 (7.39)	$t = 1.38$, $p = .169$, $d = .220$
Treatment and course			
Number of episodes	9.25 (7.54)	8.25 (7.19)	$t = 0.84$, $p = .400$, $d = .135$
Psychotherapeutic treatment (yes, no) [% in treatment]	59/40 [59.6%]	29/35 [45.3%]	$\chi^2(1) = 3.19$, $p = .074$
Antidepressant medication (yes, no) [% yes]	59/40 [59.6%]	25/39 [39.1%]	$\chi^2(1) = 6.56$, $p = .010$
Tranquilizers (yes, no) [% yes]	18/81 [18.2%]	3/61 [4.7%]	$\chi^2(1) = 6.31$ $p = .012$

GAD-7 Generalized Anxiety Disorder-7, *PHQ-9* Patient Health Questionnaire-9 (PHQ-9), *PHQ-15* Patient Health Questionnaire-15, *QIDS* Quick Inventory of Depressive Symptomatology, *SF-12* Short Form Health Survey—12, *SBQ-R* Suicide Behaviors Questionnaire-Revised, *WSQ* Web Screening Questionnaire

[a]Secondary education is classified based on the German educational system: "Hauptschule" ("lower," 9 years), "Realschule" ("middle," 10 years), "Fachhochschulreife" ("higher," 12 years), "Abitur" ("highest," 12 or 13 years)

Table 2 Percentage of sensory perceptions as measured with the SPD questionnaire (in descending order of prevalence; results from pilot study in square brackets)

Sensory channel	None	Weak	Medium	Strong	Extreme
Bodily	58.9 [60.4]	12.3	12.3	13.5	3.1
Auditory	62.6 [69.4]	15.3	7.4	11.7	3.1
Visual	68.7 [72.8]	14.7	9.2	5.5	1.8
Tactile	80.4 [86.2]	8.6	6.7	2.5	1.8
Olfactory	86.5 [87.4]	3.1	3.1	4.9	2.5
Other	96.3 [95.2]	0.6	–	3.1	–

the WSQ). In addition, they reported a similar number of depressive episodes despite their much younger age. The two groups did not significantly differ in terms of gender distribution, overall depression symptom severity, suicidality, quality of life, or general anxiety. Of note, patients with no perception-laden thoughts complained more about worse sleep. Importantly, all significant results remained when the analyses were repeated after removing the bodily sensations item.

In addition to the binary comparisons, we also calculated correlations. Sensory sensations were significantly correlated with depressive symptoms, as assessed with the QIDS ($r = .193$, $p = .014$) and the PHQ-9 ($r = .167$, $p = .033$). A significant relationship also emerged with the PHQ-15 ($r = .458$, $p < .001$) as well as lower physical well-being ($r = -.225$, $p = .004$); for number of episodes the correlation achieved a statistical trend ($r = .143$, $p = .068$). No significant correlations emerged for the other variables and there were also no relationships with course of symptom severity (difference score for QIDS and PHQ-9 over time). Since we did not see significant relationships between those with and without sensory irritations on the PHQ-9 and the QIDS, we followed up on the results and tested different cut-offs. Individuals with a SPD score of at least 8 showed significantly higher depression as measured with the PHQ-9 than those below ($p < .05$; for the QIDS the significant cut-off was 3 or more vs. 2 or less). Finally, we aimed to confirm

a prior finding showing an association between agitation/motor retardation with SPD. Indeed, PHQ-8 (agitation/motor retardation) and QIDS item 15 (motor retardation) were correlated with SPD ($r = .20$, $p = .011$; $r = .27$, $p = .001$). Yet, after correcting for multiple analyses, the correlational differences to other items were not significant.

Discussion

The present study confirmed a high prevalence of sensory properties in individuals with depressive thoughts. The prevalence rate was 60.7% and thus only slightly higher than the 56.5% observed in the pilot study (Moritz et al. 2014b) with less severely depressed patients. This rate is lower than rates reported in patients with OCD, where sensory intrusions can be observed in three out of four patients. This discrepancy may arise because intrusive thoughts are a defining feature in OCD but not in depression, where a subgroup of patients, such as older adults, may suffer from physical symptoms rather than intrusive thoughts (Cahoon 2012). As in the pilot study, the most prevalent sensory channels were bodily, auditory, and visual sensations. Prevalence across time was stable. Internal consistency was relatively high, as in the pilot study. Test–retest reliability was low, for which at least two explanations seem plausible. First, this may reflect methodological problems of the scale, which taps each phenomenon with a single item only. Second, sensory properties may naturally fluctuate over time or may change during the course of treatment.

As we noted earlier, despite similar scores for those with and without sensory sensations on depression, general anxiety, and quality of life, there is tentative evidence that sensory intrusions may be associated with a more complicated course of illness but not with higher symptom severity per se. Patients reporting sensory intrusions received more medication, had a similar number of depressive episodes despite their younger age, reported more somatic complaints, and (at trend level) were more often currently receiving psychotherapeutic treatment. Importantly, these results were still observed after removing the bodily item of the SPD to address the concern that bodily sensations may reflect arousal or stress rather than core perceptual experiences (Moritz et al. 2018b). Interestingly, there were small but significant correlations between SPD and depression (PHQ-9 and QIDS total scores) and when a different cut-off was set instead of the presence versus absence dichotomy, those scoring high on the SPD also showed higher depression. Whether the new cut-off of 8 points on the SPD can reliably discriminate between those with higher versus lower depression scores awaits to be replicated.

In line with our prior study, agitation/motor retardation was correlated with the SPD, but after correction for multiple analyses the correlational differences with other items were not significant. Contrary to expectation, it must also be acknowledged that patients without perception-laden thoughts reported worse sleep.

In our opinion, sensory phenomena should be addressed in the treatment of depression. Patients with depression often worry that they may become psychotic (approximately one out of 5 patients according to a study by Miegel et al. 2019), and this particular fear has been associated with suicidality. Thus, showing that such sensory phenomena, which are often equated with hallucinations, are common in nonpsychotic depression as well as in other disorders and even in the normal population (where the prevalence of hallucinations is estimated at 15%) may help to reduce worry and dysfunctional coping strategies adopted against these experiences, such as thought suppression. As recommended in a previous study (Moritz et al. 2014b), a vulnerability (vivid thoughts as the breeding ground of intrusive depressive thoughts) may be turned into a virtue by, for example, cognitive restructuring (Holmes et al. 2006; Ji et al. 2017). Variants of imagery rescripting (Smucker et al. 1995) are especially promising in this regard as this technique requires a vivid imagination (for a review on mental imagery, see Holmes et al. 2016). The technique was originally employed to alter the recollection of past negative events by giving negative memories "happy endings." However, it has been subsequently successfully applied to worries about the future; expected catastrophes are "edited over" by vividly imagining positive outcomes (Ji et al. 2017). In a recent study in patients with depression, this technique yielded good results even when unguided (Moritz et al. 2018a). In addition to imagery rescripting for past and future events, patients were further instructed to create visual metaphors for their current mood (e.g., a blobfish at the bottom of the ocean) that should then be transformed into something positive using their mind's eye.

Our study highlights that the distinctions between normal thoughts, intrusive thoughts, and hallucinations are less clear-cut than contemporary definitions suggest (see "Introduction"). In short, thoughts are not as "silent" and hallucinations are not as realistic as is traditionally postulated. The phenomena are multidimensional and partly overlap; their key distinguishing feature seems to be source attribution. Although this is likely somewhat related to perceptual aspects, these aspects should not be confounded as there are incidents when voice-hearers externalize ownership even though the "voice" lacks many of the features of a real voice. In contrast, some individuals have learned that a hallucinated voice that has all the features of a real voice exists only in their mind. Individuals seem to differ in terms of the criteria they adopt for externalizing inner turmoil to an external agent versus accepting authorship. Normal thoughts and intrusive thoughts differ in the

degree of distress they cause; the two can be distinguished from voice-hearing based on attribution.

The present study has a number of limitations. First, more items per category would be desirable; the low number of items may have compromised test–retest reliability, and more examples may raise the validity of the assessment (currently, we only provide examples for acoustic and visual phenomena). Importantly, the instructions should emphasize that the questions are not about ruminations and depressive thoughts in response to sensory or physical phenomena (e.g., depressive thoughts due to fatigue). Second, even though the patient remains the only source for tapping intrusive thoughts, even with interviews, an expert rating should be developed in order to prevent misunderstandings, particularly with respect to bodily sensations. The analyses of medication are limited by self-reporting and low prescription rates, both of which compromise the reliability of the findings. More generally, there is a need for more research on the causal association between medication and the extent of sensory intrusive thoughts, that is, whether drugs are taken or prescribed more often when such thoughts arise or whether such thoughts are in part a side effect. Independent replication is thus warranted, and our results should be interpreted very cautiously. Finally, studies are needed to determine the prevalence of sensory irritations in the general population.

To conclude, depressive thoughts and ruminations are bothersome due not only to their content and intrusiveness but also because of their subjective sense of reality. The individual does not *suffer in silence*; in many cases, these thoughts are perceptual. "Normalizing" such phenomena by means of psychoeducation and cognitive-behavioral programs may help to attenuate patients' worries about becoming psychotic and help them disengage from dysfunctional coping strategies such as thought suppression. Treatment strategies such as imagery rescripting and variants thereof may help by using the patient's vivid imagination in a functional way to ameliorate mood problems.

Compliance with Ethical Standards

Conflict of interest Steffen Moritz, Jan Philipp Klein, Thomas Berger, Frank Larøi and Björn Meyer declare that they have no conflict of interest.

Informed Consent All procedures performed in studies involving human participants were in accordance with the ethical standards of the University Medical Center Hamburg, Germany and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Animal Rights No animal studies were carried out by the authors for this article.

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