

Further evidence of the multi-dimensionality of hallucinatory predisposition: factor structure of a modified version of the Launay-Slade Hallucinations Scale in a normal sample

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Abstract

Recent years has seen an increasing interest in the hallucinatory experience, including investigations of its phenomenological prevalence and character both in pathological and normal (predisposed) populations. We investigated the multi-dimensionality of hallucinatory experiences in 265 subjects from the normal population, who completed a modified version of the Launay-Slade Hallucinations Scale. Principal components analysis was performed on the data. Four factors were obtained loading on items reflecting (1) sleep-related hallucinatory experiences (2) vivid daydreams (3) intrusive thoughts or realness of thought and (4) auditory hallucinations. The results offer further evidence of the multi-dimensionality of hallucinatory disposition in the normal population. Directions for future research in hallucinatory predisposition are discussed.

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1. Introduction

Recent years has seen an increasing interest in the hallucinatory experience, including investigations of its phenomenological prevalence and character both in pathological and normal (predisposed) populations. This work has resulted in a number of measuring devices for use in the clinical population and also in order to explore hallucinatory experiences in the normal population, including the Launay-Slade Hallucinations Scale (LSHS) [14], a frequently applied questionnaire for measuring hallucinatory experiences. This scale was based on the long tradition of viewing hallucinatory experiences on a continuum with normal functioning [23,24]. The original scale was designed to assess hallucinatory experiences in the carceral population. It consisted of 12-items where subjects were required to respond either true or false to each item. Based on the data of 54 normal controls, 42 psychiatric patients and 200 prisoners, a principal components analysis resulted in two factors: “a tendency to hallucinatory experiences” and “negative response set”.

All items except items 9 (“I have never been troubled by hearing voices in my head”) and 11 (“I have never heard the voice of the devil”) loaded on the first factor, whilst items 9 and 11 (i.e., negative response items) loaded on the second factor. These findings lead Bentall and Slade [3] to make certain changes to the original scale, including changing the negative response items to positive ones, and substituting the true and false with a five-point Likert system. The latter modification was made in order to allow greater response variability. Three studies have studied the multi-dimensionality of this modified version. First, in a patient population consisting of psychiatric patients (with schizophrenia, schizoaffective, and affective disorders) with a documented history of auditory hallucinations, Levitan et al. [15] found a four-factor solution, which included “vivid daydreams”, “clinical auditory hallucinations”, “intrusive thoughts”, and “sub-clinical auditory hallucinations”. Second, Aleman et al. [1], using the same version, albeit in a normal sample, found a three-factor solution including “tendency towards hallucinatory experiences”, “subjective externality of thought”, and “vivid daydreams”. Finally, Morrison et al. [17] found a two-factor

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solution including auditory and visual hallucinations when they administered a modified LSHS to a normal sample. In addition to the Bentall and Slade [3] modifications, the Morrison et al. [17] version also included three additional items related to visual hallucinations (“When I look at things they appear strange to me”, “I see shadows and shapes when there is nothing there”, “When I look at things they look unreal to me”, “When I look at myself in the mirror I look different”) given the lack of items assessing visual compared to auditory hallucinations in the original LSHS.

However, various other aspects of hallucinatory experiences have not been taken into account in these previous versions of the LSHS. For instance, little is known about other sub-types of hallucinations in the general population, including olfactory, haptic, gustatory, and sleep-related hallucinations, that is, hypnagogic (i.e., vivid perceptual experiences occurring at sleep onset) and hypnopompic hallucinations (i.e., similar experiences that occur at awakening). Relatively little research has been conducted in this area. Nonetheless, a few studies have reported high prevalence rates of hypnagogic and hypnopompic hallucinations in the general population. For example, Ohayon et al. [18] observed that 37% of the normal subjects reported experiencing hypnagogic hallucinations and 12% reported hypnopompic hallucinations. Although both types of hallucinations were more common among the subjects with sleep-related disturbances (insomnia, excessive daytime sleepiness), the prevalence of these hallucinations far exceeded that which can be explained by the association with these disturbances. Similar rates were reported in a study investigating the prevalence of hallucinations in the general population in three countries (UK, Germany and Italy) with 24.8% of the subjects reporting hypnagogic hallucinations and 13.8% reporting hypnopompic hallucinations [19]. Furthermore, according to the literature, people seem to have experiences in many modalities. Among the most common are sensed presence, visual and auditory hallucinations, being touched, falling, flying and floating sensations, and out-of-body experiences [4,5]. Also, in Ohayon [19] olfactory hallucinations were reported occurring at least once a month in 9.3%, gustatory hallucinations in 7.7%, and haptic hallucinations in 2.6%, of the subjects. Although important changes have been made to the LSHS scale, it still does not take into account this full variety of hallucinatory experiences reported in the normal population. Without a complete inclusion of these experiences, we cannot fully understand the nature of the concept of hallucinatory predisposition. The aim of the present study was to investigate the multi-dimensionality of hallucinatory experiences in the normal population with the help of a newly revised version of the LSHS.

2. Subjects and method

The subjects consisted of 265 normal subjects who completed a French translation of a modified, 17-item version of

the LSHS [3]. The majority of the subjects were undergraduate students from the University of Liège. The mean age was 23.7 years (S.D. = 8.6). 193 of the subjects were female and the other 72 subjects were male. LSHS items were scored on a five point scale as follows: 0 = “certainly does not apply to me”, 1 = “possibly does not apply to me”, 2 = “unsure”, 3 = “possibly applies to me” and 4 = “certainly applies to me”.

This version included the following modifications. Firstly, based on the recommendations from Morrison et al. [17], items tapping into visual hallucinatory experiences were included. Secondly, items tapping into other modalities were incorporated into the scale, such as tactile and olfactory hallucinations. Thirdly, an item was included that taps into the experience of feeling the presence of someone close who has passed away. This item was included with the elderly population in mind. Fourthly, items that have posed problems in previous research were modified and/or removed from the original scale. For example, the item “I have heard the voice of the devil” is very rarely endorsed by the subjects based on previous studies, and is often removed before statistical analyses due to low variation rates [17]. This has also been our experience, where, in a pilot study based on 60 subjects, none of the subjects responded affirmatively to this question. Also, the item “In the past I have heard the voice of God speaking to me” was modified so as to include other similar, spiritual experiences, and a form of hedge, resulting in the item “In the past I have heard the voice of God or one of his messengers speaking to me”. This is also because this item posed problems in the same pilot study, where none of the 60 subjects responded affirmatively to this item. Finally, two items were added to the scale that cover the many modalities that people report in hypnagogic and hypnopompic hallucinations. One item included visual, auditory and tactile modalities (“Sometimes, immediately prior to falling asleep or upon awakening, I have had the experience of having seen or felt or heard something or someone that wasn’t there or the feeling of being touched even though no one was there”), whilst the other included sensations of flying and floating, and out-of-body experiences (“Sometimes, immediately prior to falling asleep or upon awakening, I have had a sensation of floating or falling or that I left my body temporarily”).

Items included in the French translation of the modified version of the LSHS are presented in the appendix.

Reliability was assessed by internal consistency. The index used for all items was Cronbach’s α coefficient [6]. Factor structure of the data was examined by principal component analysis (PCA). A Varimax rotation (with normalisation) was then performed. Since the modified scale in the present study contains both the original, well-studied items and newly-added items, it is possible to have a priori hypotheses of both high and low degree of inter-item correlations. For this reason, additional factor analyses that implicate both hypotheses were also performed. All analyses were performed with the Statistica statistical package.

3. Results

Mean total score was 26.7 (range = 3–52; S.D. = 9.96). There was no evidence of sex differences in LSHS-ratings ($P > 0.3$). The distribution was positively skewed, comparable to the distributions reported in other studies [1,3]. All items correlated significantly with the total test score ($P < 0.001$). Internal reliability was established after finding a moderately high Cronbach alpha coefficient ($\alpha = 0.78$) for all items.

A substantial percentage of the subjects responded affirmatively (i.e., “possibly applies” or “certainly applies”) to typical hallucination-items. For example, 28% of the subjects responded affirmatively to the item: “In the past, I have had the experience of hearing a person’s voice and then found that no one was there” and 13% responded affirmatively to the item: “I often hear a voice speaking my thoughts aloud”. These results are comparable to Aleman et al. [1] who found 31% and 11% of the subjects responding affirmatively to the two respective items. These rates are also similar to reports from studies with normal samples utilising a different hallucinations scale (the Posey and Losch Verbal Hallucinations scale [20]), where the prevalence of auditory hallucinations in normal subjects falls between 37% and 39% [2,20]. Also, 30% of the subjects responded affirmatively to items of having experienced hypnagogic and hypnopompic hallucinations related to visual, auditory and tactile modalities, and 51% reported having experienced hypnagogic and hypnopompic hallucinations related to falling and floating sensations. This is similar to the few studies that have reported prevalence rates of these types of hallucinations in the normal population (e.g., [18] where 49% of the subjects reported either hypnagogic and/or hypnopompic hallucinations). Also, a significant number of the subjects (28%) responded affirmatively to an item explicitly included for the elderly population (“On certain occasions I have had the feeling of the presence of someone close who has deceased”). Finally, a

Table 1

Eigenvalues and percentage of variance accounted for by the four-factor solution

Factor	Eigenvalue	Percentage of variance	Cumulative variance
1	3.69	25.2	25.2
2	1.87	11.7	36.9
3	1.35	10.4	47.3
4	1.22	8.5	55.8

number of subjects responded affirmatively to items related to other modalities, such as olfactory (21%) and tactile hallucinations (18%).

Principal components analysis revealed four factors which accounted for 56% of the variance. The criterion chosen for the number of factors to be extracted was Catell’s scree test, which plots the eigenvalues in component order, draws a straight line through the components with the lowest eigenvalues, and retains those whose eigenvalues fall above this line. Kaiser’s [13] criterion to retain factors with unrotated eigenvalues greater than 1 was used. Criteria for defining the factors were as follows: items were required to load above 0.5 on a factor to contribute to it, and furthermore, if an item loaded over 0.5 on both factors it only contributed to the factor it loaded highest on. Eigenvalues and percentage of variance accounted for by the four-factor solution are presented in Table 1. One item (“In the past I have heard the voice of God speaking to me, or one of his messengers”) was removed prior to factor analysis because of lack of variation (only 1% of the subjects responded affirmatively to this question).

Table 2 shows loadings on the four factors which can be characterised as representing items related to (1) sleep-related hallucinatory experiences (2) vivid daydreams (3) intrusive thoughts or realness of thought and (4) auditory hallucinations. The results of the principal factor analysis with Varimax rotation revealed the same factors as the principal components analysis, with similar loadings of items on

Table 2

LSHS items and factor loadings (only loadings >0.5 are shown)

Item	1	2	3	4
I have had the feeling of touching something or being touched and then found that nothing or no one was there	0.76			
Sometimes, immediately prior to falling asleep or upon awakening, I have had a sensation of floating or falling or that I left my body temporarily	0.63			
Sometimes, immediately prior to falling asleep or upon awakening, I have had the experience of having seen or felt or heard something or someone that wasn’t there or the feeling of being touched even though no one was there	0.61			
On certain occasions, I have seen the face of a person in front of me, but that there was no one	0.55			
In the past, I have smelt a particular odour when there was nothing there	0.55			
On certain occasions I have had the feeling of the presence of someone close who has deceased	0.53			
Sometimes when I look at things like chairs and tables they seem unreal or strange to me	0.51			
The sounds that I hear in my daydreams are usually clear and distinct		0.78		
In my daydreams, I can hear the sound of a tune almost as clearly as if I were actually listening to it		0.78		
The people in my daydreams seem so true to life that sometimes I think that they are		0.68		
Sometimes a passing thought will seem so real that it frightens me			0.71	
Sometimes my thoughts seem as real as actual events in my life			0.65	
No matter how hard I try to concentrate, unrelated thoughts always creep into my mind			0.62	
I have been troubled by hearing voices in my head				0.80
I often hear a voice speaking my thoughts aloud				0.69
In the past, I have had the experience of hearing a person’s voice and then found that no one was there				0.67

factors. The main difference being a slightly lower (0.49 vs. 0.50) loading of an item (“Sometimes, when I look at things such as chairs and tables, they seem unreal or strange to me”) on the first factor. Apart from this, there were no significant differences between results from the principal components analysis and principal factor analysis with Varimax rotation. Furthermore, additional factor analyses (normalised Biquartimax, Quartimax, and Equamax rotations) revealed the same number of factors, with the same items contained within factors, and highly similar loadings for items.

The item with the highest loading in the first factor (25% of the variance) consisted of the item assessing the presence of tactile hallucinations (“I have had the feeling of touching something or being touched and then found that nothing or no one was there”). Also, both items specifically constructed to tap into hypnagogic and hypnopompic hallucinations were included in this factor. Furthermore, items tapping into olfactory hallucinations (“In the past, I have smelt a particular odour when there was nothing there”), the feeling that someone is present in the room or nearby (“On certain occasions I have had the feeling of the presence of someone close who has deceased” and “On certain occasions, I have seen the face of a person in front of me, but that there was no one”), and the feeling that objects are distorting (“Sometimes when I look at things like chairs and tables they seem unreal or strange to me”) were included in this factor. We interpreted this factor as representing sleep-related hallucinations. The second factor (14%) included items such as “The sounds that I hear in my daydreams are usually clear and distinct” and “In my daydreams, I can hear the sound of a tune almost as clearly as if I were actually listening to it”. This factor may be described as vividness of daydreams. The third factor (10%) contained items such as “No matter how hard I concentrate, unrelated thoughts creep into my mind” and “Sometimes a passing thought seems so real to me that it frightens me”. We have interpreted this factor as representing intrusive thoughts or realness of thought. Finally, the fourth factor (8%) consists of items such as “I have been troubled by hearing voices in my head” and “I often hear a voice speaking my thoughts aloud”. This factor may be characterised as auditory hallucinations.

4. Discussion

In this study, we investigated the multi-dimensionality of hallucinatory experiences in the normal population with the help of a newly revised version of the LSHS. **A substantial number of the subjects reported typical hallucinatory experiences,** which is in accordance with previous findings [1,29]. Furthermore, the subjects reported having hallucinatory experiences in modalities other than auditory and/or visual ones, such as olfactory and tactile hallucinations, and sleep-related hallucinations. A surprisingly significant number of subjects responded affirmatively to an item explicitly included for the elderly population, suggesting that this experience

may not be entirely unique to the elderly population. It is the first time that these latter types of hallucinatory experiences have been examined in the normal, young population.

The multi-dimensionality of the LSHS was investigated with PCA, yielding four factors, which were characterised as (1) sleep-related hallucinatory experiences (2) vivid daydreams (3) intrusive thoughts or realness of thought and (4) auditory hallucinations. These results offer further evidence of the multi-dimensionality of hallucinatory predisposition in the normal population, with a range of associated phenomena. The present study revealed a complicated factor structure, in that four relatively independent factors were found, compared to the previous studies of normal subjects finding two [17] or three factors [1]. While some factors, such as factor 2 (“Vivid daydreams”) can be seen as representing experiences related to individual personal variation, other factors such as factor 4 (“Auditory hallucinations”) might be more closely related to psychotic experiences in clinical subjects. However, this should be investigated more closely in the future, in addition to investigating the presence of the two other factors (i.e., factor 1 “sleep-related hallucinations” and factor 3 “intrusive thoughts or realness of thought”) in both clinical and non-clinical samples. Two previous studies also found evidence for a vivid daydreams factor and for a factor related to vivid thoughts [1,15]. Evidence for an auditory hallucinations factor is in agreement with two studies [15,17]. However, in the former study, two auditory hallucinations factors were found (“clinical auditory hallucinations” and “sub-clinical auditory hallucinations”), which is probably related to the fact that this study included psychiatric patients compared to normal subjects in the present study. Such a distinction between clinical and sub-clinical hallucinations may be specific to psychiatric patients [1]. Finally, the present study did not find evidence of a specific visual hallucinations factor as did Morrison et al. [17]. This might be related to the fact that what was covered by the visual hallucinations factor in Morrison et al.’s study, in the present study were more precisely analysed and distributed in other factors, such as the sleep-related hallucinations. Indeed, the item “Sometimes, when I look at things such as chairs and tables, they are unreal or strange” cannot be viewed as a true visual hallucination, but, rather as a perceptual distortion/aberration as there is no perception without object (i.e., the subject reports perceiving an object that truly exists, albeit in a distorted form). However, similar shortcomings are evident in visual hallucination items included in Morrison et al. [17], which included items such as “When I look at things they appear strange to me”, “When I look at things they look unreal to me”, “When I look at myself in the mirror I look different” that similarly cannot be considered as visual hallucinations, but, rather as perceptual distortions or examples of misidentification syndrome-like experiences. Future studies should look into ways of improving LSHS items seeking to assess visual hallucinations. The sleep-related hallucinations factor has not been reported in the literature. The presence of this factor is related to the fact that the present version

of the scale includes (for the first time) items specifically constructed to tap into hypnagogic and hypnopompic hallucinations.

In order to shed more light on the nature of hallucinatory predisposition, a similar avenue should be followed in order to better understand hallucinatory predisposition in other populations. Previous research has documented the presence of hallucinations in subjects from various populations who do not present signs of psychosis such as in children [16,22], adolescents [7,21,28] and the elderly [9,10,27]. This latter group is particularly interesting as studies suggest that certain factors (e.g., life-events, sensory deficits, cognitive difficulties) not found in other age-groups, may be uniquely associated with the development of hallucinations in these subjects. Also, the nature of hallucinatory experiences reported may differ. For example, it is less likely that a day-dreaming factor may arise in the elderly population as studies show that daydream frequency and intensity decrease with age in adulthood [8]. Also, a large body of evidence documents perceptual distortions that are unique in the elderly population (e.g., the presence of persons in the subject's own house, misidentification of the subject's own self or of others, and misidentifications of events on television as real events).

A possible limitation of the following study is the fact that the subjects were predominantly female (73% vs. 27%). However, there was no evidence of sex differences in LSHS-ratings. Another limitation is that as we did not ask the subjects questions regarding possible drug habits, certain of the subject-reported hallucinatory experiences may have been predominantly drug-related. However, since the test population consisted primarily of a student population and/or working population, one can assume that drug use is limited mostly to on and off use and furthermore probably only to 'soft drugs' such as cannabis. Psychotic symptoms associated with cannabis use is rare [11] and usually only occur in excessive consumption of the drug [26], which is probably not the case in the study population. Furthermore, psychotic symptoms associated with regular cannabis use consists of symptoms such as depersonalisation, derealisation, a feeling of loss of control, fear of dying, irrational panic, paranoia ideas [25], euphoria, feelings of detachment, and relaxation [12], all experiences that the present version of the LSHS does not tap into. In addition, the fact that the majority of experiences reported by the subjects have nothing to do with acute cannabis responses suggests that the majority of hallucinatory experiences are not drug-related. Another limitation is that the scale in the present form does not provide other information associated with hallucinatory experiences, such as frequency. This aspect is not especially important when the scale is used to identify hallucinatory-prone and non-hallucinatory-prone groups in the normal population. In contrast, when the aim of a study is to go beyond the identification of the presence of hallucinations in either the general population or in clinical groups (or both), the exploration of supplementary information concerning the hallucinatory experiences becomes very important and informative indeed.

We are currently conducting a study on clinical and non-clinical subjects, utilising a version of the LSHS that includes information not only concerning frequency of hallucinatory experiences, but also in terms of degree of control, emotional reactions, context-specificity and personal salience. Finally, it is important to note that the type of statistical technique utilised in the present study (exploratory factor analysis) possesses certain limitations. For example, the decision as to the number of factors to retain is often subjective, based on the researcher's weighing of various information (e.g., scree tests, eigenvalues, interpretability of factors, percentage of total variance).

5. Conclusion

The multi-dimensionality of a newly revised version of the LSHS was investigated with PCA, yielding a complicated four-factor structure. These results offer further evidence of the multi-dimensionality of hallucinatory predisposition in the normal population, with a range of associated phenomena. Results revealed that a substantial number of subjects reported typical hallucinatory experiences. Furthermore, subjects responded affirmatively to items concerning hallucinatory experiences in modalities other than auditory and/or visual ones, such as olfactory and tactile hallucinations, and sleep-related hallucinations, in addition to items originally included for the elderly population.

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Appendix

Item No.	Item
1	Parfois une pensée passagère semble si vraie qu'elle m'effraie
2	Parfois mes pensées semblent aussi réelles que les vrais événements de ma vie
3	Quelque soit ma concentration sur mon travail, des pensées sans rapport se glissent dans mon esprit
4	Dans le passé, j'ai déjà fait l'expérience d'entendre la voix d'une personne, et de me rendre compte ensuite qu'il n'y avait personne
5	Les sons que j'entends dans mes rêveries sont généralement clairs et distincts

Item No.	Item
6	Les gens dans mes rêveries semblent si vivants que parfois je pense qu'ils le sont
7	Dans mes rêveries, je peux entendre le son d'une chanson presque aussi clairement que si je l'écoutais réellement
8	J'entends souvent une voix qui dit mes pensées à voix haute
9	J'ai déjà été troublé par l'audition de voix dans ma tête
10	En certaines occasions, j'ai vu le visage d'une personne en face de moi alors qu'il n'y avait personne
11	Parfois, au moment de l'endormissement ou de l'éveil, j'ai déjà vu ou entendu quelque chose ou quelqu'un qui n'était pas là ou j'ai eu le sentiment d'être touché(e) alors qu'il n'y avait personne
12	Parfois, au moment de l'endormissement ou de l'éveil, j'ai déjà eu un sentiment que je flottais dans l'air, ou tombais, ou quittais mon corps temporairement
13	En certaines occasions, j'ai eu le sentiment de la présence d'une personne proche qui est décédé(e)
14	Dans le passé, j'ai déjà senti une odeur particulière alors qu'il n'y avait rien
15	J'ai déjà eu le sentiment de toucher quelque chose ou d'être touché(e), alors qu'il n'y avait rien ni personne
16	Quelquefois, quand je regarde des choses comme des tables ou des chaises, elles ont l'air étranges ou irréelles
17	Dans le passé, j'ai entendu une voix qui était celle de Dieu, ou d'un de ses messagers

References

- [1] Aleman A, Nieuwenstein MR, Böcker KBE, de Haan EHF. Multidimensionality of hallucinatory predisposition: factor structure of the Launay-Slade Hallucination Scale in a normal sample. *Pers Individ Dif* 2001;30:287–92.
- [2] Barrett TR, Etheridge JB. Verbal hallucinations in normals: I. People who hear 'voices'. *App. Cog Psychol* 1992;6:379–87.
- [3] Bentall RP, Slade PD. Reliability of a scale measuring disposition towards hallucination: a brief report. *Pers Individ Dif* 1985;6:527–9.
- [4] Cheyne JA, Rueffer SD, Newby-Clark IR. Hypnagogic and hypnopompic hallucinations during sleep paralysis: neurological and cultural construction of the night-mare. *Conscious Cog* 1999;8:319–37.
- [5] Cheyne JA, Newby-Clark IR, Rueffer SD. Relations among hypnagogic and hypnopompic experiences with sleep paralysis. *J Sleep Res* 1999;8:313–7.
- [6] Cronbach LJ. Coefficients alpha and the internal structure of tests. *Psychometrika* 1956;10:255–82.
- [7] DiDuca D, Joseph S. Assessing schizotypal traits in 13–18 year olds: revising the JSS. *Pers Individ Dif* 1999;27:673–82.
- [8] Giambra LM. Daydreaming characteristics across the life-span: age differences and 7–20 year longitudinal changes. In: Kunzendorf RG, Wallace B, editors. *Individual Differences in Conscious Experience*. Amsterdam: John Benjamins; 2000. p. 147–206.
- [9] Grimby A. Bereavement among elderly people: grief reactions, post-bereavement hallucinations and quality of life. *Acta Psychiatr Scand* 1993;87:72–80.
- [10] Grimby A. Hallucinations following the loss of a spouse: Common and normal events among the elderly. *J Clin Gerontol* 1998;4:65–74.
- [11] Gruber A, Pope H. Cannabis psychotic disorder. Does it exist? *Am J Addict* 1994;3:72–83.
- [12] Johns A. Psychiatric effects of cannabis. *Br J Psychiatry* 2001;178:116–22.
- [13] Kaiser H. A note on Guttman's lower bound for the number of common factors. *Multivariate Behav Res* 1961;1:249–76.
- [14] Launay G, Slade P. The measurement of hallucinatory predisposition in male and female prisoners. *Pers Individ Dif* 1981;2:221–34.
- [15] Levitan C, Ward PB, Catts SV, Hemsley DR. Predisposition toward auditory hallucinations: the utility of the Launay-Slade Hallucination Scale in psychiatric patients. *Pers Individ Dif* 1996;21:287–9.
- [16] McGee R, Williams S, Poulton R. Hallucinations in nonpsychotic children. *J Am Acad Child Adolesc Psychiatry* 2000;39:12–3.
- [17] Morrison AP, Wells A, Nothard S. Cognitive factors in predisposition to auditory and visual hallucinations. *Br J Clin Psychol* 2000;39:67–78.
- [18] Ohayon MM, Priest RG, Caulet M, Guilleminault C. Hypnagogic and hypnopompic hallucinations: Pathological phenomena? *Br J Psychiatry* 1996;169:459–67.
- [19] Ohayon MM. Prevalence of hallucinations and their pathological associations in the general population. *Psychiatry Res* 2000;97:153–64.
- [20] Posey TB, Losch ME. Auditory hallucinations of hearing voices in 375 normal subjects. *Imag Cogn Pers* 1983;2:99–113.
- [21] Rawlings D, MacFarlane C. A multidimensional schizotypal traits questionnaire for young adolescents. *Pers Individ Dif* 1994;17:489–96.
- [22] Schreier HA. Hallucinations in nonpsychotic children: More common than we think? *J Am Acad Child Adolesc Psychiatry* 1999;38:623–5.
- [23] Slade PD, Bentall RP. Sensory deception: a scientific analysis of hallucination. London: Croom Helm; 1988.
- [24] Strauss JS. Hallucinations and delusions as points on continua function. *Arch General Psychiatry* 1969;21:581–6.
- [25] Thomas H. Psychiatric symptoms in cannabis users. *Br J Psychiatry* 1993;163:141–9.
- [26] Thomas H. A community survey of adverse effects of cannabis use. *Drug Alcohol Depend* 1996;42:201–7.
- [27] Tien AY. Distributions of hallucinations in the population. *Soc Psychiatry Psychiatr Epidemiol* 1991;26:287–92.
- [28] Wolfradt U, Straube ER. Factor structure of schizotypal traits among adolescents. *Pers Individ Dif* 1998;24:201–6.
- [29] Young HF, Bentall RP, Slade PD, Dewey ME. Disposition towards hallucination, gender and EPQ scores. *Pers Individ Dif* 1986;7:247–9.