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Social Anxiety in Online and Real-Life Interaction and Their Associated Factors

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Abstract

Social anxiety was compared between online and real-life interaction in a sample of 2,348 college students. Severity of social anxiety in both real-life and online interaction was tested for associations with depression, Internet addiction, Internet activity type (gaming versus chatting), and scores on Behavioral Inhibition System (BIS)/Behavioral Activation System (BAS) scales. The results showed that social anxiety was lower when interacting online than when interacting offline. Depression, Internet addiction, and high BIS and BAS scores were associated with high social anxiety. The social anxiety decreased more in online interaction among subjects with high social anxiety, depression, BIS, and BAS. This result suggests that the Internet has good potential as an alternative medium for delivering interventions for social anxiety. Further, the effect of BIS on social anxiety is decreased in online interaction. More attention should be paid for BIS when the treatment for social anxiety is delivered online.

Introduction

The *Diagnostic and Statistical Manual of Mental Disorders (4th ed.)*[1] defines social anxiety as excessive fear of potentially embarrassing or humiliating situations. Previous studies reported a 3–13 percent life-time prevalence of social anxiety.[2,3] Early onset of the disorder often results in a chronic course and functional disability.[4] Although both pharmacotherapy and psychotherapy are reportedly effective for social anxiety,[5,6] studies indicate that only about half of people with social anxiety ever seek treatment.[7] The disorder-specific fear of meeting a therapist may prevent them from seeking counseling from mental health professionals. Therefore, the Internet has been evaluated as a potential alternative tool for delivering treatment.[8] However, empirical results were necessary to understand how the social anxiety would be affected in online interaction.

Communication apprehension, which is the fear or anxiety associated with communication with another person,[9] reportedly contributes to social anxiety.[10] Some researchers suggest that anxiety during interaction is learned by conditioning-based reinforcement in communication. The Internet provides a new medium for computer-mediated communication (CMC)[11] without face-to-face interaction. As the Internet enables anonymity and free self-presentation,[12] the fluidity of self-identity may attenuate concerns about criticism by others. Lack of direct face-to-face interaction may also diminish concerns about negative evaluation from others. Thus, CMC might make Internet users free from social rules and feel less subject to criticism from others.[11] These ideas might suggest that CMC might make a difference on the process of communication and decrease apprehension for interaction online.

The Internet has rapidly grown as a major communication medium. To investigate the social anxiety online could understand how the symptoms were presented in CMC. Further, to understand the difference in social anxiety in real-word and online interaction (SA-RvsO) could provide a directed insight to the effect of CMC on social interaction. Lastly, how the subjects with social anxiety experience their symptoms in CMC and whether the CMC would decrease social anxiety more for them had never been evaluated. These are important to determine whether the Internet was really an alternative media to deliver the treatment for social anxiety. Social anxiety disorder is a disorder with a marked and persistent fear of social situations in which embarrassment or humiliation might occur.[13] Sufferers might also fear such conditions online, but CMC might make them free from such conditions.[10] Thus, we hypothesize that CMC would decrease apprehension for interaction more for subjects with

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high social anxiety, because this effect might be not significant for others without pathological apprehension.

Depression is an important comorbid disorder of social anxiety.[4] In subjects with social anxiety, comorbid depression has a mutually deteriorating course[4,14,15] Thus, intervention programs for social anxiety should also consider comorbid depression. The Internet is now recognized as an alternative medium to deliver treatment for depression.[16] However, the role of depression in social anxiety during online interaction has not been evaluated.

Social anxiety is also reportedly associated with Internet addiction.[17,18] The CMC effect, which decreased social anxiety, has been suggested to explain the association.[17,18] The evaluation of whether subjects with Internet addiction have higher SA-RvsO or not could examine the hypothesis claimed in previous studies.

The Behavioral Inhibition System (BIS)/Behavioral Activation System (BAS) scales were originally developed to apply Gray theory in measures of sensitivity to punishment and reward, respectively.[19] Subjects with high BIS might have higher than normal anxiety in response to experiencing humiliating social experience. As subjects with high BIS tend to be sensitive to aversive results, they tend to avoid social interaction that can cause negative experiences. Thus, high BIS is apparently a predisposing characteristic of social anxiety.[20,21,22] After getting online, the CMC effect could make them less subject to criticism or embarrassing conditions.[11] As some aversion results are decreased in CMC, the contribution of BIS to social anxiety will be hypothesized to decrease online. Further, subjects with higher BAS tend to be sensitive to reward experiences. They may be more encouraged by the specific pleasures from social interaction online, such as pleasure of control,[12] or the rewarding designs in online gaming or social interaction Web site. These effects might attenuate their anxiety in social interaction online.

Thus, we hypothesized that social anxiety is lower during online interaction than during real-life interaction. We also hypothesized that the magnitude of decreased social anxiety online is larger in subjects with high social anxiety. We further hypothesized that subjects with higher depression, Internet addiction, and scores on BIS/BAS scales show more decrease in social anxiety after getting online. The present study will (a) compare social anxiety between online and real-life interaction (SA-RvsO), (b) compare SA-RvsO between subjects with high social anxiety and a control group, and (c) investigate the effects of depression, Internet addiction, Internet activity type, and BIS/BAS characteristics on SA-RvsO in order to validate the hypothesis.

Methods

The subjects in this study were recruited from colleges in urban, suburban, and rural areas of Taiwan (four, two, and two colleges, respectively). The final population included 2,348 students (1,124 males and 1,224 females) who gave informed consent and completed all measurements. The study was approved by the institutional review board of Kaohsiung Municipal Hsiao-Kang Hospital.

Measurements

The Brief Version of Fear of Negative Evaluation Scale (BV-FNE) was developed to evaluate the cognitive symptoms of social phobia. The BV-FNE, a short 5-point version of the 12-item Likert-type FNE, has good correlation with the original scale ($r = 0.96$), good internal consistency ($\alpha = 0.90$), and a good 4-week test–retest reliability coefficient (0.75).[23] The present study used the BV-FNE to evaluate cognitive symptoms of social phobia. The prevalence of social phobia was 3–13 percent in general population[3,24] and 9.5 percent in females and 4.9 percent in males among a community population aged 14–24.[25] In this study, 8.7 percent of all subjects with scores higher than 42 were classified as the high social anxiety group. We selected the cutoff point based on prevalence to represent the sample with pathological social anxiety. Subjects were also asked to answer the same questions according to their response for social interaction online. The responses to questions about online social interaction had a high internal consistency ($\alpha = 0.85$) and a good 2-week test–retest reliability coefficient (0.88) in a preliminary test of 50 college students. The questions for online responses were used to investigate the cognitive symptoms of social phobia online.

Center for Epidemiological Studies Depression Scale. The 20-item Mandarin-Chinese version[26] of Center for Epidemiological Studies Depression Scale (CES-D)[27] is a self-administered test of the frequency of depressive symptoms within the previous week in which high scores indicate increased severity of depression. The CES-D in the present study had a Chronbach's alpha of 0.78.

Chen Internet Addiction Scale. The Chen Internet Addiction Scale (CIAS) contains 26 items measured on a 4-point Likert scale ranging from 26 to 104, wherein high scores indicate increased severity of Internet addiction. The internal reliability of the scale and subscales in the original study ranged from 0.79 to 0.93.[28,29]

BIS/BAS scales. The BIS/BAS scales assess individual differences in the sensitivity of the two motivational systems proposed by Gray. The BIS scale measures the degree to which respondents expect to feel anxiety when confronted with cues for punishment. The BAS subscales for reward responsiveness, drive, and fun seeking measure the degree to which rewards yield positive emotions, the tendency to actively pursue appetitive goals, and the tendency to seek out and impulsively engage in potentially rewarding activities, respectively. The range of Chronbach's alpha values for the four subscales is 0.66–0.76.[18]

Statistical analysis

Paired t test was used to measure SA-RvsO. A t test was then used to compare SA-RvsO between the high social anxiety group and the control groups. Further, the association between high social anxiety and depression, Internet addiction, BIS, and BAS were also evaluated by t test. The SA-RvsO was calculated by subtracting the social anxiety in real-life interaction from that in online interaction. By controlling for gender and age, separate linear regression analyses were performed to test SA-RvsO score for associations with each of the following variables: high social anxiety, depression, Internet addiction, Internet behavior, BIS score, and BAS score. Variables with significant associations with SA-RvsO score were then entered into another regression model for

SA-RvsO. To prevent type I error in this large sample, a p value lower than 0.01 was considered significant.

Results

Sixty-six (30 males and 36 females) participants were excluded after failing to complete the social anxiety questionnaire. Enrolled and excluded participants did not significantly differ in gender ($\chi^2 = 0.16$, $p = 0.69$) or age ($t = -1.30$, $p = 0.20$). The final population included 2,282 participants (1,094 males and 1,188 females) who had completed all scales. Their mean age was 20.96 ± 1.77 years. Table 1 shows the distribution of all measures. The skewness scores demonstrated that scores of BV-FNE, CIAS, CES-D, and BIS/BAS were normally distributed.

The comparison of BV-FNE scores in Table 2 shows that, compared with other groups, the high social anxiety group had more social anxiety in both real-life interaction and online interaction. This group also had high scores for CES-D, CIAS, BIS, and BAS, which suggest that these variables were significantly associated with social anxiety.

The paired t test results show that social anxiety was generally lower during online interaction than during real-life interaction ($t_{2,281} = 44.16$, $p < 0.001$). The regression analysis in model 1 of Table 3 revealed that subjects with high social anxiety had lower SA-RvsO (more negative) than control group. It demonstrates that the social anxiety decreased more in online interaction among the high social anxiety group compared with the control group in Figure 1. As the SA-RvsO score negatively correlated with scores for depression, BIS, and BAS in models 3 and 4 of Table 3, the difference in social anxiety between online and real-life interaction was larger in those with high scores for depression, BIS, and BAS. However, the effects of Internet addiction and Internet activity on SA-RvsO were not significant.

Further, regression model (model 6 in Table 3) confirmed that high social anxiety and BIS had the strongest and second strongest associations with SA-RvsO, respectively. Regression modeling also showed that, after including social anxiety and BIS, depression was not significantly associated with SA-RvsO. The multicollinearity test revealed that all variance inflation factors were less than 2.[30]

Lastly, to understand the association between BIS, social anxiety, and CMC effect, the associations between BIS and social anxiety in the real world and online were evaluated by linear regression with control of gender and age. The result demonstrated that the association between BIS and social anxiety was higher in the real world (95 percent confidence interval [CI] of unstandardized coefficiency: 1.27–1.42) than online (95 percent CI of unstandardized coefficiency: 0.73–0.92) (Table 4).

Discussion

The key finding of this study was the lower social anxiety observed during online interaction than during real-life interaction, particularly in subjects with high social anxiety. Social anxiety disorder is characterized by a marked fear of social situations. Negative self-image, fear of performing poorly, and negative bias in social interactions contribute to cognitive mechanism of social anxiety.[13] Other potential contributors include conditioning events[31] such as experiencing humiliating social experiences.[32] Although embarrassing interactions can occur online, escaping from such interactions is easier in Internet. Besides, the baseline self-image depends on preexisting images of the self.[3] The anonymity online may provide opportunities to modify the preexisting self-image. Further, because social cues are limited in CMC,[11] negative interpretations of social cues are also limited. Moreover, asynchronous CMC is often less stressful compared with real-life interaction, because the participants need not respond immediately. Lastly, some conditioned anxiety-provoked social cues such as threatening facial expressions[32] cannot be perceived in CMC. The aforementioned characteristics of CMC can attenuate social anxiety in online interaction.

This study showed that the attenuating effect of Internet on social anxiety is larger in subjects with high social anxiety. Subjects with high social anxiety are vulnerable to the effects of cognitive and external factors mentioned above. As these factors could be attenuated in CMC, the high social anxiety group could experience more decreased social anxiety in online interaction. This result supports that Internet-delivered treatment may prevent the social anxiety itself from becoming a barrier to seeking treatment for social anxiety.

When interacting online, however, the high social anxiety group in this study still revealed more social anxiety than the control group did. This suggests that subjects with high social anxiety are still vulnerable to social anxiety online. Thus, the psychopathology of social anxiety existed after getting online and could be explored and intervened online. Further, interventions for social anxiety should thus consider social

Table 1. Descriptive Data for Scores on Brief Version of Fear of Negative Evaluation Scale, Modified Version of Brief Version of Fear of Negative Evaluation Scale for Online Context, Center for Epidemiological Studies Depression Scale, Chen Internet Addiction Scale, and Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) Scales

	Minimum	*Maximum*	*Mean*	SD	*Skewness*	*Kurtonsis*
BV-FNE	12	48	33.47	6.34	−0.02	−0.16
BV-FNE (online)	12	48	27.68	6.80	0.10	0.23
CESD	26	104	51.77	13.70	0.25	0.10
CIAS	0	58	16.72	8.97	0.85	0.93
BIS	13	52	40.23	5.27	−0.18	0.87
BAS	8	28	20.50	2.83	−0.18	0.74

BV-FNE, Brief Version of Fear of Negative Evaluation Scale; BV-FNE (online), Modified Version of BV-FNE for online context; CESD, Center for Epidemiological Studies Depression Scale; CIAS, Chen Internet Addiction Scale; BIS, Behavioral Inhibition System; BAS, Behavioral Activation System; *SD*, standard deviation.

Table 2. Comparison of the High Social Anxiety and Control Groups in Terms of Scores for Brief Version of Fear of Negative Evaluation Scale, Modified Version of Brief Version of Fear of Negative Evaluation Scale for Online Context, Center for Epidemiological Studies Depression Scale, Chen Internet Addiction Scale, and Behavioral Inhibition System/Behavioral Activation System (BIS/BAS) Scales

Variables	*High social anxiety group* (N = *198*) *Mean* ± SD	*Control group* (N = *2084*) *Mean* ± SD	t
BV-FNE	45.06 ± 1.82	32.37 ± 5.45	72.16*
BV-FNE (online)	34.46 ± 8.66	27.04 ± 6.22	11.78*
CIAS	56.47 ± 16.65	51.32 ± 13.31	4.23*
CESD	24.84 ± 11.98	15.95 ± 8.23	10.22*
BAS	42.93 ± 5.13	39.97 ± 5.22	7.66*
BIS	23.69 ± 2.52	20.20 ± 2.66	17.70*

*$p < 0.001$.

difficulties experienced during both face-to-face and online social interaction.

Cognitive-behavior therapy for social anxiety includes exposure, cognitive restructuring, relaxation training, and social skills training.[33] In the Internet, exposure therapy could begin with the non–real-time asynchronous online communication media that are least likely to provoke social anxiety such as text messaging or e-mail and then gradually progress to real-time chat, voice communication, or web camera communication. Asynchronous CMC provides sufficient time to identify negative thoughts in communication. Moreover, compared with real-life interaction, relaxation methods are easier to apply when using CMC media. Lastly, the social skill trainings such as therapist modeling, behavior rehearsal, and corrected feedback were more easily to be conducted in online interaction, especially in communication in text. However, the effectiveness of cognitive behavior therapy for treating social anxiety needs further study.

Other reports have indicated that CMC associates with decreased wellbeing.[34] For example, some people may invest time in online social interaction at the expense of real-life interaction.[35] It suggests that CMC may have negative psychological consequence if online interaction replaces real-world interaction. Thus, the goal of therapy for social anxiety delivered by Internet should be to decrease real-life social anxiety. For example, exposure training should gradually shift from the online context to the real-life context. Additionally, therapeutic relationships should be established not only online, but also in the real world. Lastly, as social anxiety predicts Internet addiction,[18] Internet-delivered treatments for social anxiety should include preventive intervention for Internet addiction.

In line with previous reports,[20,21] this study showed that BIS is associated with social anxiety. Subjects with high BIS are more likely to pay attention to negative social cues.[19] The activated BIS would then inhibit the social interaction. After repeatedly activating the BIS under negative social experiences, the persisting restriction on social interaction results in functional impairment. Thus, BIS is one possible mechanism of social anxiety.[22,36] In the present study, subjects with higher BIS or BAS show more decrease in social anxiety after getting

Table 3. The Association Between the Difference in Social Anxiety in Real-World and Online Interaction and Social Anxiety, Depression, Internet Addiction, Internet Activity, Behavior Inhibition, and Behavior Activation

	SA-RvsO (online–real world)				
Covariables	B	*Standardized* B	t	R^2	*VIF*
Model 1				0.07	
Male	1.31	0.11	5.16***		1.005
Age	−0.06	−0.02	−0.81		1.004
Social anxiety	−5.18	−0.23	−11.49***		1.003
Model 2		0.01			
Male	1.40	0.26	5.29***		1.027
Age	−0.04	0.07	−0.51		1.003
Internet addiction	0.01	0.01	1.05		1.024
Model 3		0.02			
Male	1.43	0.260	5.50***		1.003
Age	−0.02	0.07	−0.31		1.007
Depression	−0.05	0.02	−3.35**		1.004
Model 4		0.07			
Male	0.94	0.26	3.64***		1.033
Age	−0.08	0.07	−1.06		1.006
Behavior activation	−0.10	0.02	−4.18***		1.033
Behavior inhibition	−0.49	0.05	−10.53***		1.064
Model 5				0.01	
Male	1.48	0.12	5.54***		1.05
Age	−0.35	−0.01	−0.47		1.02
Online game	−0.31	−0.02	−0.67		1.15
Online chatting	−0.00	0.00	−0.01		1.13
Model 6		0.10			
Male	0.94	0.25	3.71***		1.037
Age	−0.09	0.07	−1.30		1.015
Social anxiety	−3.86	0.48	−7.98***		1.196
Behavior activation	−0.07	0.03	−3.00**		1.083
Behavior inhibition	−0.39	0.05	−7.71***		1.339
Depression	0.03	0.02	1.77		1.249

**$p < 0.01$; ***$p < 0.001$.

VIF, variance inflation factors; *B*, unstandardized coefficiency; SA-RvsO, social anxiety in real-world and online interaction.

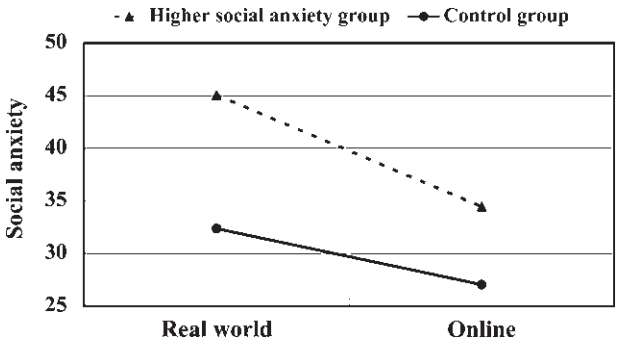

FIG. 1. The high social anxiety group shows more decrease in social anxiety in online interaction when compared with the control group.

Table 4. The Associations Between Behavior Inhibition and Social Anxiety in the Real World and Online Analyzed by Linear Regression

	Social anxiety in the real world			*Social anxiety online*		
	B	*95 percent CI*	t	B	*95 percent CI*	t
Male	0.56	0.14–0.99	2.59*	1.50	0.97–2.03	5.53***
Age	−0.19	−0.31–0.07	−3.12**	−0.27	−0.42–0.12	−3.57***
Behavior inhibition	1.34	1.27–1.42	35.06***	0.82	0.73–0.92	17.19***

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
CI, confidence interval.

online. In real-life interaction, people with higher BIS are sensitive to embarrassing situations. The activated BIS will inhibit their social interaction. In CMC, as these provoked factors of BIS are often attenuated, the symptoms of social anxiety decrease. On the other hand, the CMC also provides pleasure of control in the social interaction online.[12] Some specific social interactions such as gaming in group, providing assistance to others, or response to others' articles are usually encouraged in social interaction Web site. These interactions are usually rewarded with scores, virtue currency, or free to get some specific service. Subjects with higher BAS who are sensitive to reward will be more encouraged to interact with others in CMC. The higher promoted motivation may attenuate their fear for social interaction. Thus, people with higher BIS or BAS are more subject to the attenuating effect of CMC on social anxiety. This would suggest that the barrier of treatment for social anxiety could be decreased among subjects with higher BIS or BAS. However, both BIS and BAS correlate with Internet addiction.[37] Internet addiction should be well monitored among social anxiety cases with high BIS.

Based on the results of the regression model 6 in Table 3 for SA-RvsO, the effect of BIS was smaller than that of social anxiety. The results in Table 4 demonstrate that the association between BIS and social anxiety was significantly lower online than that in the real world. It demonstrates that CMC's effect attenuates the contribution of BIS to social anxiety. Then, the effect of BIS on social anxiety would be more likely to be ignored in the treatment delivered via the Internet. Thus, more attention should be paid for the effect of BIS on social anxiety. For example, oversensitivity to negative social cue from others should be discussed, and more effective coping style and encouragement for social interaction could be provided to reduce the effect from BIS.

The observed correlation between social anxiety and depression in this study indicates the importance of treating comorbid depression in patients with social anxiety. In this study, the higher depressive subjects decreased their social anxiety more in the Internet. It may indicate that providing treatment via Internet may reduce social anxiety in depressive patients.

Lastly, SA-RvsO revealed no associations with Internet addiction or with any specific Internet activity type. Although this study demonstrated that social anxiety was lower during online interaction than during face-to-face interaction, the observed difference in social anxiety revealed no correlation with any mechanisms of Internet addiction.

This study had three limitations that should be considered when interpreting its findings. First, in this study, two popular online activities, gaming and chatting, were evaluated. For many Internet users, however, the two activities are often simultaneous, because chatting is common during online gaming and chat rooms often provide games for visitors. This may explain why social anxiety did not vary according to online activity type in this study. The online activity should be classified according to motivation, for task or for communication, in future study for its effect on SA-RvsO. Second, social anxiety was evaluated only by self-reported information from the participants. The assessment could not prevent recall bias for social anxiety, particularly that in the online context. Third, the cross-sectional research design could not confirm causal relationships between Internet use and hostility.

Conclusion

This study demonstrated that social anxiety is lower during online interaction than during face-to-face interaction, especially in subjects with high social anxiety, depression, high BIS score, and high BAS score. It suggests that Internet has good potential as an alternative medium for providing information about social anxiety or for implementing interventions for social anxiety, because it decreases barriers to treatment associated with the symptoms of social anxiety itself. However, the benefits and risks of Internet-delivered interventions need further study. Further, the contribution of BIS for social anxiety is decreased online. The treatment for social anxiety delivered with the Internet should pay more attention to the effect of BIS on social anxiety.

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Disclosure Statement

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References

1. American Psychiatric Assn WDU. (2000) *Diagnostic and statistical manual of mental disorders*. 4th ed, Text Revision. Washington, DC: American Psychiatric Association.
2. Stein MB, Stein DJ. Social anxiety disorder. The Lancet 2008; 371:1115–1125.
3. Sadock BJ, Sadock VA. (2007) *Kaplan & Sadock's synopsis of psychiatry*. 10th ed. Philadelphia: Lippincott Williams & Wilkins.
4. Keller MB. Social anxiety disorder clinical course and outcome: review of Harvard/Brown Anxiety Research Project (HARP) findings. Journal of Clinical Psychiatry 2006; 67:14–19.

5. Ipser JC, Kariuki CM, Stein DJ. Pharmacotherapy for social anxiety disorder: a systematic review. Expert Review of Neurotherapeutics 2008; 8:235–257.
6. Singh JS, Hope DA. Cognitive-behavioral approaches to the treatment of social anxiety disorder. Israel Journal of Psychiatry and Related Sciences 2009; 46:62–69.
7. Wang PS, Lane M, Olfson M, et al. Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. Archives of General Psychiatry 2005; 62:629–640.
8. Berger T, Hohl E, Caspar F. Internet-based treatment for social phobia: a randomized controlled trial. Journal of Clinical Psychology 2009; 65:1021–1035.
9. McCroskey JC. Oral communication apprehension: a summary of recent theroy and research. Human Communication Research 1977; 4:78–96.
10. Schroeder JE, Ketrow SM. Social anxiety and performance in an interpersonal perception task. Psychological Reports 1997; 81:991–996.
11. Riva G. The sociocognitive psychology of computer-mediated communication: the present and future of technology-based interactions. CyberPsychology and Behavior 2002; 5:581–598.
12. Leung L. Net-generation attributes and seductive properties of the internet as predictors of online activities and internet addiction. CyberPsychology and Behavior 2004; 7:333–348.
13. Hirsch CR, Clark DM, Mathews A. Imagery and interpretations in social phobia: support for the combined cognitive biases hypothesis. Behavior Therapy 2006; 37:223–236.
14. Dalrymple KL, Zimmerman M. Does comorbid social anxiety disorder impact the clinical presentation of principal major depressive disorder? Journal of Affective Disorders 2007; 100:241–247.
15. Ledley DR, Huppert JD, Foa EB, et al. Impact of depressive symptoms on the treatment of generalized social anxiety disorder. Depression and Anxiety 2005; 22:161–167.
16. Titov N. Internet-delivered psychotherapy for depression in adults. Current Opinion in Psychiatry 2011; 24:18–23.
17. Yen JY, Ko CH, Yen CF, et al. The comorbid psychiatric symptoms of Internet addiction: attention deficit and hyperactivity disorder (ADHD), depression, social phobia, and hostility. Journal of Adolescent Health 2007; 41:93–98.
18. Ko CH, Yen JY, Chen CS, et al. Predictive values of psychiatric symptoms for internet addiction in adolescents: a 2-year prospective study. Archives of Pediatrics and Adolescent Medicine 2009; 163:937–943.
19. Carver CS, White TL. Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. Journal of Personality and Social Psychology 2010; 67:319–333.
20. Schofield CA, Coles ME, Gibb BE. Retrospective reports of behavioral inhibition and young adults' current symptoms of social anxiety, depression, and anxious arousal. Journal of Anxiety Disorders 2009; 23:884–890.
21. Morgan BE, van HJ, Hermans EJ, et al. Gray's BIS/BAS dimensions in non-comorbid, non-medicated social anxiety disorder. World Journal of Biological Psychiatry 2009; 10:925–928.
22. Marcin MS, Nemeroff CB. The neurobiology of social anxiety disorder: the relevance of fear and anxiety. Acta Psychiatr Scand Suppl 2003; 417:51–64.
23. Leary MR. A Brief Version of the Fear of Negative Evaluation Scale. Personality and Social Psychology Bulletin 1983; 9:371–375.
24. Mather AA, Stein MB, Sareen J. Social anxiety disorder and social fears in the Canadian military: prevalence, comorbidity, impairment, and treatment-seeking. Journal of Psychiatric Research 2010; 44:887–893.
25. Wittchen HU, Stein MB, Kessler RC. Social fears and social phobia in a community sample of adolescents and young adults: prevalence, risk factors and co-morbidity. Psychological Medicine 1999; 29:309–323.
26. Chien CP, Cheng TA. Depression in Taiwan: epidemiological survey utilizing CES-D. Seishin Shinkeigaku Zasshi Psychiatria et Neurologia Japonica 1985; 87:335–338.
27. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. Applied Psychological Measurement 1977; 1:385–401.
28. Chen SH, Weng LC, Su YJ, et al. Development of Chinese Internet Addiction Scale and its psychometric study. Chinese Journal of Psychology 2003; 45:279–294.
29. Ko CH, Yen JY, Chen SH, et al. Proposed diagnostic criteria and the screening and diagnosing tool of Internet addiction in college students. Comprehensive Psychiatry 2009; 50:378–384.
30. O'Brien RM. A caution regarding rules of thumb for variance inflation factors. quality and quantity 2007; 41:673–690.
31. Ollendick TH, Hirshfeld-Becker DR. The developmental psychopathology of social anxiety disorder. Biological Psychiatry 2002; 51:44–58.
32. Staugaard SR. Threatening faces and social anxiety: a literature review. Clinical Psychology Review 2010; 30:669–690.
33. Heimberg RG. Cognitive-behavioral therapy for social anxiety disorder: current status and future directions. Biological Psychiatry 2002; 51:101–108.
34. Schiffrin H, Edelman A, Falkenstern M, et al. The associations among computer-mediated communication, relationships, and well-being. CyberPsychology, Behavior, and Social Networking 2010;13:299–306.
35. Morahan-Martin J. The relationship between loneliness and internet use and abuse. CyberPsychology and Behavior 1999; 2:431–439.
36. Bijttebier P, Beck I, Claes L, et al. Gray's Reinforcement Sensitivity Theory as a framework for research on personality-psychopathology associations. Clinical Psychology Review 2009; 29:421–430.
37. Yen JY, Ko CH, Yen CF, et al. The association between harmful alcohol use and Internet addiction among college students: comparison of personality. Psychiatry and Clinical Neurosciences 2009; 63:218–224.

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