**Name of Journal: *World Journal of Psychiatry***

**ESPS Manuscript NO: 27214**

**Manuscript Type: Original Article**

***Retrospective Study***

**Oral but not written test anxiety is related to social anxiety**

Laurin-Barantke L *et al.* Test anxiety and social anxiety in exams

**Lisa Laurin-Barantke, Jürgen Hoyer, Lydia Fehm, Susanne Knappe**

**Lisa Laurin-Barantke, Jürgen Hoyer,** Institute of Clinical Psychology and Psychotherapy, Technische Universität Dresden, 01187 Dresden, Germany

**Lydia Fehm,** Center for Psychotherapy (ZPHU), Humboldt-Universität zu Berlin, 10179 Berlin, Germany

**Susanne Knappe,** Institute of Clinical Psychology and Psychotherapy, Center for Preventive Intervention Studies, Technische Universität Dresden, 01187 Dresden, Germany

**Author contributions:** Laurin-Barantke L and Knappe S conceptualized and designed the study; Laurin-Barantke L was responsible for data collection; Laurin-Barantke L and Knappe analyzed the data and interpreted the results; Laurin-Barantke L, Hoyer J, Fehm L and Knappe S helped to draft the manuscript; Hoyer J and Fehm L critically revised the manuscript related to important intellectual consent; all authors approved the manuscript for submission and publication.

**Institutional review board statement:**The study was reviewed and approved by the ethics committee of the TU Dresden (EK-NR. 205062013).

**Informed consent statement:** All study participants provided informed written consent prior to study enrollment.

**Conflict-of-interest statement:**All authors declare no conflict of interest.

**Data sharing statement:** No additional data are available. The statistical methods of this study were reviewed by Michael Höfler and the corresponding author, at the Institute of Clinical Psychology and Psychotherapy, Technische Universität Dresden.

**Open-Access:** This is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/

**Manuscript source:** Invited manuscript

**Correspondence to: Dr. Susanne Knappe, Dipl, Psych,** Institute of Clinical Psychology and Psychotherapy, Technische Universität Dresden, Chemnitzer Str. 46, 01187 Dresden, Germany. susanne.knappe@tu-dresden.de

**Telephone:** +49-0351-46339727

**Fax:** +49-0351-46336984

**Received:** May 17, 2016

**Peer-review started:** May 19, 2016

**First decision:** July 5, 2016

**Revised:** July 15, 2016

**Accepted:** July 29, 2016

**Article in press:**

**Published online:**

**Abstract**

**AIM:** To examine the associations of test anxiety (TA) in written *vs* oral exam situations with social anxiety (SA).

**METHODS:** A convenience sample of 204 students was recruited at the Technische Universität Dresden (TU Dresden, Germany) and contacted *via* e-mail asking to complete a cross-sectional online survey based on established questionnaires. The study protocol was approved by ethics committee of the TU Dresden. Full data of *n* = 96 students were available for dependent *T*-tests and correlation analyses on the associations of SA and TA respectively with trigger events, cognitions, safety behaviors, physical symptoms and depersonalization. Analyses were run using SPSS.

**RESULTS:** Levels of TA were higher for fear in oral exams than for fear in written exams (M = 48.1, SD = 11.5 *vs* M = 43.7, SD = 10.1 *P* < 0.001). Oral TA and SA were positively correlated (Spearman’s *r* = 0.343, *P* < 0.001; Pearson’s *r* = 0.38, *P* < 0.001) contrasting written TA and SA (Spearman’s *r* = 0.17, *P* > 0.05; Pearson’s *r* = 0.223, *P* > 0.05). Compared to written TA, trigger events were more often reported for oral TA (18.2% *vs* 30.3%, *P* = 0.007); which was also accompanied more often by test-anxious cognitions (7.9% *vs* 8.5%, *P* = 0.001), safety behavior (8.9% *vs* 10.3%, *P* < 0.001) and physical symptoms (for all, *P* < 0.001).

**CONCLUSION:** Written, but not oral TA emerged being unrelated to SA and may rather not be considered as a typical facet of SA disorder.

**Key words:** Social anxiety; Test anxiety; Depersonalization; Derealization; Safety behavior

**© The Author(s) 2016.** Published by Baishideng Publishing Group Inc. All rights reserved.

**Core tip:** In a convenience student sample, levels of test anxiety (TA) were higher for fear in oral exams than for fear in written exams. Oral TA and social anxiety (SA) were positively correlated, contrasting written TA and SA. Compared to written TA, trigger events were more often reported for oral TA; which was also accompanied more often by test-anxious cognitions, safety behavior and physical symptoms. Results point to overlaps between oral TA and SA. Since written TA appeared unrelated to SA, it may rather not be considered as a typical facet of SA.

Laurin-Barantke L, Hoyer J, Fehm L, Knappe S. Oral but not written test anxiety is related to social anxiety. *World J Psychiatr* 2016; In press

**INTRODUCTION**

The aim of a deepened understanding of social anxiety (SA) disorder, its putative subtypes and differentiation from other mental disorders has stimulated research in the last decade, *e.g.*, on the relationship of public speaking anxiety with other facets of SA disorder[1,2]. Broadly, the diagnostic category of SA disorder represents a multi-faceted phenomenon, that spans from more or less isolated social fears to severe anxiety in social situations related to interactions with others and performance in public[1,3,4]. Results of Hall[5] and Knappe *et al*[6] pointed to notable differences between fear of public speaking and test anxiety (TA) on the one hand, and other social fears and SA disorder on the other, namely in terms of age of onset, social anxious cognitions, physical symptoms and increase of self-reported anxiety levels over time. For example, in a community sample of adolescents and young adults, isolated social fears in test situations were unrelated to catastrophic social anxious cognitions, but associated with significant avoidance (though not with moderate/severe impairment), lower comorbidity, behavioral inhibition, and parental psychopathology as compared to respondents with other performance or interaction related social fears[6]. Findings suggest that TA might be meaningfully distinguished from SA, and question whether TA is in fact part of the SA spectrum or if it should be better classified as a specific fear or phobia[3,5,6].

Despite efforts to better understand the relationship of TA and SA disorder, little attention has been paid to the fact that TA can occur in oral and written exams and that these two types of situations imply differing cues for anxiety reactions: A convenience sample of college students preferred written exams over oral exams[7,8], probably because social interaction is limited in written exams, whereas oral exams demand both performance and social interaction skills.

To better understand the relationship of TA and SA, this study aims to explore similarities and differences in written and oral exams, as well as similarities and differences between both forms of TA and SA.

Some facets of TA and SA have been explored so far: Sarason[9] hypothesized, that some type of TA is triggered by “quite specific unfortunate experiences, *e.g*., a traumatizing teacher in the third grade”. Accordingly, trigger events may be particularly relevant for TA, whereas for SA, only few of those affected recall a specific event as origin of their fear[10]. With regard to cognitions, Knappe *et al*[6] found that fear of taking tests was negatively associated with socially phobic cognitions like “something embarrassing or shameful could happen”, “to be ashamed” and “to turn red”, whereas there was a positive association between catastrophic anxiety cognitions and the majority of social fears. Bögels *et al*[3] concluded that blushing is a physical, maybe even unique, sign of SA disorder compared with other anxieties. However, they did not differentiate for specific social fears or social situations. Hoyer and colleagues found that symptoms of depersonalization were more frequent in social phobia patients (92%) than in controls (52%)[11].

Overall, based on however limited findings on clinical features, it is suggested that: (1) TA in oral exams is associated with higher levels of SA as compared to written exams; and that (2) oral TA is more similar to SA in terms of safety behaviors, cognitions and physical symptoms than written TA; (3) Similar to SA, symptoms of depersonalization/derealization are expected to occur more frequently in oral exams than in written exams.

# MATERIALS AND METHODS

## Procedure and participants

A convenience sample of 204 students was recruited at the Technische Universität Dresden (TU Dresden), Germany, and contacted *via* email asking to complete an online survey. Students received course credits and/or randomly drawn cinema and bowling vouchers for participation. The ethics committee of the TU Dresden approved the study protocol.

Data from 105 students were not available for analyses, since e-mail addresses were incorrect (*n* = 14), students did not respond (*n* = 55), or filled in less than 50% of the questionnaire (*n* = 36, 18.9%).There were no systematic differences between participants responding only partly (*n* = 22) and those who responded completely (*n* = 99) (Table 1). *Via* skip rule, only participants who reported anxiety in or avoidance of at least one social situation listed in the LSAS (see below) were asked about trigger events, TA, cognitions, behavior, depersonalization and physical symptoms. Indication of TA based on the PAF [Prüfungsangstfragebogen, (TA Questionnaire), see below] was not required as a necessary condition (*i.e*., no skip rule when no TA was reported) because Knappe *et al*[6] observed that fear of taking tests occurred independently from SA but not vice versa. Three subjects were excluded because they skipped the survey after indicating no fear or avoidance of social situations. Accordingly, analyses were based on *n* = 96 subjects with complete data sets. The sample consisted of 23 males (24%) and 73 females (76%), aged 19 to 46 years (M = 22.9 years, SD = 3.6). Additional information was collected on the target degree (*n* = 32 state examination, *n* = 32 bachelor, *n* = 2 master, *n* = 30 diploma) and branch of study (*n* = 33 medicine, *n* = 31 psychology, *n* = 8 mechanical engineering, *n* = 7 biology, *n* = 6 architecture, *n* = 5 sociology, *n* = 6 other). Students were also asked to recall any event as a trigger for their anxiety in social situations, oral or written exams.

***Measures***

**SA:**The 24-item German self-report Version of the “Liebowitz Social Anxiety Scale” (LSAS)[12] was administered. Item 17 (“taking a test”) was splitted for detailed assessment of anxiety and avoidance during written or oral exam situations (namely: taking a written test, taking an oral examination). The 27-item German “Fragebogen zu sozialphobischem Verhalten” [SPV, (Questionnaire for Social Phobic Behavior)][13] was used to assess social anxious motivated safety behavior, *e.g*., “I try to behave as normal as possible”. Ratings were shown in inversed order for comprehensiveness with other measures.

**TA**:The German questionnaire “Prüfungsangstfragebogen” [PAF, (TA Questionnaire), 20 items][14] was used to assess severity of TA. In addition, generic items asked for trigger events for fear of written and oral exams separately, as well as for test-anxious cognitions (TAC, 10 items) and test-anxious coping and safety behavior (TAB, 17 items). The subscale “physical symptoms” of the German “Brief Social Phobia Scale” (BSPS-G, 4 items)[15] was used to assess bodily symptoms of TA. All instructions were slightly modified to allow for separate self-assessment in written and oral exams.

**Symptoms of depersonalization/derealization:** The German version of the “Cambridge Depersonalisation Scale 9” (CDS-9, 9 items)[16] was used to assess symptoms of depersonalization/derealization. The instruction was slightly modified for separate assessment with regard to social situations, as well as written and oral exams. The items were presented following the numerical order of the full CDS (in contrast to Michal *et al*[16]). To increase reasonableness of the questionnaire, the duration scale of the CDS-9 was omitted.

The PAF, TAB TAC, BSPS-G und CDS-9 were administered twice for separate assessments in oral and written TA situations. Internal consistencies (Cronbach’s α) for scores of all modified scales ranged between 0.737 and 0.919 (Table 2). Convergent and discriminant validity of all modified scales were explored based on their correlation patterns, indicating sufficient validity. Details are available upon request (Table 3).

## Statistical analysis

Dependent t-tests for paired samples were used to compare mean values of the number of trigger events, TA, test-anxious cognitions, test-anxious coping and safety behavior, symptoms of depersonalization/derealization and physiological symptoms (blushing, palpitation, tremor and sweating) in written exams to oral exams. Associations of SA (based on LSAS) with TA during written exams and TA during oral exams (based on PAF) were compared using Steiger’s Z[17], which allows to compare overlapping correlations. In absence of normally distributed data, Spearman correlations were computed. Pearson correlations were additionally computed since they are necessary for the computation of Steiger’s Z. The correlations were similar and therefore the Pearson correlations were compared within a sample using Steiger’s Z. Analyses were run using SPSS[18]. A Bonferroni correction (αcorr = 0.025) was applied for analyses on safety behaviors to account for multiple testing (*i.e*., comparison between SA and oral TA; comparison between SA and written TA). It was not applied for explorative analyses, where a higher α error can rather be tolerated than an increase of the β error[19].

# RESULTS

***Frequencies and associations of SA and written or oral TA***

Isolated oral and written TA was reported in 14.6% (*n* = 14) and 2.1% (*n* = 2), respectively, of the sample. More than one third of the sample reported at least one condition out of SA, written TA or oral TA (36.5%, *n* = 35). Symptoms of depresonalization/derealization occurred most often in social situations (*n* = 13; 13.5%), followed by oral exams (*n* = 11; 11.5%) and written exams (*n* = 8; 8.3%) (Table 4).

As expected, SA was unrelated to written TA (Spearman’s *r* = 0.17, *P* > 0.05; Pearson’s *r* = 0.22, *P* > 0.05), but positively related to oral TA (Spearman’s *r* = 0.34, *P* < 0.001; Pearson’s *r* = 0.38, *P* < 0.001). Correlations of SA with written *vs* oral TA however did not differ (Steiger’s *Z* = -1.18, *P* > 0.05).

***Comparisons between written and oral*** *TA*

Analyses revealed substantial differences between oral and written TA in terms of trigger events, clinical characteristics and physiological symptoms (Table 5). Specifically, trigger events were more often reported for oral TA (30.3%) than written TA (18.2%) (*t*(95) = 2.78, *P* = 0.007). As expected, the level of TA was higher among those reporting fear of oral exams than in those with fear of written exams (Table 5) (*t*(95) = -4.86, *P* < 0.001). Further, TAC and TAB were reported more often for oral TA than for written TA. For symptoms of depersonalization/derealization, no differences between oral and written TA were observed. Physical symptoms were reported more often for oral TA than for written TA.

***Comparison between SA, and written and oral TA***

SA, based on the LSAS, was positively related to safety behaviors (Spearman’s *r* = 0.64, *P* < 0.001; Pearson’s *r* = 0.70, *P* < 0.001). Both forms of TA were moderately associated with safety behaviors (written: Spearman’s *r* = 0.31, *P* < 0.001; Pearson’s *r* = 0.28, *P* < 0.001; oral: Spearman’s *r* = 0.42, *P* < 0.001; Pearson’s *r* = 0.45, *P* < 0.001); these correlations were however lower than the correlation between LSAS and safety behaviors and did not differ (written TA: Steiger’s *Z* = 3.22, *P* < 0.001; oral TA: Steiger’s *Z* = 2.23, *P* < 0.005; written compared to oral TA: Steiger’s *Z* = -0.93, *P* > 0.05).

Symptoms of depersonalization/derealization were similarly frequent across all conditions (scale: 0 = never to 4 = constantly; SA: M = 3.7, SD = 2.7, oral TA: M = 3.2, SD = 5.2, written TA: M = 2.7, SD = 1.9), and only the difference between SA and written TA was statistically significant (*t*(95) = 2.95, *P* = 0.004).

# DISCUSSION

Compared to written TA, SA was more closely related to oral TA and oral TA was triggered more often by an event and accompanied more often by test-anxious cognitions, safety behavior and physical symptoms. In terms of safety behaviors and symptoms of depersonalization/derealization, TA conditions and SA were quite similar. Hence, both the differences between TA conditions and associations between oral TA with SA indicate that SA and oral TA are overlapping entities.

Notably, TA in oral exams was associated with SA, unlike with TA in written exams. Hence, TA seems to be a heterogeneous phenomenon that comprises of different types of exam situations which are more or less social in nature. In fact, oral test situations could be presumed as social situations that require social skills, interaction and communication with others and that may elicit fear of negative evaluation. Further, oral exams are difficult to predict and to control, similar to social situations in general. In contrast, written test situations do not necessarily include interacting with others, and often follow familiar structures or schedules. Written exams may thus elicit lower levels or even no SA. Accordingly, Fehm, Schneider and Hoyer[20] reported higher levels of prolonged rumination about past social situations (*i.e.*, post-event processing) in interaction-related social situations as compared to performance-related social situations. When written exams are perceived as aversive, this may be related to other factors than to SA, such as inefficient study skills and/or test-taking skills, intolerance of uncertainty[21], avoidance temperament[22], perfectionism[23] or low self-efficacy. Nonetheless, cognitive interference may affect performance in both written and oral exams[24].

Findings need to be considered in light of some limitations: The limited convenience sample (*n* = 96) with overrepresentations of students of psychology and medicine did not allow for analyses on isolated conditions. Though standardized or structured measures are preferred for a more comprehensive evaluation, indications of SA and TA were deduced from established self-report questionnaires (LSAS and PAF) which were modified for separate evaluations of anxiety in oral *vs* written exams. Rates for SA were however in line with population-based data in similar age ranges[6]. Given the limited sample size and the absence of normally distributed data for some variables, multivariate statistics were not applied. Statistical analyses based on correlation analyses and dependent *t-*tests for paired samples were sufficient for testing hypotheses and for the exploration of similarities and differences in written and oral exams, as well as of similarities and differences between both forms of TA and SA. For larger samples with independent assessments for written and oral tests, ANOVA models may be more adequate. All questionnaires were conceptualized as paper-pencil-measures but administered in a web-based format. Internal consistencies for the modified scales were however medium to high. In addition, putative influences on TA like stereotype threat or language difficulties, perceived difficulty or relevance of the exams, or indicators of performance (*i.e*., grades, results of previous exams) were not assessed.

The similarities and differences of oral and written TA with SA again support the conceptualization of SA as a multi-faceted phenomenon. Because of the notable differences between oral and written TA in terms of trigger events, test-anxious cognitions, safety behavior and physical symptoms, it may be concluded that TA could be rather used to describe anxiety in oral exams than in written exams, similar to the recently introduced DSM-5 “performance only” specifier for SAD where SA is limited to speaking or performing in public[1]. Further differentiation of situation-specific types of TA would allow clarifying the facets of TA and their relationships to SA.

**COMMENTS**

***Background***

The diagnostic category of social anxiety (SA) disorder spans from more or less isolated social fears to severe anxiety in social situations related to interactions with others and performance in public. Studies so far pointed to notable differences between fear of public speaking and test anxiety (TA) on the one hand, and other social fears and SA disorder on the other. Findings suggest that TA might be meaningfully distinguished from SA. Some suggest even an alternative diagnostic classification of TA apart from the SA spectrum, for example as a specific fear or phobia.

***Research frontiers***

Little attention has been paid to the fact that TA can occur in oral and written exams and that these two types of situations imply differing cues for anxiety reactions. More details on the clinical features may help to inform the diagnostic classification of TA.

***Innovations and breakthroughs***

Compared to written TA, SA was more closely related to oral TA and oral TA was triggered more often by an event and accompanied more often by test-anxious cognitions, safety behavior and physical symptoms. In terms of safety behaviors and symptoms of depersonalization/derealization, TA conditions and SA were quite similar.

***Applications***

Because of the notable differences between oral and written TA, it may be concluded that TA could be rather used to describe anxiety in oral exams than in written exams, similar to the recently introduced DSM-5 “performance only” specifier for SA disorder.

***Terminology***

TA refers to excessive stress, marked anxiety or fear and discomfort during and/or before taking a test or examination. Associated symptoms include physiological over-arousal, tension and somatic symptoms, cognitive symptoms such as worry, dread, fear of failure, and catastrophizing of anticipated consequences of the test situation.

***Peer-review***

Nice little study with a defined focus.

**REFERENCES**

1 **American Psychiatric Association**. Diagnostic and Statistical Manual of Mental Disorders DSM-5 (5th ed.). Arlington, VA: American Psychiatric Publishing, 2013

2 **Blöte AW**, Kint MJ, Miers AC, Westenberg PM. The relation between public speaking anxiety and social anxiety: a review. *J Anxiety Disord* 2009; **23**: 305-313 [PMID: 19117721 DOI: 10.1016/j.janxdis.2008.11.007]

3 **Bögels SM**, Alden L, Beidel DC, Clark LA, Pine DS, Stein MB, Voncken M. Social anxiety disorder: questions and answers for the DSM-V. *Depress Anxiety* 2010; **27**: 168-189 [PMID: 20143427 DOI: 10.1002/da.20670]

4 **Knappe S**, Beesdo-Baum K, Fehm L, Lieb R, Wittchen HU. Characterizing the association between parenting and adolescent social phobia. *J Anxiety Disord* 2012; **26**: 608-616 [PMID: 22445318 DOI: 10.1016/j.janxdis.2012.02.014]

5 **Hall TS**. Is test anxiety a form of specific social phobia? University of Maryland, 2005

6 **Knappe S**, Beesdo-Baum K, Fehm L, Stein MB, Lieb R, Wittchen HU. Social fear and social phobia types among community youth: differential clinical features and vulnerability factors. *J Psychiatr Res* 2011; **45**: 111-120 [PMID: 20684833 DOI: 10.1016/j.jpsychires.2010.05.002]

7 **Zeidner M**, Bensoussan M. College students' attitudes towards written versus oral tests of English as a foreign language. *Language Testing* 1988; **5**: 100-114 [DOI: 10.1177/026553228800500107]

8 **Zoller U**, Ben-Chaim D, Kamm SD. Examination-type preferences of college science students and their faculty in Israel and USA: A comparative study. *Sch Sci Math* 1997; **97**: 3-12 [DOI: 10.1111/j.1949-8594.1997.tb17334.x]

9 **Sarason IG**. Test anxiety and the self-disclosing coping model. *J Consult Clin Psychol* 1975; **43**: 148-153 [PMID: 1120823 DOI: 10.1037/h0076507]

10 **Stemberger RT**, Turner SM, Beidel DC, Calhoun KS. Social phobia: an analysis of possible developmental factors. *J Abnorm Psychol* 1995; **104**: 526-531 [PMID: 7673576]

11 **Hoyer J**, Braeuer D, Crawcour S, Klumbies E, Kirschbaum C. Depersonalization/derealization during acute social stress in social phobia. *J Anxiety Disord* 2013; **27**: 178-187 [PMID: 23434546 DOI: 10.1016/j.janxdis.2013.01.002]

12 **Stangier U**, Heidenreich T. Liebowitz Soziale Angst-Skala (LSAS). In: Collegium Internationale Psychiatriae Scalarum, editors. Internationale Skalen für Psychiatrie. 5th ed. Göttingen: Hogrefe, 2005

13 **Hoyer J**, Margraf J. Angstdiagnostik: Grundlagen und Testverfahren (Clinical Diagnostics of Anxieties: Basics and Tests). Hoyer J and Margraf J., editors. Heidelberg: Springer, 2003

14 **Hodapp V**, Rohrmann S, Ringeisen T. Prüfungsangstfragebogen (PAF). Göttingen: Hogrefe, 2011

15 **Chaker S**, Haustein E, Hoyer J, Davidson JRT. Ein Interview zur Erfassung sozialer Ängste unter Einbeziehung von Körpersymptomen (An Interview for the Measurement of Social Anxieties with Inclusion of Physiological Symptoms). *Verhaltenstherapie* 2011; **21**: 194-196 [DOI: 10.1159/000330926]

16 **Michal M**, Sann U, Niebecker M, Lazanowsky C, Kernhof K, Aurich S, Overbeck G, Sierra M, Berrios GE. [The measurement of the depersonalisation-derealisation-syndrome with the German version of the Cambridge Depersonalisation Scale (CDS)]. *Psychother Psychosom Med Psychol* 2004; **54**: 367-374 [PMID: 15343478 DOI: 10.1055/s-2004-828296]

17 **Garbin C** (n.d.). Bivariate correlation comparisons. University of Nebraska-Lincoln. Available from: URL: http://psych.unl.edu/psycrs/statpage/biv\_corr\_comp\_eg.pdf

18 PASW Statistics for Windows, Version 18.0. Chicago: SPSS Inc., 2009

19 Kowalski A, Enck P. Statistische Methoden bei Mehrfachtestung: Die Bonferroni-Korrektur (Statistical Methods to account for Multiple Testing: The Boferroni-Correction). Psychother Psychosom Med Psychol 2010; 60: 286–287 [DOI: 10.1055/s-0030-1248493]

20 **Fehm L**, Schneider G, Hoyer J. Is post-event processing specific for social anxiety? *J Behav Ther Exp Psychiatry* 2007; **38**: 11-22 [PMID: 16730328 DOI: 10.1016/j.jbtep.2006.02.004]

21 **Dugas M**, Freeston M, Ladouceur R. Intolerance of Uncertainty and Problem Orientation in Worry. *Cognit Ther Res* 1997; **21**: 593-606 [DOI: 10.1023/A: 1021890322153]

22 **Liew J**, Lench HC, Kao G, Yeh YC, Kwok OM. Avoidance temperament and social-evaluative threat in college students' math performance: a mediation model of math and test anxiety. *Anxiety Stress Coping* 2014; **27**: 650-661 [PMID: 24684522 DOI: 10.1080/10615806.2014.910303]

23 **Eum K**, Rice KG. Test anxiety, perfectionism, goal orientation, and academic performance. *Anxiety Stress Coping* 2011; **24**: 167-178 [PMID: 20503124 DOI: 10.1080/10615806.2010.488723]

24 **Friedman IA**, Bendas-Jacob O. Measuring perceived test anxiety in adolescents: A self-report scale. *Educ PsycholMeas* 1997; **57**: 1035-1046 [DOI: 10.1177/0013164497057006012]

**P-Reviewer:** Hosak L, Richter J **S-Editor:** Ji FF **L-Editor: E-Editor:**

|  |
| --- |
| **Table 1 Description of full and partial responders** |
|  |  |  |  |
|  | Complete responders(*n* = 99)a | Partial responders(*n* = 22)b |   |
|   | *n* | % | *n* | % | *χ*2 test |
| Sex |  |  |  |  | 0.290 |
|  Males | 25 | 26.0 | 8 | 36.4 |  |
|  Females | 74 | 74.0 | 14 | 63.6 |
|  |  |  |  |  |  |
| Age (M, SD) | 22.9 (3.6) | 23.0 (2.6) | 0.573 |
|  |  |  |  |  |  |
| Branch of study |  |  |  |  | 0.297 |
|  Mechanical engineering | 9 | 9.4 | 2 | 9.1 |  |
|  Psychology | 32 | 33.3 | 6 | 27.3 |
|  Sociology | 5 | 5.2 | 4 | 18.2 |
|  Medicine | 34 | 35.4 | 6 | 27.3 |
|  Architecture | 6 | 6.3 | 1 | 4.5 |
|  Biology | 7 | 7.3 | 1 | 4.5 |
|  Other | 6 | 6.3 | 2 | 9.1 |
|  |  |  |  |  |  |
| Degree of study |  |  |  |  | 0.814 |
|  Diploma | 31 | 32.3 | 7 | 31.8 |  |
|  Bachelor | 33 | 34.4 | 9 | 40.9 |
|  Master | 2 | 2.1 | 0 | 0.0 |
|  Stateexam | 33 | 34.4 | 6 | 27.3 |
|  |  |  |  |  |  |
| Number of days since last exam |  |  |  |  |
|  Written exam (M, SD) | 51.1 (69.0) | 51.3 (63.5) | 0.920 |
|  Oral exam (M, SD) | 253.7 (342.8) | 406.1 (518.5) | 0.468 |
|  |  |  |  |  |  |
| Probable social anxiety disorder |  |  |  |  |
|  SSQ | 14 | 14.1 | 5 | 22.7 | 0.317 |
|  LSAS-anxiety (M, SD) | 15.6 (10.5) | 13.0 (10.0) | 0.366 |
|  LSAS-avoidance (M, SD) | 13.6 (10.2) | 11.9 (12.1) | 0.574 |
|  |  |  |  |  |  |
| Probable test-anxiety |  |  |  |  |  |
|  Written exam LSAS-anxiety (M, SD) | 1.1 (0.8) | 0.9 (0.8) | 0.804 |
|  Written exam LSAS-avoidance (M, SD) | 0.2 (0.6) | 0.3 (0.6) | 0.550 |
|  Oral exam LSAS-anxiety  (M, SD) | 1.8 (1.0) | 1.5 (1.1) | 0.566 |
|  Oral exam LSAS-avoidance  (M, SD) | 0.2 (0.6) | 0.3 (0.9) | 0.619 |
| aData of additional 3 participants were not used since they did not report any fear or avoidance of social situations and thus were not asked about trigger events, test anxiety, cognitions, behavior, depersonalization and physical symptoms due to skip rules; bData of additional 14 participants were not used since they did not give written informed consent. M: Mean; SD: Standard deviation; SSQ: Symptom screening questionnaire; LSAS: Liebowitz Social Anxiety Scale (subscales for severity of social anxiety and avoidance of social situations). |

|  |
| --- |
| **Table 2 Reliability of scales and measures (*n* = 96)** |
|  |  | α |
| Social anxiety | LSAS anxiety subscale | 0.914 |
|  | LSAS avoidance subscale | 0.897 |
|  | SPK | 0.926 |
|  | SPV | 0.821 |
|  | BSPS-G physical subscale | 0.737 |
|  | CDS-9 frequency subscale | 0.848 |
| Written test anxiety | PAF | 0.897 |
|  | TAC | 0.884 |
|  | TAB | 0.780 |
|  | BSPS-G, physical subscale | 0.775 |
|  | CDS-9 frequency subscale | 0.911 |
| Oral test anxiety | PAF | 0.906 |
|  | TAC | 0.888 |
|  | TAB | 0.811 |
|  | BSPS-G, physical subscale | 0.756 |
|  | CDS-9 frequency subscale | 0.919 |

α: Cronbach‘s α; LSAS: Liebowitz Social Anxiety Scale; SPV: FragebogenzusozialphobischemVerhalten (Questionnaire for Social Phobic Behavior); BSPS-G: Brief Social Phobia Scale, German Version; CDS-9: Cambridge Depersonalisation Scale; PAF: Prüfungsangstfragebogen (test anxiety questionnaire);

TAC: Test anxious cognitions (generic questionnaire); TAB: Test anxious coping and safety behavior (generic questionnaire).

|  |
| --- |
| **Table 3 Convergent and discriminant validity of scales and measures** |
|  |  |  |  |  |  |  |  |  |
|  | LSAS anxiety subscale | LSAS avoidance subscale | PAF written | PAF oral | TAC written | TAC oral | TAB written | TAB oral |
| Oral PAF | 0.379d | 0.304d | 0.663d | 1 | 0.625d | 0.806d | 0.332d | 0.442d |
| Written PAF | 0.223b | 0.167 | 1 | 0.663d | 0.770d | 0.650d | 0.467d | 0.236b |
| SPK | 0.673d | 0.592d | 0.283d | 0.453d | 0.425d | 0.562d | n.e. | n.e. |
| SPV | 0.701d | 0.678d | 0.425d | 0.524d | n.e. | n.e. | 0.301d | 0.412d |
| CDS-9 frequency subscale social | 0.338d | 0.320d | 0.323d | 0.311d |  | n.e. | n.e. | n.e. |
| CDS-9 frequency subscale written | 0.274d | 0.306d | 0.398d | 0.383d | n.e. | n.e. | n.e. | n.e. |
| CDS-9 frequency subscale oral | 0.390d | 0.341d | 0.337d | 0.488d | n.e. | n.e. | n.e. | n.e. |
| Tremor social | 0.322d | 0.352d | 0.258b | 0.223b | n.e. | n.e. | n.e. | n.e. |
| Sweating social | 0.351d | 0.298d | 0.200 | 0.311d | n.e. | n.e. | n.e. | n.e. |
| Blushing social | 0.242b | 0.115 | 0.218b | 0.278d | n.e. | n.e. | n.e. | n.e. |
| Palpitation social | 0.379d | 0.351d | 0.206b | 0.313d | n.e. | n.e. | n.e. | n.e. |
| Tremor written | 0.294d | 0.141 | 0.640d | 0.452d | n.e. | n.e. | n.e. | n.e. |
| Sweating written | 0.096 | 0.028 | 0.484d | 0.361d | n.e. | n.e. | n.e. | n.e. |
| Blushing written | -0.099 | -0.094 | 0.137 | 0.201b | n.e. | n.e. | n.e. | n.e. |
| Palpitation written | 0.168 | 0.050 | 0.657d | 0.488d | n.e. | n.e. | n.e. | n.e. |
| Tremor oral | 0.289d | 0.151 | 0.488d | 0.608d | n.e. | n.e. | n.e. | n.e. |
| Sweating oral | 0.182 | 0.048 | 0.291d | 0.434d | n.e. | n.e. | n.e. | n.e. |
| Blushing oral | 0.120 | -0.060 | 0.189 | 0.332d | n.e. | n.e. | n.e. | n.e. |
| Palpitation oral | 0.172 | 0.054 | 0.499d | 0.612d | n.e. | n.e. | n.e. | n.e. |

Pearson‘s correlation coefficient b*P* < 0.005, two-tailed d*P* < 0.001, two-tailed. n.e.: Not estimated; PAF: Prüfungsangstfragebogen.

|  |
| --- |
| **Table 4 Frequencies of social anxiety, written or oral test anxiety and depersonalization**  |
|  |  |  |
|  | *n* = 96 |  |
| Social anxiety disorder and test anxiety | *n* | % |
| Overall |  |  |  |
|  | Social anxiety disorder | 12 | 12.5 |
|  | Written test anxiety | 13 | 13.5 |
|  | Oral test anxiety | 28 | 29.2 |
| Isolated conditions |  |  |  |
|  | Social anxiety disorder | 4 | 4.2 |
|  | Written test anxiety | 2 | 2.1 |
|  | Oral test anxiety | 14 | 14.6 |
| Co-occurrence of conditions |  |  |  |
|  | Written and oral test anxiety | 7 | 7.3 |
|  | Social anxiety disorder and written test anxiety | 1 | 1.0 |
|  | Social anxiety disorder and oral test anxiety | 4 | 4.2 |
|  | Social anxiety disorder, written and oral test anxiety | 3 | 3.1 |
| Symptoms of depersonalization/derealization |   |   |   |
|  | Social situations | 13 | 13.5 |
|  | Written exams | 8 | 8.3 |
|   | Oral exams | 11 | 11.5 |
| Social anxiety disorder was assessed using the anxiety subscale of the LSAS and test anxiety was assessed using the PAF. Symptoms of depersonalization/derealization were measured using the CDS-9. LSAS: Liebowitz Social Anxiety Scale; PAF: Prüfungsangstfragebogen. |

|  |
| --- |
| **Table 5 Clinical correlates of test anxiety in written and oral exams (*n* = 96)** |
|  |  |  |  |  |  |  |
|  | Test anxiety |   |   |   |   |   |
|  | Written | Oral |  |  |  |  |  |
|  | M (SD) | M (SD) | Δ (SD) | 95%CI | df | t | *P* |
| Test anxiety | 43.66 (10.12) | 48.12 (11.52) | -4.46 (8.98) | (-6.28, -2.64) | 95 | -4.86 | < 0.001 |
| Test-anxious cognitions | 20.02 (7.89) | 21.72 (8.49) | -1.69 (4.71) | (-2.65, -0.74) | 95 | -3.53 | 0.001 |
| Test-anxious behavior | 39.00 (8.99) | 44.57 (10.34) | -5.57 (6.74) | (-6.94, -4.21) | 95 | -8.11 | < 0.001 |
| Any trigger event (*n*, %) | 18 (18.2%) | 30 (30.3%) | -12 (-) | (0.036, 0.214) | 95 |  2.775 | 0.007 |
| Symptoms of DP/DR | 2.71 (4.71) | 3.167 (5.22) | -.46 (2.85) | (-1.04, 0.12) | 95 | -1.58 | 0.118 |
| Blushing | 0.27 (0.62) | 1.17 (1.19) | -0.90 (1.00) | (-1.10, -0.69) | 95 | -8.78 | < 0.001 |
| Palpitation | 1.47 (1.05) | 2.11 (1.11) | -0.65 (0.78) | (-0.80, -0.49) | 95 | -8.10 | < 0.001 |
| Tremor | 0.70 (0.95) | 1.33 (1.26) | -0.64 (0.94) | (-0.83, -0.45) | 95 | -6.61 | < 0.001 |
| Sweating | 1.22 (1.05) | 1.81 (1.14) | -0.59 (0.87) | (-0.77, -0.42) | 95 | -6.72 | < 0.001 |

All values represent raw, non-standardized scores. Test anxiety was measured using the PAF. Test-anxious cognitions were assessed using a generic questionnaire. Test-anxious coping and safety behavior was assessed using a generic questionnaire. Symptoms of depersonalization/derealization were measured with the CDS-9. Blushing, palpitation, tremor and sweating were assessed using the respective item of the BSPS-G. *P* two-tailed at *P* < 0.05 CI: Confidence interval; df: Degrees of freedom; *t*: *t*-value; DP/DR: Symptoms of depersonalization/derealization; PAF: Prüfungsangstfragebogen; BSPS-G: German “Brief Social Phobia Scale”.