Oral behaviors in young adults: a multidimensional evaluation of the influence of personality, coping, and distress

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RESEARCH

Oral behaviors in young adults: a multidimensional evaluation of the influence of personality, coping, and distress

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Abstract

Objectives This study explored the relationship of oral parafunction to the psychological variables of personality, coping, and distress. Correlates of sleeping/waking-state oral activities with the different psychological factors were also examined, along with psychological predictors for high parafunction.

Materials and methods Young adults from a large private university were enrolled. The frequency of oral behaviors was appraised with the oral behavior checklist (OBC), and participants were stratified into low and high parafunction (LP/HP) groups following the DC/TMD. Personality traits, coping styles, and psychological distress were assessed with the Big Five Personality Inventory-10 (BFI-10), brief-COPE Inventory (BCI), and Depression, Anxiety, Stress Scales-21 (DASS-21) correspondingly. Statistical evaluations were performed using the chi-square/Mann–Whitney *U* tests, Spearman's correlation, and logistic regression analyses ($\alpha = 0.05$).

Results Among the 507 participants (mean age 22.2 ± 1.5 years), 84.6% and 15.4% had low and high parafunction respectively. While personality profiles did not vary substantially, the HP group exhibited significantly greater emotion-focused/dysfunctional coping, general distress, depression, anxiety, and stress scores than the LP group. Associations between OBC and the various psychological variables were weak when significant or insignificant. Neuroticism and dysfunctional coping were moderately correlated to general distress, depression, anxiety, and stress ($r_s = 0.44–0.60/0.45–0.51$). Multivariate analyses indicated that high parafunction was predicted by dysfunctional coping style (OR = 2.55) and anxiety (OR = 1.33).

Conclusions Dysfunctional coping was the main risk factor for high parafunction, increasing its odds by about 2.5 times.

Clinical relevance Oral parafunction appears to be a dysfunctional coping response to psychological distress.

Keywords Oral parafunction · Behavior · Personality · Coping · Psychological distress

Introduction

Oral parafunction is defined as any non-purposeful activity or behavior involving the stomatognathic system. These oral activities/behaviors can take place during sleeping and/or waking states [1, 2]. Though usually non-detrimental, they could cause considerable harm to teeth/dental restorations, the masticatory muscles, temporomandibular joints (TMJs), as well as supporting structures when their frequency or forces exceed physiologic tolerance [1]. Oral parafunction, particularly bruxism (repetitive masticatory muscle activities when asleep or awake), has been associated with the development and presence of temporomandibular disorders (TMDs) [3–7]. While sleep bruxism is characterized by rhythmic (phasic) or non-rhythmic (tonic) jaw-muscle activities, awake bruxism is typified by repetitive/sustained tooth contacts, and/or mandibular bracing/thrusting [2, 8].

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The prevalence of sleep and awake bruxism is estimated to range from 1 to 15% and 22 to 30% respectively [9]. Other waking-state parafunctional behaviors include abnormal jaw posturing, tongue thrusting, holding/biting objects, and gum chewing.

Oral parafunction can be assessed via several techniques including self-reported questionnaires, physical examination, ambulatory electromyography, and sleep polysomnography [2]. Self-reported questionnaires, which are pragmatic for larger-scale studies, are commonly employed, of which the oral behaviors checklist (OBC) is probably the most popular [10, 11]. The OBC is part of the diagnostic criteria for TMDs (DC/TMD) axis II protocol (psychosocial and behavioral aspects) and consists of twenty-one items for identifying/quantifying the frequency of "jaw overuse" behaviors [10–12]. Its reliability and validity have been established clinically as well as in the natural environment using electromyography and Ecological Momentary Assessment (EMA) correspondingly [10, 11, 13, 14]. More recently, Donnarumma et al. presented a new method for scoring the OBC. In addition to sleeping-state oral activities, subscales for waking-state non-functional (NFA) and (functional) behaviors were established that were differentially related to dissimilar TMD subtypes [15].

Current evidence suggests that psychological distress, encompassing the negative emotions of depression, anxiety, and stress, can trigger parafunctional behaviors that may result in TMD pain [1, 16–19]. Other possible pathways have also been proposed, specifically, psychological distress contributes directly to pain, pain causes maladaptive behaviors including parafunction, and oral parafunction serves as a coping response to psychological distress and/or pain [1]. Nevertheless, personality traits and dispositional coping have interactive and independent effects on how psychological distress is perceived and moderated [20]. While personality is the set of unique patterns of cognitions, behaviors, and feelings that distinguish a person, coping is the set of predictable strategies used by a person to alleviate stress/negative emotions. The few studies concerning personality/coping determined that oral parafunction could be associated with different personality traits, particularly extroversion, conscientiousness, as well as neuroticism, and the use of dysfunctional/maladaptive coping strategies [21–25]. However, the three interrelated psychological variables have not been investigated simultaneously in people with oral parafunction.

Accordingly, the objectives of this study were to explore the relationship of oral parafunction to the psychological variables of personality, coping, and distress. The correlates of sleeping/waking-state oral activities with personality traits, coping styles, and psychological distress were examined, along with psychological predictors for high parafunction. The research hypotheses were (a) individuals with high parafunction present significantly greater conscientious and neurotic personality traits, more frequent use of dysfunctional coping, and higher levels of depression, anxiety, and stress; (b) sleeping-state and waking-state oral behaviors are significantly and moderately correlated to conscientiousness, neuroticism, dysfunctional coping, and psychological distress; and (c) depression, anxiety, and/or stress were the main risk factors for high oral parafunction.

Materials and methods

Study design and participants

The study was endorsed by the Ethics Committee of the Faculty of Dentistry, Universitas Trisakti, Indonesia (reference: 013/S3/KEPK/FKG/9/2021). A cross-sectional design and non-probabilistic voluntary sampling method were employed. Volunteers were recruited from the country's largest private university through in-person invites and campus-wide intranet postings. Young adults, aged 18–24 years old, who were proficient in English were included, whereas those with a history of orofacial trauma/orthognathic surgery and debilitating psychological and/or physical disorders were duly excluded. At least 318 participants were required for the study based on an enrollment of 20,638 students, a projected parafunction prevalence of 30%, a confidence level of 95%, and a precision of ±5% [9]. Study details were presented to all interested students, and informed consent was attained from eligible ones before administrating an online survey containing the OBC, Big Five Personality Inventory-10 (BFI-10), brief-COPE (Coping Orientations to Problems Experienced) Inventory (BCI), and Depression, Anxiety, Stress Scales-21 (DASS-21) [10, 11, 26–28].

Study measures

Oral behaviors/parafunction

The frequency of oral behaviors/extent of oral parafunction was appraised with the OBC which consists of two items concerning sleeping-state oral activities and nineteen items about waking-state oral activities (Appendix Table 5). The items were rated on a 5-point Likert scale extending from "none of the time" = 0 points to "4–7 nights per week" or "all of the time" = 4 points. Total OBC scores, which ranged from 0 to 84 points, were computed and participants were then categorized into those with low (0–24 points) and high (25–84 points) oral parafunction following the DC/TMD scoring manual for self-reported instruments [29]. Scores for sleeping-state (SA - items 1 and 2), waking-state non-functional (NFA - items 3, 4, 5, 6, 7, and 11), and functional (FA - items 12, 13, 17, 18, 19, and 20) oral activities were also calculated for the two groups of participants [15]. Teeth clenching/grinding when asleep and sleeping positions that put

pressure on the jaws were appraised by the two SA items. The six NFA items concerned the clenching, grinding, and holding activities whilst the six FA items involved normal jaw functioning such as chewing, talking, singing, and yawning.

Psychological measures

Personality traits were assessed based on the five-factor model using the BFI-10 [26, 30]. The BFI-10 has been validated for measuring both within and between-person personality variations [31]. Two items were assigned to each of the five personality dimensions, specifically openness, conscientiousness, extraversion, agreeableness, and neuroticism (OCEAN) [26]. The items were rated on a five-point Likert scale extending from "disagree strongly" = 1 point to "agree strongly" = 5 points with one item in each dimension being scored in reverse. OCEAN dimension scores were computed with higher scores specifying greater propensity for specific personality traits.

Coping styles were assessed with the BCI which comprised twenty-eight items regarding ways of managing negative life experiences. The good reliability and validity of the BCI are well recognized [32]. Two items were assigned to each of the fourteen coping strategies. The items were rated on a four-point Likert scale extending from "I haven't been doing this at all" = 1 point to "I've been doing this a lot" = 4 points. The various coping strategies were then categorized into the following coping styles: problem-focused coping (active coping, instrumental support, and planning), emotion-focused (acceptance, emotional support, humor, positive reframing, and religion), and dysfunctional coping (behavioral disengagement, denial, self-distraction, self-blame, substance use, and venting) [27, 33]. Coping style scores were calculated with higher scores specifying more frequent utilization of functional (problem and emotion-focused) and dysfunctional coping strategies.

Psychological distress was assessed with the DASS-21 which encompassed twenty-one items relating to the negative emotional states of depression, anxiety, and stress [28]. The good measurement properties and bifactor structure (consisting of a common factor for general distress and the three subscales) of the DASS-21 have been established [34, 35]. Seven items were assigned to each of the three emotional constructs. The items were rated on a four-point Likert scale extending from "did not apply to me at all" = 0 points to "applied to me very much, or most of the time" = 3 points. Total and subscale scores were computed with greater scores specifying higher levels of general distress, depression, anxiety, and stress. Cut-off points for the different subscale severity classifications (normal to extremely severe) are detailed in the DASS manual [28].

4 Statistical analyses

Statistical analyses were carried out using the IBM SPSS Statistics for Windows software Version 27.0 (IBM Corporation, Armonk, NY, USA) with the significance level set at 0.05. Categorical data were displayed as frequencies with percentages and appraised using the chi-square test. Numerical data were presented as means with standard deviations (SD) as well as medians with interquartile ranges (IQR) and examined for normality with the Shapiro-Wilk's. The Mann–Whitney *U* test and Spearman's rank-order correlation were employed as numerical data were not normally distributed. Correlation coefficients (r_s) of 0.1, 0.4, and 0.7 indicated weak, moderate, and strong associations between the different variables [36]. Multivariate logistic regression analysis was performed to determine the psychological predictors for the presence of high oral parafunction. A stepwise selection method was utilized for the regression model with a threshold of $p < 0.10$ for excluding insignificant variables. To control for possible bias, simultaneous forward and backward testing of the explanatory variables was also carried out. Odds ratios (ORs) with 95% confidence intervals (95% CIs) were used to report the outcomes.

Results

Of the 540 volunteers, 33 met the exclusion criteria and were duly rejected. The remaining 507 participants had a mean age of 22.2 ± 1.5 years and were comprised of 85.6% women. Low and high parafunction were conveyed by 84.6% and 15.4% of the participants. Gender distribution was similar between the low parafunction (LP) and high parafunction (HP) groups. Individuals with high parafunction had significantly higher SA, NFA, and FA scores than their counterparts with low parafunction (Table 1). Table 2 shows the mean/median personality trait, coping style, and psychological distress scores for the two groups. While personality profiles did not vary substantially, the HP group exhibited significantly greater emotion-focused and dysfunctional coping, general distress, depression, anxiety, as well as stress scores when compared to the LP group.

Tables 3 and 4 reflect the outcomes of correlation and logistic regression analyses. Moderate to strong correlations were discerned between OBC-SA ($r_s = 0.49$), OBC-NFA ($r_s = 0.67$), and OBC-FA ($r_s = 0.71$). Associations between OBC and the various personality, coping, and distress variables were weak when significant or insignificant. Similar trends were also noted for SA, NFA, and FA. Neuroticism and dysfunctional coping were moderately correlated to general distress, depression, anxiety, and stress ($r_s = 0.44$–0.60 and 0.45–0.51 accordingly). Multivariate modeling indicated that only dysfunctional coping style

Table 1 Demographic characteristics of the study sample

Variables	Total	Low parafunction (LP)	High parafunction (HP)	*P*-value*	Differences
Total					
n (%)	507 (100)	429 (84.6)	78 (15.4)		
Age					
Mean (SD)	22.21 (1.46)	22.26 (1.42)	21.91 (1.63)		
Median (IQR)	22.0 (3.0)	22.0 (3.0)	22.0 (2.0)	0.080	
Gender					
Female, *n* (%)	434 (85.6)	368 (85.8)	66 (84.6)		
Male, n (%)	73 (14.4)	61 (14.2)	12 (15.4)	0.451	
Sleeping-state oral activity (SA) score					
Mean (SD)	3.23 (1.83)	3.05 (1.84)	4.18 (1.41)		
Median (IQR)	4.0 (2.0)	3.0 (2.0)	4.0 (2.0)	**< 0.001**	HP > LP
Waking-state non-functional oral activity (NFA) score					
Mean (SD)	2.47 (2.61)	1.86 (2.03)	5.81 (2.90)		
Median (IQR)	2.0 (4.0)	1.0 (3.0)	5.50 (4.0)	**< 0.001**	HP > LP
Waking-state functional oral activity (FA) score					
Mean (SD)	6.78 (2.77)	6.20 (2.38)	9.99 (2.59)		
Median (IQR)	7.0 (4.0)	6.0 (4.0)	9.50 (4.0)	**< 0.001**	HP > LP

SD Standard deviation; *IQR* interquartile range. Results of *Mann–Whitney *U* and ^Chi-square tests. Bold indicates $P < 0.05$

(OR = 2.55; 95% CI = 1.67–3.83) and anxiety (OR = 1.33; 95% CI = 1.13–1.57) were risk factors for high parafunction. Conversely, depression seemed to reduce its likelihood (OR = 0.90; 95% CI = 0.81–0.98). Gender, the different personality traits, as well as problem- and emotional-focused coping styles did not influence the odds of high parafunction significantly. Simultaneous forward and backward methods yielded congruent results.

Discussion

The associations of oral parafunction with personality traits, dispositional coping styles, and psychological distress were investigated together with the psychological predictors of high parafunction in young adults. As participants with high parafunction frequently employed emotion-focused and dysfunctional coping strategies and had higher levels of psychological distress, the first research hypothesis was partly supported. The second and third research hypotheses were not sustained as correlations between sleeping/waking-state oral activities and the various psychological variables were weak when significant or insignificant and dysfunctional coping was the foremost predictor for high parafunction. Young adulthood represents the transition period during which young people assume adult roles/responsibilities and engage in work and/or higher education. The marked increase in serious psychological distress in young adults over the past decade is of concern, particularly among university students who are more disposed to psychological, sleep, and eating disorders as well as chronic pain conditions including TMDs [5, 37–41], As oral parafunction is very common in university students with 77–95% reporting at least one sleeping/waking-state oral activity, participants were dichotomized into those with low and high parafunction as advocated by the DC/TMD [5, 12, 41]. The 15% prevalence of "self-reported" high parafunction observed in this study was consistent with the frequency of generically "identified" bruxism (8–31%) reported in adults [42]. Significant differences in SA, NFA, and FA scores were noted between the HP and LP groups. NFA and FA scores were strongly correlated to OBC scores ($r_s = 0.67/0.71$) despite their use of only 6 items each, corroborating the new and shortened method for scoring the OBC [15]. The OBC can thus be reduced from 21 to 14 items to decrease administration time, response fatigue, and item non-response [43],

Personality traits and coping styles

Although earlier studies had suggested that oral parafunction is associated with extroversion (tendency to be assertive and sociable), conscientiousness (tendency to be task-oriented

Table 2 Mean/median psychological variable scores for the "low" and "high parafunction" groups

Psychological variables	Low parafunction (LP)	High parafunction (HP)	*P* value*	Differences
Personality traits				
Openness (OP)				
Mean (SD)	6.32 (1.44)	6.64 (1.46)		
Median (IQR)	6.0 (2.0)	6.50 (2.0)	0.070	
Conscientiousness (CP)				
Mean (SD)	6.65 (1.37)	6.35 (1.28)		
Median (IQR)	7.0 (2.0)	6.0 (2.0)	0.057	
Extraversion (EP)				
Mean (SD)	6.84 (1.60)	6.91 (1.70)		
Median (IQR)	7.0 (2.0)	7.0 (2.0)	0.706	
Agreeableness (AP)				
Mean (SD)	6.93 (1.46)	6.65 (1.64)		
Median (IQR)	7.0 (2.0)	7.0 (1.25)	0.060	
Neuroticism (NP)				
Mean (SD)	6.68 (1.64)	6.60 (1.83)		
Median (IQR)	7.0 (2.0)	6.0 (3.0)	0.607	
Coping styles				
Problem-focused (PC)				
Mean (SD)	5.77 (1.09)	6.01 (1.14)		
Median (IQR)	6.0 (1.33)	6.0 (1.67)	0.060	
Emotion-focused (EC)				
Mean (SD)	5.55 (0.96)	5.90 (1.0)		
Median (IQR)	5.60 (1.20)	6.0 (1.25)	**0.002**	HP > LP
Dysfunctional (DC)				
Mean (SD)	3.89 (0.72)	4.43 (0.74)		
Median (IQR)	3.83 (1.0)	4.42 (1.0)	**< 0.001**	HP > LP
Psychological distress				
General (GD)				
Mean (SD)	13.83 (9.95)	18.87 (10.28)		
Median (IQR)	12.0 (12.0)	19.0 (14.25)	**< 0.001**	HP > LP
Depression (DD)				
Mean (SD)	3.17 (3.54)	4.24 (3.52)		
Median (IQR)	2.0 (3.0)	3.50 (4.0)	**0.002**	HP > LP
Anxiety (AD)				
Mean (SD)	4.44 (3.35)	6.60 (3.58)		
Median (IQR)	4.0 (4.0)	6.0 (5.0)	**< 0.001**	HP > LP
Stress (SD)				
Mean (SD)	6.23 (4.22)	8.03 (4.35)		
Median (IQR)	6.0 (6.0)	8.0 (6.0)	**< 0.001**	HP > LP

SD Standard deviation; *IQR* interquartile range. Results of *Mann–Whitney *U* test. Bold indicates $P < 0.05$

and well-organized), and neuroticism (tendency to experience negative emotions), no significant differences in the five personality dimensions were discerned between the HP and LP groups [21, 22]. In addition to race/ethnic variations, the disparate findings could also be attributed to the use of different personality measures and methods for determining oral parafunction. Moreover, the putative influence of personality on oral parafunction could be mediated or moderated by dispositional coping and psychological distress. Nevertheless, the correlations between neuroticism and general distress, depression, anxiety, and stress were moderately strong, lending additional support to the validity of BFI-10.

Regarding dispositional coping, the HP group presented significantly greater emotion-focused and dysfunctional coping scores than the LP group. Hence, individuals with high parafunction may endeavor to regulate feelings/emotional responses and employ maladaptive coping strategies, such as avoidance and self-blame instead of addressing problems

Table 3 Correlations between oral behaviours and psychological variables

Variables	OBC	SA	NFA	FA	OP	CP	EP	AP	NP	PC	EC	DC	GD	DD	AD
OBC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SA	**0.49****	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NFA	**0.67****	0.32**	-	-	-	-	-	-	-	-	-	-	-	-	-
FA	**0.71****	0.11*	0.19**	-	-	-	-	-	-	-	-	-	-	-	
OP	0.12**	NS	NS	0.09*	-	-	-	-	-	-	-	-	-	-	
CP	−0.19**	−0.16**	−0.14**	NS	−0.23**	-	-	-	-	-	-	-	-	-	-
EP	NS	NS	NS	NS	−0.16**	0.16**	-	-	-	-	-	-	-	-	-
AP	NS	NS	−0.13**	NS	NS	NS	NS	-	-	-	-			-	-
NP	NS	NS	NS	NS	0.20**	−0.19**	−0.27**	NS	-	-	-	-	-	-	-
PC	0.11*	NS	NS	0.12**	NS	0.14**	0.13**	NS	−0.12**	-	-	-	-	-	-
EC	0.18**	NS	NS	0.19**	NS	NS	0.20**	0.10*	−0.16**	**0.76****	-	-	-	-	-
DC	0.29**	NS	0.19**	0.23**	0.17**	−0.20**	NS	NS	0.23**	0.33**	0.31**	-	-	-	-
GD	0.26**	NS	0.20**	0.17**	0.27**	−0.25**	−0.28**	NS	**0.57****	NS	NS	**0.51****	-	-	-
DD	0.16**	NS	0.13**	0.13**	0.26**	−0.26**	−0.34**	NS	**0.44****	−0.12**	−0.10*	**0.47****	**0.84****	-	-
AD	0.31**	0.09*	0.23**	0.19**	0.22**	−0.21**	−0.18**	NS	**0.49****	NS	NS	**0.45****	**0.89****	**0.61****	-
SD	0.26**	0.10*	0.20**	0.15**	0.23**	−0.21**	−0.24**	NS	**0.60****	NS	NS	**0.48****	**0.95****	**0.71****	**0.79****

OBC Total OBC score; *SA* sleeping-state oral activity score; *NFA* waking-state non-functional oral activity score; *FA* waking-state functional oral activity score; personality: *OP* openness; *CP* conscientiousness; *EP* extraversion; *AP* agreeablenes; *NP* neuroticism; coping: *PC* problem-focused; *EC* emotion-focused; *DC* dysfunctional; distress: *GD* general; *DD* depression; *AD* anxiety; *SD* stress. Results of Spearman's correlation. *$P < 0.05$, **$P < 0.01$, and bold indicates correlation coefficient > 0.4. NS denotes no significant correlation

Table 4 Risk factors for the presence of "high parafunction" (results of multivariate logistic regression analyses)

Variables	Odds ratio (95% CI)	*P* value^
Coping		
Dysfunctional	2.55 (1.67–3.83)	**< 0.001**
Psychological distress		
Depression	0.90 (0.81–0.98)	**0.018**
Anxiety	1.33 (1.13–1.57)	**0.001**

Bold entries indicate significance below 0.05

when experiencing difficulties [23–25]. While emotion-focused coping strategies are deemed functional and were not associated with psychological distress, maladaptive strategies are considered dysfunctional and were moderately correlated to general distress, depression, anxiety, and stress (r_s=0.45–0.51). More recently, the use of dysfunctional coping strategies during the Coronavirus Disease 2019 (Covid-19) pandemic was also found to be linked to higher levels of psychological distress in university students [44, 45]. The relationship between oral parafunction and psychological distress could therefore be mediated by dispositional coping [20].

Psychological distress

The role of psychological distress in the etiology of oral parafunction is widely recognized [1, 16–19]. For this reason, the significantly higher levels of general distress, depression, anxiety, and stress observed in the HP group were anticipated. Depression, anxiety, and stress are characterized by the feeling of sadness/hopelessness, apprehension/unease, and physical/emotional strain respectively. While the HP group had mild stress (8–9 points) and moderate anxiety (6–7 points), depression scores were within the normal range (0–4 points). In any case, the correlations of OBC, NFA, and FA to psychological distress scores, albeit significant, were weak (r_s=0.13–0.31). The association between SA and psychological distress scores was mostly insignificant or very weak (r_s=0.09–0.10). Dysfunctional coping appears to be more closely related to psychological distress than oral parafunction given their moderately strong correlations (r_s=0.45–0.51). Furthermore, many other factors including the use of tobacco/alcohol/caffeine and certain psychotropic medications, second-hand smoke, as well as gastroesophageal reflux, neurodevelopmental, and sleep-related disorders could also contribute to oral parafunction [9, 46, 47].

The bifactor structure of the DASS-21 was supported as very strong correlations (r_s=0.84–0.95) were detected between general distress (total DASS-21) and the three subscales. The common "general distress (negative effect)" factor was also confirmed via exploratory structural equation modeling in a recent study [35]. Because of the latter, "general distress" was omitted from the regression modeling to circumvent structural multicollinearity. Multicollinearity is a concern as it undermines the statistical significance of psychological (independent) variables when isolating their relationship to the presence of high oral parafunction [48].

Risk factors for high parafunction

After controlling for confounders in the multivariate model, dysfunctional coping, anxiety, and depression were significantly related to high parafunction. Dysfunctional coping increased the risk of high parafunction by about 2.5 times whereas anxiety heightened its prospect by 33%. Oral parafunction may thus be a dysfunctional coping response to psychological distress, particularly anxiety. Nevertheless, further research is warranted as the association of sleeping and waking-state oral activities with anxiety symptoms may differ [24, 49–52]. The inferred minor protective effect of depression against high oral parafunction may be explained by the relatively low depression scores reported by the participants. This finding was consistent with that of an earlier study involving a similar cohort [40]. Higher levels of depression had been linked to waking-state but not sleeping-state oral activities [52].

Study limitations

This analytic observational study had a few limitations. First, the cross-sectional design applied does not allow temporal and causal relationships to be ascertained. While personality traits and coping styles might remain constant, the level of psychological distress will vary with existing stressors. A longitudinal approach could be adopted for further work entailing repeated assessments at specified time points. Second, only university students were investigated and respondents consisted mostly of women. The latter may be attributed to the greater tendency of women to participate in online surveys [53]. Further studies should incorporate working and out-of-school young adults, more male participants, in addition to other racial/ethnic groups. Third, study instruments were all self-reported and disposed to information bias including recall, social desirability, and other partialities [54], SA, in particular, occurs in a state of reduced consciousness and could be under-reported due to the lack of awareness. Lastly, a time lag exists between actual oral parafunctional behaviors and the completion of the OBC. This could be addressed by the use of EMA in conjunction with the OBC in prospective research [13, 14].

Conclusion

This study is the first to establish the association of oral parafunction with the psychological variables of personality, coping, and distress. Low and high parafunction were present in 84.6% and 15.4% of the young adults examined. Though personality traits did not differ substantially, participants with high parafunction utilized emotion-focused and dysfunctional coping strategies more frequently and had higher levels of general distress, depression, anxiety, and stress than their counterparts with low parafunction. Notwithstanding, correlations of sleeping and/or waking-state oral activities with the various psychological variables were weak when significant or insignificant. Neuroticism and dysfunctional coping were, however, moderately related to general distress, depression, anxiety, and stress ($r_s = 0.44–0.60/0.45–0.51$). Multivariate analyses indicated that dysfunctional coping increased the odds of high parafunction by 2.5 times whereas anxiety heightened its likelihood by 33%. Oral parafunction may therefore be a dysfunctional coping response to psychological distress, particularly anxiety. Mindfulness-based programs, such as mindfulness-based stress reduction and mindfulness-based cognitive therapy, could be beneficial for managing psychological distress and dysfunctional coping as well as oral parafunctional behaviors and related TMD pain [55–57].

Appendix

Table 5 The oral behaviour checklist (OBC) and items for sleeping-state (SA), waking-state non-functional (NFA), and functional (FA) oral activities

S/no	Questions *How often do you do each of the following activities, based on the last month?*	Items for OBC	SA	NFA	FA
1	Clench or grind teeth when asleep, based on any information you may have	✓	✓		
2	Sleep in a position that puts pressure on the jaw (for example, on stomach, on the side)	✓	✓		
3	Grind teeth together during waking hours	✓		✓	
4	Clench teeth together during waking hours	✓		✓	
5	Press, touch, or hold teeth together other than while eating (that is, contact between upper and lower teeth)	✓		✓	
6	Hold, tighten, or tense muscles without clenching or bringing teeth together	✓		✓	
7	Hold or jut jaw forward or to the side	✓		✓	
8	Press tongue forcibly against teeth	✓			
9	Place tongue between teeth	✓			
10	Bite, chew, or play with your tongue, cheeks or lips	✓			
11	Hold jaw in rigid or tense position, such as to brace or protect the jaw	✓		✓	
12	Hold between the teeth or bite objects such as hair, pipe, pencil, pens, fingers, fingernails, etc	✓			✓
13	Use chewing gum	✓			✓
14	Play musical instrument that involves use of mouth or jaw (for example, woodwind, brass, string instruments)	✓			
15	Lean with your hand on the jaw, such as cupping or resting the chin in the hand	✓			
16	Chew food on one side only	✓			
17	Eating between meals (that is, food that requires chewing)	✓			✓
18	Sustained talking (for example, teaching, sales, customer service)	✓			✓
19.	Singing	✓			✓
20.	Yawning	✓			✓
21	Hold telephone between your head and shoulders	✓			

SA Sleeping-state oral activities; *NFA* waking-state non-functional oral activities; *FA* waking-state functional oral activities

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Author contribution Yap, AU is responsible for conceptualization, methodology, formal analysis, resources, data curation, writing—original draft, writing — review and editing, visualization, and supervision. Dewi NL is responsible for software, validation, formal analysis, and writing-review and editing. Pragustine Y is responsible for investigation, resources, writing—review and editing. Marpaung C is responsible for conceptualization, methodology, software, validation, formal analysis, investigation, resources, writing — review and editing, visualization, supervision, and project administration.

Declarations

Ethical approval This study was approved by the ethics committee at the Faculty of Dentistry, Universitas Trisakti, Indonesia (reference: 013/S3/KEPK/FKG/9/2021).

Informed consent Informed consent was obtained from all study participants.

Conflict of interest The authors declare no competing interests.

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