Comprehensive Psychiatry 86 (2018) 91–95

Contents lists available at ScienceDirect

Comprehensive Psychiatry

journal homepage: www.elsevier.com/locate/comppsych

Olfactory reference syndrome symptoms in Chinese university students: Phenomenology, associated impairment, and clinical correlates

Xiaolu Zhou [a,*], Sophie C. Schneider [b], Sandra L. Cepeda [b], Eric A. Storch [b]

[a] Research Institute for International and Comparative Education, Shanghai Normal University, Shanghai, China
[b] Menninger Department of Psychiatry and Behavioral Sciences, Baylor College of Medicine, Houston, TX, USA

ARTICLE INFO

Article history:
Received 30 March 2018
Received in revised form 12 June 2018
Accepted 17 June 2018
Available online xxxx

ABSTRACT

Background: The present study aimed to explore the phenomenology, associated impairment, and clinical correlates of olfactory reference syndrome (ORS) symptoms in a Chinese university student sample, and establish estimated ORS prevalence.
Methods: A total of 421 undergraduate students completed self-report measures assessing symptoms of ORS, obsessive-compulsive disorder, depression, anxiety, stress, taijin kyofushu, fear of negative evaluation, and ORS-related functional impairment.
Results: Higher ORS symptom severity was moderately associated with poorer insight, greater avoidance, and higher ORS-related functional impairment. ORS severity was weakly associated with increased comorbid disorder symptoms, and was not associated with gender. Clinically significant ORS symptoms were present in 2.4% of the sample.
Discussion: Collectively, these findings suggest that ORS symptoms are relatively distinct from other disorders in a non-clinical sample. Future studies are encouraged to further explore the phenomenology, etiology, neurobiology, and treatment of ORS in order to inform diagnosis and nosology.

1. Introduction

Olfactory reference syndrome (ORS), characterized by preoccupation with an erroneous belief that one emits a foul odor from his/her body, has been reported internationally for over a century [1–7]. Individuals with ORS are faced with significant distress due to the perceived body smell [8], and feel compelled to perform time-consuming rituals to check, eliminate or mask the odor [9]. Consequently, individuals with ORS often avoid social situations [10], experience impaired personal, family, social or work/school functioning [11], and sometimes have suicidal ideation and attempts [1,12].

As the "olfactory" in ORS suggests, sufferers are extremely concerned about smells that they believe are emitted from their body, resulting in spending hours per day on thoughts of body odor, which is hard to control and resist, and contributes to significant distress and interference. The most commonly reported odors include bodily smells [e.g., fecal odor, halitosis, genital odor, sweat; 2–4,13] and non-bodily odors [e.g., metal, garbage, rotten onions; 13,14,15]. Common body areas of concern as the source of the perceived smell are the armpits, mouth, genitals, and/or feet [12,14]. Some controversy exists regarding whether patients' belief about their odors are delusional in nature. Although Pryse-Phillips [9], who first coined the name olfactory reference syndrome, presented case reports on the presence of olfactory hallucination, ORS beliefs are not always delusional, and sufferers' insight range from good to absent [3,10,11,16]. In fact, just 18% of 253 adults with ORS reported poor or absent insight in a recent study [14] although severity of ORS symptoms was related to insight level [14]. As the "reference" in ORS indicates, some patients also experience referential thinking that other people comment on their smells. In turn, these patients may misinterpret the behaviors of others, such as opening a window and touching their nose, as an indication of bad odor [2,9]. However, not all patients report referential thinking [12].

In response to the unpleasant, obsessive thoughts regarding body smell, individuals with ORS will also perform repetitive, compulsive behaviors. The most common reported behaviors of ORS include sniffing body areas, excessive showering, checking others' reaction, excessive changing of clothes, and camouflaging with various perfumes, mints and powders [12,14]. In addition, patients may avoid social situations because of the embarrassment, shame, and fear of negative evaluation and of offending others, which can lead to social isolation and work or school impairments [10,11,17].

The prevalence of ORS has not been systematically examined, but an estimate of 0.5–2.1% has been reported in studies of ORS or body odor

* Corresponding author at: Research Institute for International and Comparative Education, Shanghai Normal University, 100 Guilin Road, Shanghai 200234, China.
E-mail addresses: zhouxiaolu@shnu.edu.cn (X. Zhou), eric.storch@bcm.edu (E.A. Storch).

https://doi.org/10.1016/j.comppsych.2018.06.013
0010-440X/

concerns [18]. The association between gender and ORS is unclear; males represented 52/84 (61.9%) ORS case studies identified by Begum and McKenna [13], and 169/253 (66.8%) cases in Greenberg, Shaw [14], suggesting either higher prevalence among males, or higher rates of clinical identification. Interestingly, Greenberg, Shaw [14] found that females reported higher ORS symptom severity than males. The mean age of ORS onset is 21 years [13,14], and the disorder often follows a chronic course [12,14]. Some patients seek help from non-psychiatric clinicians; however, their ORS symptoms do not improve long-term with non-psychiatric treatments [12].

Efforts to examine ORS have been hampered by diagnostic confusion; ORS has variously been considered a symptom of hypochondriasis, social phobia, or a delusional disorder [19]. DSM-5 refers to olfactory reference symptom in the section on 'other specified obsessive compulsive and related disorders' but does not provide diagnostic criteria [20]. ORS will be formalized for the first time in the upcoming International Classification of Diseases and Related Health Problems (ICD-11) [21] as an obsessive-compulsive and related disorder [19]. This reflects the core ORS symptomology of obsessions over perceived odor, and compulsive behavior in response to these thoughts, and the close association with obsessive-compulsive disorder (OCD). The recent formalization of diagnostic criteria will greatly assist ORS research efforts, and hopefully may increase clinical recognition of the disorder.

The limited available research suggests that ORS is commonly comorbid with major depressive disorders in both clinical and community samples [13,14]. Depressive symptoms may develop before, at the same time, or after the development ORS symptoms [12]. ORS also shares features with social anxiety disorder; both conditions include the avoidance of social situations and the concern of social implications [18]. A culturally-bound syndrome of social anxiety disorder, known as taijin kyofushu (TKS), has also been shown to share similarities with ORS [13,16,18]. Individuals with TKS experience obsessions of shame and fear that they would offend others by blushing, staring inappropriately, emitting offensive odors, or presenting with physical deformities [22]. The fear of emitting offensive odors is called 'Jiko-shu-kyofu', which means fear of odor from oneself. Jiko-shu-kyofu is one subtype of TKS, and can lead individuals to avoid and isolate themselves from social situations. Suzuki, Takei [16] compared seven cases of Japanese Jiko-shu-kyofu with thirty-six cases of ORS, as described by Pryse-Phillips [9], in terms of clinical phenomenology and treatment. Suzuki and colleagues [16] concluded that ORS and Jiko-shu-kyofu may indeed share a common entity; however, there remains a lack of empirical data about the relation between ORS and TKS, including the subtype of Jiko-shu-kyofu. There has been little systematic evaluation of the association between ORS and potentially associated disorders, so the relative strength of the associations with these disorders remains unknown.

Overall, despite increasing interest in the nature and classification of ORS, research on the disorder has mainly been attained from small case series and reports, with a limited number of empirical studies [9,13,14]. It is likely that those with ORS do not seek mental health treatment for their concerns, thus it is difficult to detect in clinical populations. Further, there has been limited investigation of ORS in non-English speaking populations, despite the possible link between ORS and culturally-bound presentations of social anxiety disorder. Therefore, the overall aim of the present study was to contribute to the literature by exploring the presentation, impairment, and clinical correlates of ORS symptoms, and estimated prevalence of ORS in a Chinese university student sample. It was hypothesized that higher ORS symptoms would be positively associated with symptoms of depression, OCD, TKS, and anxiety. Further, it was hypothesized that higher ORS symptoms would be associated with greater ORS-related life interference in work/school, social, and family domains. Due to limited prior evidence, exploratory aims were to examine potential gender differences in ORS symptoms, explore the association between fear of negative evaluation and ORS, and to establish the prevalence of probable ORS in a Chinese University sample.

2. Material and methods

2.1. Participants

Participants were 421 undergraduate students recruited across various courses (e.g., math, physics, education, psychology, management, English, computer science and mechanical engineering) at Shanghai Normal University, Shanghai Polytechnic University, and University of Shanghai for Science and Technology. The mean age of the participants was 19.75 years (range = 18–24 years, $SD = 1.14$) and 52.3% (N = 220) of the sample was female. A majority of participants were of Han ethnicity (91.4%), other participants represented 11 minorities, including Uygur, Hmong, Tujia, among others. Regarding psychiatric history, participants reported a previous diagnosis of or suspected problems with: obsessive-compulsive disorder ($n = 58$; 13.8%), depression ($n = 25$; 5.9%), hair pulling or skin picking ($n = 25$; 5.9%), an anxiety disorder ($n = 24$; 5.7%), body dysmorphic disorder ($n = 19$; 4.5%), eating disorders ($n = 16$; 3.8%), bipolar disorder ($n = 8$; 1.9%), a substance-related disorder ($n = 4$; 1%), and tic disorder ($n = 1$; 0.2%). Regarding current treatment, 98.8% of participants reported not taking psychotropic medication and 1.2% did not report if they were receiving treatment; 80.5% participants reported currently not participating in psychotherapy, 19.0% did not report if they were receiving psychotherapy, and 0.2% reported currently participating in psychotherapy.

2.2. Procedures

The institutional review board at Shanghai Normal University approved study procedures. Instructors presented information about the study to students during class time. Participation was voluntary, and participants provided written informed consent. A battery of questionnaires was completed by paper-and-pencil in the class room. The survey took approximately 30 min to complete and all participants received a small remuneration (about $3 US).

2.3. Measures

All measures were administered in Chinese. The Yale-Brown Obsessive Compulsive Scale Modified for Olfactory Reference Syndrome (ORS-YBOCS) had not been previously translated from English, and so was translated into Chinese from English by a bilingual research assistant and back-translated by a second bilingual assistant.

2.3.1. ORS-YBOCS [14]

The ORS-YBOCS is a 12-item self-report measure assessing the severity of ORS symptoms. Each item is rated on a 5-point scale from 0 to 4 with varying scale anchors (e.g. *none* to *extreme*). Two subscales are generated: ORS obsessions (item 1–5) and ORS compulsions (items 6–10). Item 11 assesses dimension of insight relating to bodily odor. Item 12 assesses avoidance relating to body odor (avoiding doing anything, going anywhere, or being with anyone due to ORS). All 12 items are summed up as total score. A total score of 20 or above was used as the cutoff score to identify scores consistent with the presence of ORS [14]. Internal consistency (Cronbach's alpha) for the present sample was 0.89.

2.3.2. Taijin Kyofusho Scale (TKS-S) [23]

The TKS-S is a 31-item measure of TKS symptoms, which assesses individuals' fears of offending or embarrassing others by presenting an appearance (e.g., stiffen faces, displeasing looks), emitting offensive odors, or engaging in improper behaviors. Respondents are instructed to rate each item as it applies to them on a 7-point scale ranging from

1 (totally false) to 7 (exactly true). The TKS-S demonstrates sound psychometric properties among U.S. and Japanese college students [23], and good internal consistency among Indonesian and Swiss college students [24]. Internal consistency (Cronbach's alpha) for the current study was 0.95.

2.3.3. Obsessive Compulsive Inventory-Revised (OCI-R) [25]

The OCI-R is an 18-item questionnaire of obsessive-compulsive symptom presence and associated distress. Each item is rated on a 5-point scale ranging from 0 (*not at all*) to 4 (*extremely*). The OCI-R demonstrates sound psychometric properties among Chinese college students and patients with OCD [26,27]. In the current study, internal consistency (Cronbach's alpha) was 0.90.

2.3.4. Depression Anxiety Stress Scale-21 (DASS-21) [28]

The DASS is a 21-item scale of depressive, anxiety, and stress symptoms. Each item is rated on a 4-point scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much, or most of the time*). Three subscales are calculated: anxiety, depression, and stress. Research has established good psychometric properties in Chinese college and community samples [29,30]. Internal consistency (Cronbach's alpha) for the present study was 0.91.

2.3.5. Brief fear of negative evaluation scale (BFNE) [31]

The BFNE is a 12-item measure of individuals' fear of negative evaluations and perceptions from others. Each item is rated on a 5-point scale ranging from 1 (*not at all characteristic of me*) to 5 (*extremely characteristic of me*). The BFNE has demonstrated adequate psychometric properties in Chinese samples [32]. Internal consistency (Cronbach's alpha) for the present study was 0.88.

2.3.6. Sheehan Disability Scale (SDS) [33]

The SDS is a 3-item scale of impairment in work/school, social life, and family responsibilities. For the current study, instructions were revised to focus on the impairment specific to ORS symptoms (SDS-ORS). The SDS has demonstrated sound psychometric properties among Chinese adults [34]. Each item is rated on a 10-point scale ranging from 0 (*not at all*) to 10 (*extremely*) interfering. Internal consistency (Cronbach's alpha) for the current study was 0.93.

2.4. Data analysis

The entire sample ($N = 421$) was included in the statistical analysis. Non-normality was observed in multiple variables, including the ORS-YBOCS, SDS-ORS, and DASS-21, based on skewness and kurtosis values, as well as normal Q-Q plots, using IBM SPSS version 21. The associations between ORS symptoms, impairment across work/school, social and family domains, and symptoms of depression, anxiety, OCD, TKS, and fear of negative evaluation were examined by Spearman correlation coefficients. We employed *t*-tests to examine gender differences in ORS symptoms with bias-corrected and accelerated bootstrapping procedures conducted using 5000 resamples, in place of independent *t*-tests. Bootstrapped confidence intervals were used to test hypotheses at the $p < .05$ and $p < .01$ levels. Cohen's d was calculated for the effect size of the group differences. Because the study analyses were exploratory and we were not interested in testing a general null hypothesis [35], we did not correct for multiple comparisons.

3. Results

3.1. Descriptive statistics of ORS symptoms

The means, standard deviations, ranges, and frequencies of each ORS-YBOCS item are shown in Supplementary Table 1 for the whole sample. Individual item frequencies were examined to assess the proportion of participants who reported moderate to extreme ORS symptoms (score of 2–4). Regarding ORS-related obsessions, 4.3% ($n = 18$) were occupied by thoughts of body odor at least 1–3 h per day; 7.13% ($n = 30$) felt at least moderate interference due to the ORS thoughts; 8.6% ($n = 36$) rated greater than or equal to moderately distress caused by ORS obsessions; 13.1% ($n = 55$) made some to no effort to resist against ORS obsessions; 6.9% ($n = 29$) exhibited at least moderate control over thoughts of body smell. Regarding ORS-related compulsions, 3.1% ($n = 13$) spent at least 1–3 h per day in activities related to body smell; 4.0% ($n = 17$) rated greater than or equal to moderate interference due to ORS compulsions; 7.8% ($n = 33$) felt at least moderate distress associated with ORS compulsions; 11.9% ($n = 50$) made at least some effort to resist against ORS compulsions; 5.0% ($n = 21$) exhibited at least moderate control over ORS compulsive behaviors. 26.8% ($n = 113$) reported moderate to poor insight, and 6.4% ($n = 27$) reported moderate to extreme avoidance of activities.

Moderate or higher level of functional impairment (i.e., score ≥ 4 on any SDS-ORS item) was reported among 3.1% of participants for work or school related functioning, 4.5% for social functioning, and 2.4% for family functioning.

3.2. Gender differences in ORS symptoms

t-Tests indicate that there was no significant gender difference in the total ORS symptom severity scores, or in most individual items (see Supplementary Table 2). The only significant difference was that males reported slightly higher scores for resistance against compulsions, though the effect was small.

3.3. Clinical correlates of ORS symptoms

Spearman correlation coefficients and descriptive statistics for all study variables are reported in Table 1. ORS symptom severity, as measured by ORS-YBOCS, exhibited positive correlations with all study variables. Unexpectedly, ORS symptoms were only weakly correlated with symptoms of depression, anxiety, OCD, TKS, and fear of negative evaluation. ORS symptoms were moderately correlated with ORS-related functional impairment.

3.4. Prevalence estimate of ORS

Participants who scored ≥ 20 on the ORS-YBOCS were considered to have clinically significant ORS symptoms; 10 (2.4%) participants reported elevated ORS symptoms. Among those with elevated ORS scores, moderate or higher levels of ORS-related impairment were common; 60.0% for work or school related functioning, 60.0% for social functioning, and 40.0% for family functioning. Poor insight (90.0%) and moderate or higher levels of avoidance (70.0%) were also common among those with elevated ORS. No association was found between gender and elevated ORS classification; $\chi^2 = 0.02$, $df = 1$, $p = .880$. As shown in Supplementary Fig. 1, the most frequently endorsed ritualistic behaviors, among the 10 participants who reported elevated ORS symptoms, were airing out the area, checking others' reactions, and sniffing the area.

4. Discussion

The current study explored the phenomenology, associated impairment, and clinical correlates of ORS symptoms, and prevalence of ORS, in a large Chinese university student sample. Clinically significant ORS symptoms (defined as a score of 20 or above on the ORS-YBOCS) were reported by 2.4% of the sample, which is congruent with the estimate of 0.5–2.1% reported in studies of ORS or body odor concerns [18]. Individuals with clinically significant ORS concerns reported elevated levels of ORS-related impairment across multiple domains (i.e., school/work, social and family functioning), and 90% reported poor insight. The most frequent compulsive behaviors relating to ORS were airing

Table 1
Correlation and descriptive statistics for study variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. ORS_O		0.77**	0.91**	0.48**	0.56**	0.47**	0.50**	0.35**	0.52**	0.28**	0.21**	0.19**	0.29**	0.23**
2. ORS_C			0.90**	0.51**	0.62**	0.51**	0.52**	0.39**	0.55**	0.32**	0.26**	0.24**	0.28**	0.19**
3. ORS_T				0.69**	0.72**	0.51**	0.55**	0.39**	0.57**	0.30**	0.26**	0.25**	0.30**	0.25**
4. ORS_ins					0.46	0.33**	0.42**	0.26**	0.41**	0.10*	0.20**	0.22**	0.21**	0.23**
5. ORS_avo						0.37**	0.41**	0.28**	0.41**	0.25**	0.19**	0.23**	0.28**	0.22**
6. SDS_W/S							0.80**	0.73**	0.92**	0.21**	0.25**	0.17**	0.22**	0.15**
7. SDS_S								0.73**	0.95**	0.19**	0.22**	0.16**	0.22**	0.16**
8. SDS_F									0.76**	0.24**	0.23**	0.13**	0.17**	0.08
9. SDS_T										0.21**	0.23**	0.18**	0.23**	0.18**
10. OCIR											0.62**	0.47**	0.48**	0.36**
11. DASS-A												0.60**	0.57**	0.47**
12. DASS-D													0.48**	0.36**
13. TKS														0.60**
14. BFNE														
Mean	2.42	1.84	5.81	0.94	0.64	0.53	0.63	0.35	1.51	17.43	9.19	8.43	85.89	37.48
SD	2.53	2.39	5.72	1.18	0.64	1.09	1.23	0.93	3.05	11.30	6.76	7.66	31.67	9.27
Range	0–12	0–10	0–27	0–4	0–4	0–8	0–8	0–6	0–21	0–60	0–40	0–42	31–195	15–60

Note. ORS = Yale-Brown Obsessive Compulsive Scale Modified for olfactory reference syndrome; ORS_O = ORS-YBOCS obsessions subscale; ORS_C = ORS-YBOCS compulsions subscale; ORS_T = ORS-YBOCS total score; ORS_ins = ORS-YBOCS insight score; ORS_avo = ORS-YBOCS avoidance score; SDS = Sheehan Disability Scale; SDS_W/S = SDS work and school score; SDS_S = SDS social score; SDS_F = SDS family and home score; SDS_T = SDS total score; OCIR = Obsessive Compulsive Inventory-Revised total score; DASS = Depression Anxiety Stress Scale; DASS-A = DASS anxiety subscale, DASS-D = DASS depression subscale; TKS = Taijin Kyofusho Scale total score; BFNE = Brief fear of negative evaluation scale total score.
** $p < .01$.
* $p < .05$.

out the area, checking others' reactions, and sniffing the area, which are similar to previous results obtained from a large sample of adults with ORS [14]. However, in contrast to previous studies [13,14], there was no association between ORS status and gender.

When examining ORS symptoms across the whole sample, there was no association between total ORS severity and gender. A range of insight was observed and poorer insight was correlated with greater ORS symptom severity. This is consistent with previous findings showing that insight in ORS is present along a continuum from good to absent insight, with poorer insight associated with greater illness severity [1,2,11,13,14,16,18]. This is consistent with the dimensional approach to insight applied to related disorders such as OCD and body dysmorphic disorder [20,36]. Greater avoidance was strongly associated with greater ORS symptom severity. This avoidance might contribute to functional impairments and clinical distress in ORS [18]. Indeed, moderate correlations were found between ORS severity and functional impairment in school/work and social domains, though the association with family impairment was weak. Perhaps individuals with ORS symptoms are less worried or anxious in front of family members who unconditionally love them, and might experience fewer negative outcomes associated with their ORS in family environments.

The associations between ORS and other clinical variables were weaker than anticipated given the close associations reported between ORS and OCD, TKS, anxiety, and depression [37]. This supports the notion of ORS as a discrete entity and highlights the need for further research on the association between disorders, especially in non-clinical samples. The properties of the translated ORS-YBOCS should be further investigated, particularly in comparison to clinical interviews, to ensure that the measure is functioning sufficiently to detect ORS in this population. Further, the measure of TKS only includes two items related to odor concerns (i.e., afraid that my body odors will offend others; afraid that I will release intestinal gas in the presence of others and offend others), so future studies should use a more comprehensive measure of TKS with clearer subscales of different variants to examine ORS, TKS, and TKS subtypes.

Study findings should be interpreted in light of the limitations to the research. The university sample limits generalizability of the findings to those of lower education, and those with severe psychopathology may be unable to engage in higher education. We only used self-report measures (without any check for the validity of responses) which could be affected by poor insight, recall bias and result in false-positives, especially given the inability to assess whether concerns about body odor were realistic or not. In addition, the present study is the first to use the ORS-YBOCS among Chinese sample. Although the internal consistency of the measure was strong, the reliability and validity of this scale needs further examination. Finally, we only collected single time point data. Future studies should explore ORS with a wider range of measures, investigate clinical samples, explore the functioning of the Chinese ORS-YBOCS, and utilize longitudinal designs to capture potential changes over time and explore factors that may contribute to the development of ORS.

Based on our results and the limitations of the study, the study does not provide strong support for any proposed ORS classification. Based on previous research, it remains reasonable to classify ORS as an obsessive-compulsive and related disorder [37], however, further investigations into the phenomenology, etiology, neurobiology, and treatment of ORS are needed in order to inform diagnostic classification.

5. Conclusion

This study is one of the few empirical studies on the phenomenology and associated clinical characteristics of ORS in a large college student sample. About 2.4% of our participants reported clinically significant ORS symptoms. When examining ORS symptoms across the whole sample, ORS symptom severity was moderately associated with functional impairment, weakly associated with comorbid disorder symptoms, and was not associated with gender. Future research is needed to examine the classification, phenomenology, and correlates of ORS.

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2018.06.013.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author note

Dr. Storch receives research support from NIH, Agency for Healthcare Research and Quality, International OCD Foundation, and All Children's Hospital Research Foundation. He has received royalties from Elsevier Publications, Springer Publications, American Psychological Association, Wiley, Inc., and Lawrence Erlbaum. Dr. Storch is on the Speaker's Bureau and Scientific Advisory Board for the International OCD Foundation. Dr. Storch reports no other potential conflict of interest.

All other authors report no financial disclosure. We report no other potential conflicts of interest.

References

[1] Prazeres AM, Fontenelle LF, Mendlowicz MV, de Mathis MA, Ferrão YA, De Brito N, et al. Olfactory reference syndrome as a subtype of body dysmorphic disorder. J Clin Psychiatry 2010;71:87.
[2] Phillips K, Gunderson C, Gruber U, Castle D. Delusions of body malodour: the olfactory reference syndrome. Olfaction and the brain. Cambridge: Cambridge University Press; 2006; 334–53.
[3] Osman AA. Monosymptomatic hypochondriacal psychosis in developing countries. Br J Psychiatry 1991;159:428–31.
[4] Iwu C, Akpata O. Delusional halitosis. Review of the literature and analysis of 32 cases. Br Dent J 1990;168:294–6.
[5] Yamada M, Shigemoto T, Kashiwamura K, Nakamura Y, Ota T. Fear of emitting bad odors. Bull Yamaguchi Med Sch 1977;24:141–61.
[6] Tilley H. Three cases of parosmia; causes, treatment, &c. Lancet 1895;146:907–8.
[7] Potts C. Two cases of hallucination of smell. Univ Pa Med Mag 1891;226.
[8] Stein DJ, Le Roux L, Bouwer C, Van Heerden B. Is olfactory reference syndrome an obsessive-compulsive spectrum disorder? two cases and a discussion. J Neuropsychiatr Clin Neurosci 1998;10:96–9.
[9] Pryse-Phillips W. An olfactory reference syndrome. Acta Psychiatr Scand 1971;47:484–509.
[10] Bishop JE. An olfactory reference syndrome–monosymptomatic hypochondriasis. J Clin Psychiatry 1980;41:57–9.
[11] Malasi T, El-Hilu S, Mirza I, El-Islam MF. Olfactory delusional syndrome with various aetiologies. Br J Psychiatry 1990;156:256–60.
[12] Phillips K, Menard W. Olfactory reference syndrome: demographic and clinical features of imagined body odor. Gen Hosp Psychiatry 2011;33:398–406.
[13] Begum M, McKenna P. Olfactory reference syndrome: a systematic review of the world literature. Psychol Med 2011;41:453–61.
[14] Greenberg JL, Shaw AM, Reuman L, Schwartz R, Wilhelm S. Clinical features of olfactory reference syndrome: An internet-based study. J Psychosom Res 2016;80:11–6.
[15] Harriman P. A case of olfactory hallucination in a hypochondriacal prisoner. J Abnorm Soc Psychol 1935;29:457.
[16] Suzuki K, Takei N, Iwata Y, Sekine Y, Toyoda T, Nakamura K, et al. Do olfactory reference syndrome and Jiko-shu-kyofu (a subtype of Taijin-kyofu) share a common entity? Acta Psychiatr Scand 2004;109:150–5.
[17] Davidson M, Mukherjee S. Progression of olfactory reference syndrome to mania: a case report. Am J Psychiatry 1982;139:1623.
[18] Feusner JD, Phillips KA, Stein DJ. Olfactory reference syndrome: issues for DSM-V. Depress Anxiety 2010;27:592–9.
[19] Veale D, Matsunaga H. Body dysmorphic disorder and olfactory reference disorder: proposals for ICD-11. Rev Bras Psiquiatr 2014;36:14–20.
[20] American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington, DC: American Psychiatric Publishing; 2013.
[21] World Health Organization. 6B22 olfactory reference disorder. ICD-11 Beta draft: mortality and morbidity statistics.
[22] Takahashi T. Social phobia syndrome in Japan. Compr Psychiatry 1989;30:45–52.
[23] Kleinknecht RA, Dinnel DL, Kleinknecht EE, Hiruma N, Harada N. Cultural factors in social anxiety: a comparison of social phobia symptoms and Taijin Kyofusho. J Anxiety Disord 1997;11:157–77.
[24] Vriends N, Pfaltz MC, Novianti P, Hadiyono J. Taijin kyofusho and social anxiety and their clinical relevance in Indonesia and Switzerland. Front Psychol 2013;4:3.
[25] Foa EB, Huppert JD, Leiberg S, Langner R, Kichic R, Hajcak G, et al. The Obsessive-Compulsive Inventory: development and validation of a short version. Psychol Assess 2002;14:485.
[26] Peng Z-W, Yang W-H, Miao G-D, Jing J, Chan RC. The Chinese version of the Obsessive-Compulsive Inventory-Revised scale: replication and extension to non-clinical and clinical individuals with OCD symptoms. BMC Psychiatry 2011;11:129.
[27] Tangsu Q, Wang J, Tang T, Zhao L. Reliability and validity of obsessive compulsive scale revision application in Chinese college students. Chin J Clin Psych 2011;19:619–21.
[28] Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck depression and anxiety inventories. Behav Res Ther 1995;33:335–43.
[29] Wen Y, Wu D, Lu X. Psychometric properties of the Chinese short version of Depression Anxiety and Stress Scale in Chinese adults. Chin J Public Health 2012;28:1436–8.
[30] Gong X, Xie X-Y, Xu R, Luo Y-J. Psychometric prossperties of the Chinese versions of DASS-21 in Chinese college students. Chin J Clin Psych 2010;18(4):443–6.
[31] Leary MR. A brief version of the fear of negative evaluation scale. Personal Soc Psychol Bull 1983;9:371–5.
[32] Wei J, Zhang C, Li Y, Xue S, Zhang J. Psychometric properties of the Chinese version of the fear of negative evaluation scale-brief (BFNE) and the BFNE-straightforward for middle school students. PLoS One 2015;10:e0115948.
[33] Sheehan D. The anxiety disease. New York, NY: Charles Scribner & Sons; 1983; 151.
[34] Zhu J, Zhong B. Reliability and validity of Sheehan Disability Scale for outpatients receiving methadone maintenance treatment [J]. Chin J Drug Depend 2010;4:013.
[35] Armstrong RA. When to use the Bonferroni correction. Ophthalmic Physiol Opt 2014;34:502–8.
[36] Phillips KA, Pinto A, Hart AS, Coles ME, Eisen JL, Menard W, et al. A comparison of insight in body dysmorphic disorder and obsessive–compulsive disorder. J Psychiatr Res 2012;46:1293–9.
[37] Stein D, Kogan C, Atmaca M, Fineberg N, Fontenelle L, Grant J, et al. The classification of Obsessive–Compulsive and Related Disorders in the ICD-11. J Affect Disord 2016;190:663–74.