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Research paper

Prevalence and factors for anxiety during the coronavirus disease 2019 (COVID-19) epidemic among the teachers in China

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ABSTRACT

Objective: To assess the prevalence of anxiety and explore its factors during the Coronavirus Disease 2019 (COVID-19) epidemic among the teachers in China.

Methods: We involved 88611 teachers (response rate: 94.75%) from three cities of Henan Province, China, during February 4, 2020 and February 12, 2020. Anxiety was assessed by using Generalized Anxiety Disorder tool (GAD-7). Odds ratios (OR) with 95% Confidence intervals (CI) for potential factors of anxiety were estimated using multiple logistic regression models.

Results: The overall prevalence of anxiety was 13.67%. The prevalence was higher for women than men (13.89% vs. 12.93%). The highest prevalence of anxiety was 14.06% (SE 2.51%) with age of 60 to 100 years in men, and 14.70% (SE 0.56%) with age of 50 to 60 years in women. Participants located in country-level city school had the lowest prevalence of anxiety across all age categories (12.01% for age of 18–30 years; 12.50% for age of 30–40 years; 12.13% for age of 40–50 years; 9.52% for age of 60–100 years). After adjusting for potential confounders, age, sex, education status, type of teachers, school location, information source, worried level, fear level, and behavior status were found to be associated with anxiety.

Conclusions: This large-scale study assessed the prevalence of anxiety in teachers, as well as its potential influence of factors, which is useful for international and national decision-makers.

1. Introduction

On December 30, 2019, Wuhan became the center of an outbreak of the zoonotic Coronavirus Disease 2019 (COVID-19) (Zhu et al., 2020). Subsequently, the number of confirmed cases was a rapid increase in provinces in China which have developed economies and adjacent to Hubei province (Hong et al., 2020; Lai et al., 2020). Then, confirmed cases of COVID-19 were consecutively occurred in all provinces, municipalities, and special administrative regions in China (Hoehl et al., 2020) and appeared to be expanding (Peichao et al., 2020; Kamel et al., 2020). Finally, the outbreak was declared a Public Health Emergency of International Concern (PHEIC) on January 30, 2020 by the World Health Organization (WHO). However, the human-to-human transmission of COVID-19 has been evolving since then. The infection even spread across other countries around the world (Holshue et al., 2020; Livingston and Bucher et al., 2020; Young et al., 2020). On March 11, 2020, WHO had to announce that COVID-19 could be described as a controllable pandemic. Because of the rapid spread of severe acute respiratory syndrome coronavirus 2 (SARS-COV-2), it therefore incurs substantial losses not only on global economy and trade but also posing the great challenges on medical and health services (Phelan et al., 2020).

The burden of disease in terms of years lived with disability (YLD) attributable to anxiety disorders relatively increased by 14.8% from 2005 to 2015, ranking ninth in the world (GBD 2015 Disease and Injury Incidence and Prevalence Collaborators, 2016). In addition, anxiety disorders may increase the risk of cancer, cardiovascular disease, and even mortality (Batelaan et al., 2016; Miloyan et al., 2016; Wang et al., 2019). Previous study has revealed individuals with high health anxiety are prone to misinterpreting harmless bodily sensations and changes as evidence that they are infected in the context of a viral outbreak or pandemic, this will, in turn, increase their anxiety, influence their ability to make rational decisions, and impact their behavior (Asmundson and Taylor, 2020). Also, with the closure of schools, negative emotions experienced by teachers are compounded. The ongoing COVID-19 epidemic maybe inducing anxiety for teachers. Hence, a

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timely understanding of anxiety status is urgently needed. Cost-effectiveness studies suggest that treatment alone is not sufficient to eliminate the disease burden attributable to anxiety disorders. Another way to reduce the burden of anxiety disorders is to lower the incidence of new cases, which can be achieved through prevention rather than treatment (Andrews et al., 2004; Neil and Christensen, 2009). So, we urgently draw the prevalence and risk factors of COVID-19 in teachers.

Therefore, this present study included registered teachers in China during the COVID-19 outbreak and aimed to assess the prevalence of anxiety and identify the potential risk and protective factors contributing to anxiety. This may assist government agencies and healthcare professionals in safeguarding the psychological well-being of the school in the face of COVID-19 outbreak expansion in China and different parts of the world.

2. Methods

2.1. Study participants

We adopted a cross-sectional survey design to assess anxiety in teachers during the epidemic of COVID-19 by using an anonymous online questionnaire through an online survey platform ("SurveyStar", Changsha Ranxing Science and Technology, Shanghai, China). A total of 93,518 registered teachers (including Primary school teachers, Junior school teachers, High school teachers, and University teachers) were recruited by using a cluster sampling method from Zhengzhou, Xinyang, Xinxiang city of Henan Province, China, during February 4, 2020 and February 12, 2020. For quality control, we excluded the participants aged < 18 years or aged > 100 years or those who took ≤100 s to fully respond to the questions (n = 4907). Ultimately, we included 88,611 teachers (response rate: 94.75%) in this analysis.

This study was approved by the Ethics Committee of Zhengzhou University. All study participants consented for participation in this study.

2.2. Data collection

A standard questionnaire was developed to assess demographic characteristics (sex, age, marital status, and education level and so on), the knowledge about COVID-19, attention, behavior, mental state (worry, fear, anxiety and so on), and other factors among all participants. Attention of teachers to the epidemic were divided into 3 levels: high, moderate, and low. Information source were classed as: independent learning (including WeChat/Weibo and TV/radio), structured learning (including documents issued by the government or schools) and mixed learning (including independent and structured learning). Worried condition and fear among teachers on the epidemic were both divided into 3 levels: high, moderate, and low/none. All behavior (including "Wearing a mask", "Increasing the frequency of hand washing", "Going out for dinner", "Canceling the spring festival travel plan") were correctly, the behavioral status as high; part questions were answered correctly, the behavioral status as moderate; all questions were answered incorrectly, the behavioral status as low.

Anxiety was assessed by using the Generalized Anxiety Disorder tool (GAD-7) which has a sensitivity of 89% and specificity of 82%. A score of 10 or greater was considered a reasonable cut point for identifying cases. Cut points of 5, 10, and 15 might be interpreted as representing mild, moderate, and severe levels of anxiety on the GAD-7 (Spitzer et al., 2006).

2.3. Statistical analysis

Categorical data are represented as frequency (%) and were compared using Pearson chi-squared test. Means and standard deviations (SD) were used to present continuous data and were compared by Student's t-test or analysis of variance. Multiple logistic regression models were used to estimate odds ratios (ORs) and 95% confidence intervals (CIs). We developed three models: 1) unadjusted; 2) adjusted for sex, education status, type of teachers, school location, married status, attention level, information source, worried level, fear level, behavior status; and 3) adjusted for age, sex, education status, type of

Table 1
Characteristics of the study participants by anxiety status.

Characteristics	All participants n = 88,611	Without anxiety n = 76,501	With anxiety n = 12,110	P value
Age (years)	36.22 ± 9.02	36.21 ± 9.02	36.28 ± 9.06	0.4295
Sex (%)				0.0005
Men	20,442 (23.07) 20.35 51,030 79.65)	17,799 (23.27)	2643 (21.82)	
Women	68,169 (76.93)	58,702 (76.73)	9467 (78.18)	
Education status (%)				< 0.0001
College	20,469 (23.10)	17,452 (22.81)	3017 (24.91)	
Bachelor	57,554 (64.95)	50,222 (65.65)	7332 (60.55)	
Master	5896 (6.65)	5108 (6.68)	788 (6.51)	
Others	4692 (5.30)	3719 (4.86)	973 (8.03)	
Type of teachers (%)				< 0.0001
Primary school teacher	50,451 (56.94)	43,170 (56.43)	7281 (60.12)	
Junior school teacher	23,623 (26.66)	20,531 (26.84)	3092 (25.53)	
High school teacher	13,005 (14.68)	11,466 (14.99)	1539 (12.71)	
University teacher	1532 (1.73)	1334 (1.74)	198 (1.64)	
School location (%)				< 0.0001
City	35,047 (39.55)	30,016 (39.24)	5031 (41.54)	
Country-level city	30,633 (34.57)	26,397 (34.51)	4236 (34.98)	
Rural	22,931 (25.88)	20,088 (26.26)	2843 (23.48)	
Married status (%)				< 0.0001
Married	70,156 (79.17)	60,338 (78.87)	9818 (81.07)	
Unmarried	16,735 (18.89)	14,690 (19.20)	2045 (16.89)	
Widowed	304 (0.34)	251 (0.33)	53 (0.44)	
Divorced	1416 (1.60)	1222 (1.60)	194 (1.60)	
Attention level (%)				0.0330
High	88,146 (99.48)	76,096 (99.47)	12,050 (99.50)	
Moderate	394 (0.44)	350 (0.46)	44 (0.36)	
Low	71 (0.08)	55 (0.07)	16 (0.13)	
Information source (%)				< 0.0001
Independent learning	5583 (6.32)	4546 (5.96)	1037 (8.59)	
Structured learning	1042 (1.18)	854 (1.12)	188 (1.56)	
Mixed learning	81,716 (92.50)	70,871 (92.92)	10,845 (89.85)	
Worried level (%)				< 0.0001
High	80,781 (91.16)	68,822 (89.96)	11,959 (98.75)	
Moderate	5999 (6.77)	5891 (7.70)	108 (0.89)	
Low/none	1831 (2.07)	1788 (2.34)	43 (0.36)	
Fear level (%)				< 0.0001
High	22,272 (25.42)	14,704 (19.47)	7568 (62.63)	
Moderate	38,186 (43.59)	34,380 (45.53)	3806 (31.35)	
Low/none	27,144 (30.99)	26,434 (35.00)	710 (5.88)	
Behavior status (%)				0.0292
High	72,268 (81.56)	62,445 (81.63)	9823 (81.12)	
Moderate	16,317 (18.41)	14,038 (18.35)	2279 (18.82)	
Low	23 (0.03)	16 (0.02)	7(0.06)	

Data are mean (standard deviation) or number (percentage).
P value is from Student's t-test or chi-square test for continuous variables and categorical variables.

teachers, school location, married status, attention level, information source, worried level, fear level, behavior status.

All analyses were performed by using SAS v9.4 (SAS Inst., Cary, NC) for Windows. All statistical tests were two-sided, with $P<0.05$ considered statistically significant.

3. Results

3.1. Characteristics of the participants

Among 88,611 (23.07% men) teachers included 12,110 teachers were shown to have anxiety disorder during the outbreak of COVID-19 in China. The age of participants was 36.22 (SD 9.02) years. Table 1 shows the characteristics of participants by anxiety status. As compared to participants without anxiety, participants with anxiety were different from the proportion of sex, education status, type of teachers, school location, married status, attention level, information source, worried level, fear level, and behavior status (all $P<0.05$).

3.2. Prevalence of anxiety

The overall anxiety prevalence was 13.67% (SE 0.12%) during COVID-19 pandemic in China. The prevalence was higher for women than men (13.89% vs. 12.93%). Fig. 1 showed the prevalence of anxiety in participants by age and sex. The highest prevalence of anxiety was 14.06% (SE 2.51%) with age between 60 and 100 years in men, and 14.70% (SE 0.56%) with age between 50 and 60 years in women. The lowest prevalence of anxiety was 12.36% (SE 2.89%) found in participant with the age between 40 and 50 years in men, and 11.76% (SE 4.30%) with age of between 60 and 100 years in women. Participants located in county-level city school have the lowest prevalence of anxiety in almost age groups (12.01% for age of 18–30 years; 12.50% for age of 30–40 years; 12.13% for age of 40–50 years; 9.52% for age of 60–100 years) (Fig. 2).

3.3. The positive or risk factors of anxiety

Compared with the lowest age category (18 to 30 years), participants aged between 40 and 50 years were 17% more likely to possess anxiety disorder (OR 1.17 [95% CI 1.01–1.34]), just like the 50–100 age group which had 30% increased likelihood (OR 1.30 [95% CI 1.05–1.61]). Compared with the education status of college, the education status of others category (not a College, Bachelor or Master) increased the anxiety incident too (OR 1.17 [95% CI 1.07–1.27]). Participants with unhealthy behavior of preventing the SARS-COV-19 significantly increased the risk of anxiety, compared with participants that practiced healthy behavior (OR 3.54 [95% CI 1.06–11.8]). However, compared with men, women were less likely to develop anxiety incidents (OR 0.87 [95%CI 0.82–0.91]). The association between type of teachers and risk of anxiety was less likely in high school teacher as compared to primary school teachers (OR 0.89 [95% CI 0.83–0.95]). Similarly, teachers from county-level and rural schools had 8% [OR 0.92 (95% CI; 0.88–0.96)] and 13% [OR= 0.87 (95% CI; 0.82–0.92)] reduced odds of anxiety, compared to those cities. Participants who acquired information regarding SARS-COV-19 epidemic through mixed learning were shown to have decreased odds of anxiety compared to those who acquired it through independent learning sources (OR 0.73 [95% CI 0.68–0.79]). Compared with high worried level, moderate worried level participants had reduced odds of anxiety of about 50% (OR 0.54 [95% CI 0.45–0.66]), while low/none level showed a protective effect of about 30% against anxiety (OR 0.68 [95% CI 0.48–0.95]). Compared with high fear level, participants with moderate fear level were shown to have reduced odds of anxiety (OR 0.22 [95% CI 0.21–0.23]). Similarly, teachers with low/none fear level showed a protective effect against the anxiety disorders compared to those with those with high level of fear (OR 0.06 [95% CI 0.05–0.06]). Detail information were showed in Table 2.

3.4. Different levels of anxiety in the participants

Further, participants at all age categories indicated high proportion of minimal anxiety level (49.89%, 47.27%, 48.33%, 50.83%, and 52.67%). Mild anxiety was most prevalent (38.73%) in 30–40 age group. Prevalence of severe anxiety for participants aged 18–30, 30–40, 40–50, and 50–60 years were 4.07%, 4.50%, 4.18%, and 4.91%, respectively. The proportion with moderate anxiety at the age of 60–100 years was the lowest (7.41%). And for minimal anxiety, the proportion of participants with age of 60 to 100 years was the highest (52.67%) and 30 to 40 years was the lowest (47.27%); for mild anxiety, age of 30 to 40 years was the highest (38.73%) and 60 to 100 years was the lowest (33.74%); for moderate anxiety, age of 30 to 40 years was the highest (9.50%) and 60 to 100 years was the lowest (7.41%); for severe anxiety, age of 60 to 100 years was the highest (6.17%) and 18 to 30 years was the lowest (4.07%) (**Supplementary Materials** Fig. 1). The detail characteristics of participants by different level of anxiety were showed in **Supplementary Materials** Table 1: the proportion of sex, education status, type of teachers, school location, married status, attention level, information source, worried level, fear level, behavior status were all different in different levels of anxiety (all $P<0.05$).

4. Discussion

Our study provided the prevalence of anxiety disorder in teachers during the COVID-19 epidemic. The overall anxiety prevalence was

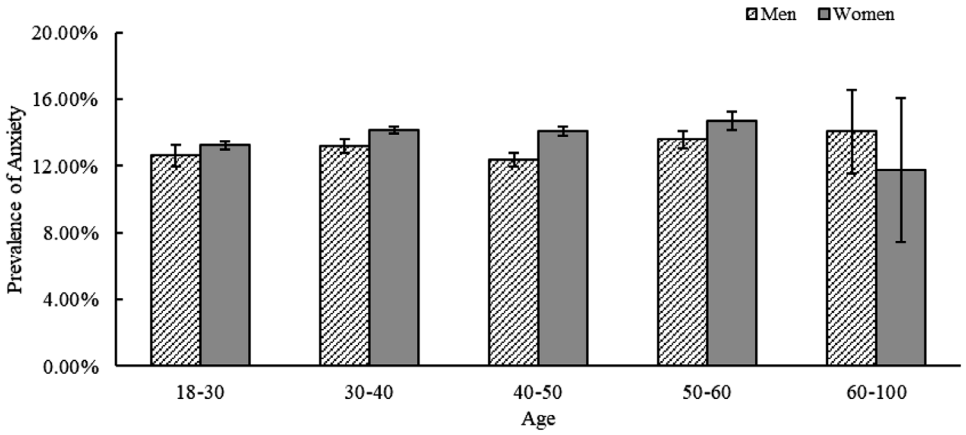

Fig. 1. Prevalence and standard error of anxiety in participants by age and sex.

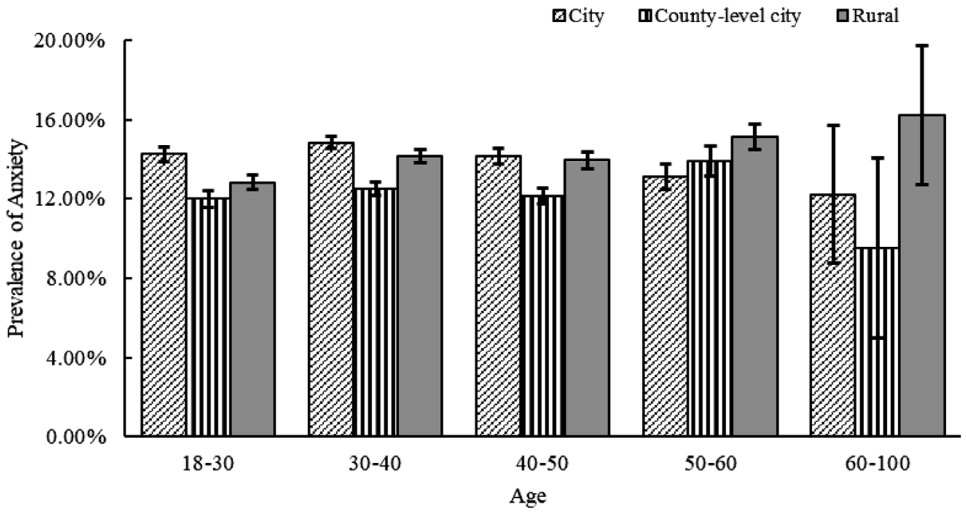

Fig. 2. Prevalence and standard error of anxiety in participants by age and school location.

13.67% (13.89% for women and 12.93% for men). Age, sex, education status, type of teachers, school location, information source, worried level, fear level, and behavior status were found to be associated with anxiety.

China Mental Health Survey (CMHS) involved 32,552 participants from 31 provinces in the mainland China and found the prevalence of anxiety to be 4.98% in 2013 (Huang et al., 2019). However, we found the prevalence of anxiety in teachers reaching up to 13.67% (about 2.74 times) in this survey. The higher prevalence may pose potential risk during the epidemic of COVID-19, such as, excessive consumption of medical resources (Asmundson and Taylor, 2020). The data from British survey found that 16% of the population suffered from some form of anxiety (Hale, 1997). Similarly, anxiety affect more than 40 million adults in the United States alone, about 18% of the population (Torpy et al., 2011). The evidence of meta-analysis has discovered the global current prevalence of anxiety disorders adjusted for methodological differences was 7.3% (95%CI 4.8–10.9%) (Baxter et al., 2013). Our study suggested that anxiety may affect more population and the burden of anxiety may have a sharp increase in the world during this pandemic. As is supposed above, the global may also face great challenges work of mental health.

As the previous studies, our study also suggested that the sociodemographic factors such as age, sex, education status were associated with anxiety (Lejtzen et al., 2014). In addition, we further found that type of teachers, school location, information source, worried level, fear level, and behavior status were associated with anxiety disorder. *Sherina* et al. suggested that familiar stressful life events, such as loss, unemployment, and work-related, family, and housing problems, were associated with anxiety in primary care patients (Tait and Berrisford, 2011). All teachers in Henan province were facing problems coping with new ways of working when we started the survey. As the epidemic spreads to other countries around the world, similar situation may be expected to happen. So our study may provide clues about the prevalence of anxiety and its factors. However, further studies about other occupations are needed to assess the stability and reliability of our results.

We also found a worrisome result that there was a significant proportion of participants aged between 60 and 100 years who presented severe anxiety level. These teachers may face the risk of insufficient incomes at their retirement stage, due to excessive expenditure on treatment for anxiety. Therefore, we suggest that the decision-makers of health services should pay more attention to the burden of anxiety among elderly individuals, especially during the outbreak of disease.

Our study has several strengths. To our knowledge, this is the large sample size study of teachers exploring the prevalence of anxiety. Secondly, we used the standardized questionnaire (GAD-7) to diagnose anxiety. Thirdly, our results inform which teachers are most likely in need of psychosocial support. Finally, we excluded the participants who not meeting the requirements of this study to make our results more realistic.

Nevertheless, some limitations should be considered. First, although we adjusted two models for many important covariates, there is still a possibility of residual confounding. Further studies are needed to assess those relations and confirm the stability of these results. Second, we did not explore the underlying mechanisms existing among covariates. Future experimental studies are needed. Thirdly, our study was designed as a cross-sectional survey, which does not establish causality. Finally, participants of this study were all teachers, which may limit the generalizability of our findings to other professional population.

5. Conclusions

The condition of the prevalence of anxiety was not optimal during the COVID-19 epidemic among the teachers in China. Factors including age, sex, education status, type of teachers, school location, information source, worried level, fear level, and behavior status may be considered as part of the overall management of anxiety.

Author's contribution

QL designed research; YM and CW collected the data; QL analyzed the data and drafted the manuscript; XZ, Clifford and JW revised the manuscript. JW had primary responsibility for final content. All authors read and approved the final manuscript.

Declaration of Competing Interest

The authors declare that they have no conflict of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in

Table 2
Independent association of characteristics of study participants and anxiety during the COVID-19 epidemic in China.

Characteristics	OR (95%CI)[a]	OR (95%CI)[b]	OR (95%CI)[c]
Age (years)			
18–30	1.00 (ref)	1.00 (ref)	1.00 (ref)
30–40	**1.07 (1.02–1.13)**	1.03 (0.98–1.10)	1.05 (0.97–1.14)
40–50	1.03 (0.98–1.09)	**1.13 (1.06–1.21)**	**1.17 (1.01–1.34)**
50–100	**1.08 (1.01–1.16)**	**1.24 (1.14–1.35)**	**1.30 (1.05–1.61)**
Sex (%)			
Men	1.00 (ref)	1.00 (ref)	1.00 (ref)
Women	**1.09 (1.04–1.14)**	**0.83 (0.79–0.88)**	**0.87 (0.82–0.91)**
Education status (%)			
College	1.00 (ref)	1.00 (ref)	1.00 (ref)
Bachelor	**0.84 (0.81–0.88)**	**0.94 (0.89–0.99)**	0.96 (0.91–1.01)
Master	**0.89 (0.82–0.97)**	1.01 (0.91–1.11)	1.04 (0.94–1.15)
Others	**1.51 (1.40–1.64)**	**1.16 (1.06–1.26)**	**1.17 (1.07–1.27)**
Type of teachers (%)			
Primary school teacher	1.00 (ref)	1.00 (ref)	1.00 (ref)
Junior school teacher	**0.89 (0.85–0.93)**	0.99 (0.95–1.04)	0.98 (0.93–1.03)
High school teacher	**0.80 (0.75–0.84)**	**0.90 (0.84–0.96)**	**0.89 (0.83–0.95)**
University teacher	0.88 (0.76–1.02)	0.91 (0.77–1.08)	0.92 (0.78–1.08)
School location (%)			
City	1.00 (ref)	1.00 (ref)	1.00 (ref)
Country-level city	**0.96 (0.92–1.00)**	**0.92 (0.87–0.96)**	**0.92 (0.88–0.96)**
Rural	**0.84 (0.80–0.89)**	**0.87 (0.82–0.91)**	**0.87 (0.82–0.92)**
Married status (%)			
Married	1.00 (ref)	1.00 (ref)	1.00 (ref)
Unmarried	**0.86 (0.81–0.90)**	**0.91 (0.87–0.97)**	0.98 (0.92–1.05)
Widowed	1.30 (0.97–1.75)	1.15 (0.82–1.62)	1.10 (0.78–1.54)
Divorced	0.98 (0.84–1.14)	1.02 (0.87–1.20)	1.00 (0.85–1.18)
Attention level (%)			
High	1.00 (ref)	1.00 (ref)	1.00 (ref)
Moderate	0.80 (0.58–1.09)	1.37 (0.96–1.95)	1.40 (0.99–2.00)
Low	**1.85 (1.06–3.22)**	1.71 (0.82–3.58)	1.69 (0.81–3.52)
Information source (%)			
Independent learning	1.00 (ref)	1.00 (ref)	1.00 (ref)
Structured learning	0.97 (0.81–1.15)	0.92 (0.76–1.10)	0.89 (0.74–1.08)
Mixed learning	**0.67 (0.63–0.72)**	**0.74 (0.68–0.80)**	**0.73 (0.68–0.79)**
Worried level (%)			
High	1.00 (ref)	1.00 (ref)	1.00 (ref)
Moderate	**0.11 (0.09–0.13)**	**0.54 (0.45–0.66)**	**0.54 (0.45–0.66)**
Low/none	**0.14 (0.10–0.19)**	**0.69 (0.49–0.97)**	**0.68 (0.48–0.95)**
Fear level (%)			
High	1.00 (ref)	1.00 (ref)	1.00 (ref)
Moderate	**0.22 (0.21–0.23)**	**0.22 (0.21–0.23)**	**0.22 (0.21–0.23)**
Low/none	**0.05 (0.05–0.06)**	**0.06 (0.05–0.06)**	**0.06 (0.05–0.06)**
Behavior status (%)			
All correct	1.00 (ref)	1.00 (ref)	1.00 (ref)
Not all correct	1.03 (0.98–1.08)	1.04 (0.98–1.09)	1.04 (0.99–1.10)
All wrong	**2.78 (1.14–6.76)**	**3.52 (1.06–11.77)**	**3.54 (1.06–11.8)**

Abbreviations: CI, confidence interval; OR, odds ratio.

[a] Unadjusted;

[b] Adjusted for sex, education status, type of teachers, school location, married status, attention level, information source, worried level, fear level, behavior status;

[c] Adjusted for age, sex, education status, type of teachers, school location, married status, attention level, information source, worried level, fear level, behavior status.

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