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## Psihometrijske značajke hrvatske verzije upitnika o utjecaju stomatološkog okruženja na stres studenata dentalne medicine

### *Psychometric Properties of the Croatian Language Version of the Dental Environment Stress Questionnaire on Dental Medicine Students*

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#### Sažetak

**Svrha:** Razviti hrvatsku verziju *Dental Environment Stress* upitnika (DES) s 41 pitanjem za mjerenje razine stresa kod studenata dentalne medicine pretkliničkih i kliničkih godina studija te ispitati psihometrijska svojstva upitnika u hrvatskoj kulturološkoj sredini. **Ispitanici i postupci:** Engleska verzija DES upitnika s 41 pitanjem prvo je prevedena na hrvatski jezik i postavljena na *Google drive*. Ispunili su je 202 studenta Stomatološkog fakulteta Sveučilišta u Zagrebu i 30 studenata drugih fakulteta Sveučilišta u Zagrebu kako bi se ispitala psihometrijska svojstva upitnika. Studenti su procijenili ukupnu količinu stresa na Likertovoj ljestvici (0 = nema stresa, 3 = najveći mogući stres). Unutarnja konzistentnost testirana je na 202 studenta dentalne medicine; test-retest analiza na 30 studenata koji su ispunili isti upitnik dvaput; konvergentna valjanost na 202 studenta dentalne medicine te divergentna valjanost na 202 studenta dentalne medicine i 30 studenata drugih fakulteta koji nisu iz područja biomedicine. **Rezultati:** Unutarnja konzistencija pokazala je visok Cronbach alpha koeficijent (0,9), a test-retest pouzdanost pokazala je da ne postoji statistički značajna razlika u zbroju bodova upitnika ( $p > 0,05$ ) unutar razdoblja od 14 dana kada se razina stresa nije značajno mijenjala (vrijeme praznika). Konvergentna valjanost potvrđena je značajnom korelacijom između zbroja bodova DES upitnika i jednim općim pitanjem o procjeni razine stresa (Spearmanov koeficijent korelacije = 0,881;  $p < 0,001$ ). Divergentna valjanost potvrđena je značajno manjim zbrojem bodova DES upitnika kod studenata fakulteta koji nisu iz područja biomedicine ( $t = 7,5$ ,  $P < 0,001$ ). **Zaključak:** Izvršne psihometrijske značajke hrvatske verzije DES upitnika omogućuju njegovu uporabu za evaluaciju razine stresa kod studenata dentalne medicine u hrvatskoj kulturološkoj sredini.

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#### Uvod

U nekim je istraživanjima dokazano da stres u akademskoj zajednici negativno utječe na uspjeh studenata (1). Studije upućuju na visoku prevalenciju stresa kod studenata medicine, dentalne medicine i farmacije (područje biomedicine) tijekom školovanja (2 – 4). Psihološki stres nastaje kada pojedinac misli da zahtjevi okoline prelaze njegove/njezine sposobnosti prilagodbe, što može rezultirati psihološkim ili biološkim promjenama svakog pojedinca te predstavlja rizik za pojavu bolesti (5). Dugogodišnje izlaganje stresu može biti povezano sa širokim spektrom negativnih ishoda kao što su: loš akademski uspjeh, neprofesionalno ponašanje, “izgaranje” i sl. (6).

Psihološki stres unutar populacije studenata dentalne medicine predmet je mnogih istraživanja u svijetu (7 – 20) u

#### Introduction

It has been proven that academic stress negatively affects students' performance (1). Many reports indicate that students of medicine, dentistry, and pharmacy (biomedicine study groups) experience high levels of stress during the course of their studies (2-4). Psychological stress occurs when an individual perceives that environmental demands exceed his/her adaptive capacity, resulting in psychological and biological changes that may place the individual at risk for a disease (5). Prolonged distress may lead to a wide range of negative outcomes, such as reduced academic performance, unprofessional conduct, burnout, etc. (6).

Psychological stress among dental students has been a subject of interest for numerous investigators from all around

svrhu njegova smanjenja (1). Međutim, za procjenu razine stresa, potreban je valjan instrument. Moguće je napraviti novi instrument za mjerenje razine stresa studenata dentalne medicine ili prevesti i prilagoditi već postojeći. Prema dostupnoj stomatološkoj literaturi, razine stresa među studentima dentalne medicine mjerene su različitim upitnicima, kao što su *General Health Questionnaire* (GHQ-12) (21), koji procjenjuje razinu psihološkog stresa kod studenata, te *Perceived Stress Scale* (PSS) (22) i *Depression Anxiety and Stress Scale* (DASS) (23). Najčešće korišten upitnik je *Dental Environment Stress Questionnaire* (DES) koji sadržava 38 pitanja (10, 13, 18 – 24). Upitnik procjenjuje izvore stresa kod studenata dentalne medicine na Likertovoj ljestvici od 4 stupnja. Ta verzija DES upitnika namijenjena je samo višim godinama studija koje uključuju klinički rad s pacijentima. Skraćena verzija DES upitnika, bez pitanja koja se odnose na klinički rad, sadržava 26 pitanja i opisana je u stomatološkoj literaturi za studente prve i druge godine dentalne medicine (pretkliničke godine) (22). Kako bi upitnik bio prilagođen nižim i višim godinama studija dentalne medicine, osmišljena je verzija DES upitnika s 41 pitanjem. Sadržava 25 izvornih pitanja iz DES upitnika i 16 modificiranih pitanja podijeljenih u sedam kategorija, ovisno o različitim potencijalnim izvorima stresa kod studenata dentalne medicine: procjena vlastite djelotvornosti, procjena fakulteta i administracije, opterećenost radom, rad s pacijentima, klinička praksa, pritisak zbog primjerenog obavljanja zadataka i socijalni stresori. Studenti u DES upitniku s 41 pitanjem procjenjuju količinu stresa na Likertovoj ljestvici od 4 stupnja (0 = nema stresa ili pitanje nije primjenjivo; 1 = najmanji stres, 2 = srednja razina stresa, 3 = najviša razina stresa) (9, 23).

### Svrha rada

Svrha rada je razviti hrvatsku verziju DES upitnika s 41 pitanjem koji mjeri razinu stresa na pretkliničkim i kliničkim godinama studija kod studenata dentalne medicine. Svrha je također bila psihometrijski ocijeniti upitnik za procjenu stresa stomatološke okoline u novoj kulturnoj sredini, tj. u hrvatskom kulturološkom okruženju. Hipoteza rada je bila da će upitnik za procjenu stresa stomatološke okoline, koji je već primjenjivan u mnogobrojnim zemljama za procjenu stresa kod studenata dentalne medicine, pokazati dobra psihometrijska svojstva u hrvatskoj kulturološkoj sredini te da će se moći primjenjivati za procjenu stresa kod studenata dentalne medicine u Hrvatskoj.

### Materijali i metode rada

#### Sudionici

Istraživanje je odobrio Etički odbor Stomatološkog fakulteta Sveučilišta u Zagrebu. U istraživanju o procjeni stresa kod studenata dentalne medicine Stomatološkog fakulteta Sveučilišta u Zagrebu sudjelovala su 202 studenta istog fakulteta, a za testiranje psihometrijskih svojstava upitnika uključeno je još 30 studenata drugih fakulteta sastavnica Sveučilišta u Zagrebu, koji nisu iz područja biomedicine. Studenti Stomatološkog fakulteta Sveučilišta u Zagrebu dobili

the world (7–20) in order to find coping strategies (1). However, to conduct a reliable research one must have an adequate instrument. It is, therefore, necessary either to create a new instrument to measure a level of stress in dental students or to translate and adapt the already existing instrument. In the available dental literature, stress levels in dental students have been measured using various questionnaires, such as General Health Questionnaire (GHQ-12) which was used to assess psychological stress of students (21) or the Perceived Stress Scale (PSS) (22) and the Depression Anxiety and Stress Scale (DASS) (23). The most frequently used questionnaire in multicentric studies was the 38-item Dental Environment Stress Questionnaire (DES) (10, 13, 18–24). It evaluated stress sources in dental students with answers to the four-degree Likert scale. The 38-item DES questionnaire has been recommended only for the senior years of study, which involve a clinical work. The shortened 26-item version of the DES questionnaire without questions related to clinical work has been described in the dental literature for students of the first and the second year (preclinical years) (22). One more version of the DES Questionnaire has been developed to fit both, the higher and the lower years of study. It comprises 41 questions (25 original questions from the DES questionnaire and 16 revised questions) divided into seven categories (dimensions) related to various potential sources of stress in dental students: Assessment of own effectiveness, Faculty and Administration, Workload, Patient Therapy, Clinical Training, Pressure due to Proper Tasks, and Social Stressors. In the 41-item DES questionnaire dental students evaluate amount of stress on the Likert scale of 4 degrees (0 = no stress or question cannot be applied; 1 = low stress, 2 = medium stress, 3 = highest stress) (9, 23).

### Aim of the study

The aim of the study was to develop the Croatian version of the 41-item DES questionnaire, which measures stress in dental students in both preclinical and clinical years of study. The aim was also to test its psychometric properties in Croatian dental student population. The hypothesis of this study was that the existing DES questionnaire, which measures stress levels in dental students and had already been adapted in many other countries will show good psychometric properties in the cultural environment of the Croatian population and that it could be used for assessment of stress level in Croatian dental students.

### Patients and Methods

#### Participants

The study was approved by the institutional Ethics Committee. A total of 202 students from the School of Dental Medicine, University of Zagreb were included, as well as additional 30 students from other Faculties of the University of Zagreb, not belonging to the biomedical group of studies. Students from the School of Dental Medicine, University of Zagreb received a written request via Facebook profile of their respective year of study, together with a brief explana-

su pismenu molbu na Facebook profilu svake godine studija s uputama o svrsi rada i načinu ispunjavanja DES upitnika koristeći se Likertovom ljestvicom od 4 stupnja (0 = nema stresa ili pitanje nije primjenjivo; 3 = najveći mogući stres). DES upitnik s 41 pitanjem postavljen je na *Google drive* gdje su ga *on-line* mogli ispuniti studenti koji su dobrovoljno željeli sudjelovati u istraživanju. Sudjelovalo je 30 studenata muškog spola (14,9 %) i 172 ženskog spola (85,1 %). Od studenata Stomatološkog fakulteta Sveučilišta u Zagrebu koji su ispunili upitnik, 31 je bio s prve godine (15,3 %), 27 s druge (13,4 %), 41 s treće (20,3 %), 30 s četvrte (14,9 %), 45 s pete (22,3 %), a 28 sa šeste godine studija (13,9 %). Dodatnih 30 studenata Sveučilišta u Zagrebu, koji nisu iz područja biomedicine, ispunili su fizičku (isprintanu) verziju DES upitnika.

### Upitnik

Izmijenjena verzija DES upitnika s 41 pitanjem koja se može koristiti kod pretkliničkih i kliničkih godina studija, izabrana je i prevedena s engleske verzije na hrvatski jezik prema prihvaćenim standardima prevođenja (25). U svakom od 41 pitanja, ispitanici su zatraženi da procijene svoju razinu stresa. Odgovori su procjenjivani na Likertovoj ljestvici od 4 stupnja (0 = nema stresa ili pitanje nije primjenjivo; 1 = najmanji stres, 2 = srednja razina stresa, 3 = najviša razina stresa). Kao dodatak pri ispunjavanju upitnika, ispitanici su zatraženi da odgovore i na jedno opće pitanje o procjeni stresa zbog stomatološke okoline na Likertovoj ljestvici 1 – 5 (1 = najmanji stres, 5 = najveći mogući stres).

Izmijenjena verzija originalne verzije DES upitnika stresa prevedena je s engleske verzije na hrvatski jezik prema prihvaćenim standardima prevođenja (14). Prvu verziju preveo je profesionalni prevoditelj upućen u stomatološke pojmove i semantiku, zajedno sa stomatologom koji odlično vlada engleskim jezikom. Tu verziju odvojeno je preispitalo dvoje hrvatskih stomatologa i jedan student stomatologije s odličnim znanjem engleskoga jezika. Ispravljani prijevodi spojeni su u jednu cjelinu. Završnu verziju je potom ponovno (*back-translation*), na engleski jezik, preveo drugi profesionalni prevoditelj u suradnji s drugim stomatologom i studentom stomatologije koji također odlično vladaju engleskim jezikom i koji su dugo boravili na engleskom govornom području. Izvorni govornik engleskog jezika usporedio je zatim unatrag prevedenu verziju s originalnom engleskom verzijom, kako bi se utvrdilo da se smisao pojedinih pitanja nije promijenio. Prije unatrag prevedene verzije, probna verzija upitnika testirana je unutar grupe od 15 studenata kako bi se dokazala jasnoća pitanja. Zatim su testirana psihometrijska svojstva: valjanost i pouzdanost.

### Psihometrijske značajke DES upitnika s 41 pitanjem

#### Valjanost

Konvergentna valjanost određena je povezanošću između jednog općeg pitanja o procjeni stresa i zbroja bodova svih pitanja DES upitnika, koristeći se Spearmanovim koeficijentom korelacije. Divergentna valjanost uspoređuje zbroj bodova DES upitnika koji su ispunili studenti Stomatološkog fakulteta Sveučilišta u Zagrebu te 30 studenata drugih fakulteta

o namjeni studija i uputama o tome kako ispuniti DES upitnik koristeći 4-stepenu Likertovu ljestvicu (0 = nema stresa ili pitanje nije primjenjivo; 3 = najviši stres). DES upitnik s 41 pitanjem postavljen je na *Google Drive*; stoga su svi studenti koji su željeli sudjelovati mogli ispuniti upitnik *on-line*. Ukupno je sudjelovalo 30 muških studenata (14,9%) i 172 ženskih studenata (85,1%) iz Škole stomatološke medicine. U studiju je sudjelovalo 31 student (15,3%) iz prvog razreda, 27 studenata (13,4%) iz drugog razreda, 41 student (20,3%) iz trećeg razreda, 30 studenata (14,9%) iz četvrtog razreda, 45 studenata (22,3%) iz petog razreda, i 28 studenata (13,9%) iz šestog razreda. Dodatnih 30 studenata iz drugih fakulteta (ne iz grupe biomedicine) ispunilo je isprintanu verziju DES upitnika.

### Instrument

Modificirani DES upitnik, tj. verzija s 41 pitanjem koja se može koristiti kod prekliničkih i kliničkih godina studija, izabran je i preveden s engleske verzije na hrvatski jezik prema prihvaćenim standardima prevođenja (25). U svakom od 41 pitanja, ispitanici su zatraženi da procijene svoju razinu stresa. Odgovori su procjenjivani na Likertovoj ljestvici od 4 stupnja (0 = nema stresa ili pitanje nije primjenjivo; 1 = najmanji stres, 2 = srednja razina stresa, 3 = najviša razina stresa). Kao dodatak pri ispunjavanju upitnika, ispitanici su zatraženi da odgovore i na jedno opće pitanje o procjeni stresa zbog stomatološke okoline na Likertovoj ljestvici 1 – 5 (1 = najmanji stres, 5 = najveći mogući stres).

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### Psychometric properties of the 41-item DES questionnaire

#### Validity

Convergent validity was determined from the association between self-reported level of stress and the 41-item DES summary score by using the Spearman rank correlation. Discriminant validity was determined by comparison of the 41-item DES questionnaire summary scores obtained from

koji nisu iz područja biomedicine (Filozofski fakultet Sveučilišta u Zagrebu, Fakultet elektrotehnike i računarstva, Pravni fakultet, Fakultet elektrotehnike, strojarstva i brodogradnje itd.).

#### Pouzdanost

U ovom istraživanju napravljen je test-retest pouzdanosti i mjerenje unutarnje konzistencije. Za procjenu test-retest pouzdanosti DES upitnik s 41 pitanjem ispunjen je dva puta u razmaku od dva tjedna za vrijeme studentskih praznika (pretpostavljalo se da se u vrijeme praznika razina stresa neće značajno mijenjati) kod 30 studenata dentalne medicine (8 muškog, 22 ženskog spola). Pretpostavljeno je da se zbroj bodova DES upitnika neće značajno mijenjati tijekom dva tjedna, zbog toga što neće biti promjene razine stresa uzrokovane stomatološkom okolinom za vrijeme praznika.

Unutarnja konzistencija procijenjena je izračunom koeficijentom Cronbach alpha.

#### Statistička analiza

Statistička analiza izvedena je s pomoću statističkog programa SPSS 22 for Windows SPSS Inc., Chicago, IL, USA) i Microsoft Office Excel-a 2003 (Microsoft, Seattle, WA, USA).

## Rezultati

### Valjanost

#### Konvergentna valjanost

U istraživanju su sudjelovala 202 studenta dentalne medicine koji su ispunili DES upitnik. Uz ispunjavanje DES upitnika, procijenili su razinu stresa zbog utjecaja stomatološke okoline tijekom studiranja s pomoću jednog općeg pitanja, a odgovori su ocjenjivani na Likertovoj ljestvici 1 - 5 : 1 = najmanji stres; 5 = najveći mogući stres. Konvergentna valjanost potvrđena je značajnom korelacijom (Spearmanov koeficijent korelacije = 0,881;  $P < 0,001$ ) između zbroja bodova DES upitnika i jednog općeg pitanja o općenitoj procjeni stresa stomatološke okoline.

#### Divergentna valjanost

Za procjenu divergentne valjanosti DES upitnika uspoređeni su zbrojevi bodova upitnika studenata Stomatološkog fakulteta Sveučilišta u Zagrebu sa zbrojem bodova upitnika studenata koji nisu bili iz područja biomedicine (Filozofski fakultet Sveučilišta u Zagrebu, Fakultet elektrotehnike i računarstva, Pravni fakultet, Fakultet elektrotehnike, strojarstva i brodogradnje itd.). Korišten je t-test za nezavisne uzorke. Pretpostavljeno je da će studenti drugih fakulteta pokazati manju razinu stresa u odnosu prema studentima dentalne medicine. Aritmetičke sredine sa standardnim odstupanjima zbroja bodova DES upitnika za studente dentalne medicine i studente drugih fakulteta prikazane su na Slici 1. Kao što je predviđeno, postoji značajna razlika između dviju grupa studenata ( $t = 7,57$ ,  $df = 230$ ,  $P < 0,001$ ) sa značajno višom razinom stresa kod studenata dentalne medicine.

the students of the School of Dental Medicine University of Zagreb and from 30 students not belonging to the Biomedicine group of studies (students from the Faculty of Humanities and Social Science, Faculty of Electrical Engineering and Computing, Faculty of Law, Faculty of Mechanical Engineering and Naval Architecture).

#### Reliability

Two types of reliability were assessed – the test-retest reliability and the internal consistency. To assess the test-retest reliability, the 41-Item DES questionnaire was administered twice within a two-week time-interval during student vacations (we assumed there will be no fluctuation in the level of stress during vacation) in 30 dental students (8 men, 22 women). It was predicted that the DES summary score would not change during the two-week period because there could not be any fluctuations in the level of stress elicited by dental surroundings due to the vacation period.

The internal consistency was assessed by calculating the Cronbach reliability coefficient  $\alpha$ .

#### Statistical analysis

Statistical analysis was performed using Statistical Package for the Social Sciences, version 20.0 for Windows (SPSS Inc., Chicago, IL, USA) and Microsoft Office Excel 2003 (Microsoft, Seattle, WA, USA).

## Results

### Validity

#### Convergent validity

The test was performed on a total of 202 dental students who filled out the DES questionnaire. Apart from filling out the DES Questionnaire, they also assessed their level of stress which they perceived due to the influence of dental environment during the study. They assessed their overall level of stress due to dental environment by using the 1-5 Likert scale with answers: 1=no stress; 5= the highest level of stress. Convergent validity was verified by a highly significant association (Spearman's  $\rho=0.881$ ;  $P<0.001$ ) between the DES Summary score and the self-assessment of the level of stress perceived due to dental environment.

#### Divergent validity

To test the divergent validity of the 41-Item DES questionnaire, the summary scores were compared between students from the School of Dental Medicine, University of Zagreb and students from other faculties (University of Zagreb) not belonging to the Biomedicine group (Faculty of Humanities and Social Science, Faculty of Electrical Engineering and Computing, Faculty of Law, Faculty of Mechanical Engineering and Naval Architecture). The t-test for independent samples was performed. It was assumed that students from other faculties would have a lower level of stress caused by dental environment than dental students. The mean values of the DES summary scores and standard deviations for dental students and for students of other faculties are presented in Figure 1. As predicted, there was a significant difference between the two groups of students ( $t = 7.57$ ,  $df = 230$ ,  $P < 0.001$ ) with significantly higher scores (higher stress) obtained from dental students.

## Pouzdanost

### Unutarnja konzistentnost

Unutarnja konzistentnost procijenjena je izračunom koeficijenta Cronbach alpha. Koeficijenti Cronbach alpha za DES upitnik s 41 pitanjem i za isti DES upitnik, ako bi se izbrisalo pojedino pitanje, testirani na 202 studenta dentalne medicine, pokazali su se više nego zadovoljavajućim (Cronbach alpha koeficijent = 0,90 i Cronbach alpha koeficijent s izbrisanim pojedinim pitanjem = 0,89-0,93).

### Test-retest pouzdanost

U testiranju test-retest pouzdanosti upitnika sudjelovalo je 30 studenata dentalne medicine (8 muškog spola te 22 ženskog spola) tijekom praznika, kada nije očekivana promjena razine stresa (Slika 2). Studenti su ispunili DES upitnik s 41 pitanjem dvaput u razdoblju od dva tjedna. Nije bilo statistički značajne razlike u količini stresa između ispunjavanja istog upitnika dvaput, kao što je predviđeno ( $t = -0,844$ ,  $df = 29$ ,  $P = 0,405$ ;  $> 0,05$ ; NS).

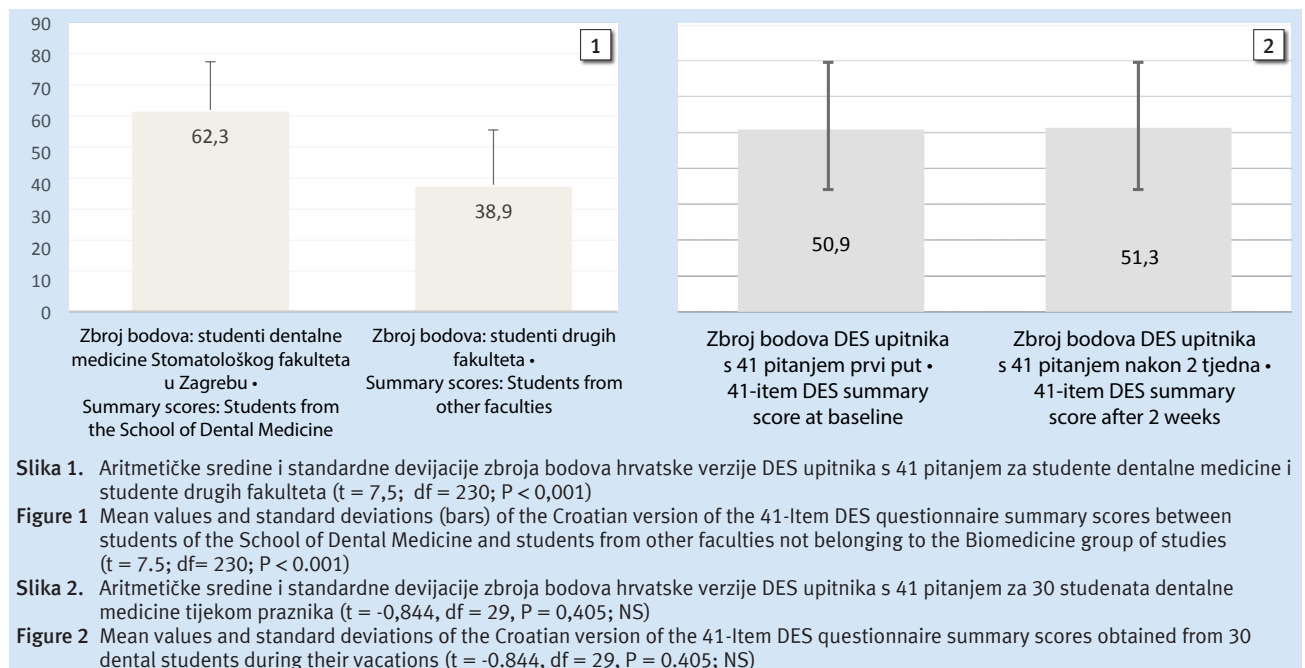
## Reliability

### The internal consistency

The internal consistency was assessed by calculating the Cronbach coefficient  $\alpha$ . The Cronbach alpha coefficient for both, the 41-Item DES questionnaire, and for the DES questionnaire when an item was deleted from 202 dental students were more than satisfactory (Cronbach's alpha = 0,90 and Cronbach's Alpha if Item deleted = 0.89-0.93).

### The test-retest reliability

The test-retest reliability was evaluated in 30 dental students (8 males and 22 females) during the vacation period, when no changes in the level of stress were predicted (Figure 2). Students filled out the 41-Item questionnaire twice (at baseline and after the period of two weeks). There were no significant differences between the two completions of the same questionnaire, as predicted ( $t = -0.844$ ,  $df = 29$ ,  $P = 0.405$ ;  $> 0.05$ ; NS).



## Rasprava

Hrvatska verzija DES upitnika s 41 pitanjem pokazala je vrlo dobra psihometrijska svojstva. DES upitnik s 41 pitanjem podijeljen je u sedam kategorija potencijalnih izvora stresa: procjena vlastite djelotvornosti (pitanja 1 – 9), procjena fakulteta i administracije (pitanja 10 – 9), opterećenost radom (pitanja 20 – 25), rad s pacijentima (pitanja 26 – 29), klinička praksa (pitanja 30 – 33), pritisak zbog primjerenog obavljanja zadataka (pitanja 34 – 36) i socijalni stresori (pitanja 37 – 41). Međutim, podjela na spomenute kategorije nije navedena u upitniku, tako da studenti nisu svjesni kategorija pitanja tijekom ispunjavanja upitnika. Broj studenata ženskog spola značajno je veći od broja studenata muškog spola unutar svih godina studija dentalne medicine, što se objašnjava

## Discussion

The Croatian version of the 41-Item DES questionnaire showed very good psychometric properties. The 41 items of the DES questionnaire have been clustered into seven domains of potential stressors: self-efficacy beliefs (items 1–9), faculty and administration (items 10–19), workload (items 20–25), patient treatment (items 26 to 29), clinical training (items 30–33), performance pressure (items 34–36) and social stressors (items 37–41). However, the above-mentioned categories were not shown in the questionnaire, hence the students were not aware of them during filling out the questionnaire. The number of female students was significantly higher than that of male students throughout all study years, from the first to the last year, which can be easily explained by the fact that students

va činjenicom da su studenti Stomatološkog fakulteta Sveučilišta u Zagrebu pretežno ženskog spola, čak 80 % studenata.

U Hrvatskoj do sada ne postoji istraživanje o utjecaju stresa na studente dentalne medicine. Zbog toga, kako bismo proveli istraživanje i saznali razinu stresa kod studenata dentalne medicine u hrvatskoj kulturološkoj sredini, možemo uvesti novi instrument ili prilagoditi postojeći (26 – 29). Uvođenje novog instrumenta ne bi omogućilo usporedbu sa studentima drugih zemalja, tako da je razumljiva prilagodba već postojećeg instrumenta, prihvaćenog u mnogim drugim zemljama. Odlučili smo adaptirati DES upitnik s 41 pitanjem koji mjeri razinu stresa na pretkliničkim i kliničkim godinama studija (9). Nakon prevođenja i probne verzije upitnika koja je dokazala dobru razumljivost pitanja, testirana su psihometrijska svojstva upitnika.

Cronbach alpha je zbrojna statistika koja bilježi opseg suglasnosti između svih pitanja. Cronbach alpha vrijednost > 0,80 upućuje na pouzdan rezultat, iako su i vrijednosti > 0,70 prihvatljive (30). Ovo istraživanje pokazalo je zadovoljavajuću vrijednost Cronbach alpha koeficijenta. Test-retest pokazao je da ne postoji statistički značajna razlika između dva ispunjavanja DES upitnika unutar 14 dana tijekom praznika.

Konvergentna valjanost pokazuje koliko se dva instrumenta (upitnika), koja ispituju sličan konstrukt, preklapaju, tj. koliko jedan instrument korelira s drugim instrumentima sličnog konstrukta. Konvergentna valjanost u ovom istraživanju pokazuje značajnu povezanost između zbroja bodova DES upitnika i jednog pitanja o općenitoj procjeni stresa uzrokovanog stomatološkom okolinom.

Divergentna valjanost mjeri konstrukte koji nisu povezani te je dokazan statistički manji zbroj bodova DES upitnika kod studenata drugih fakulteta u usporedbi sa zbrojem bodova DES upitnika studenata dentalne medicine.

DES upitnik, zahvaljujući svojim dobrim psihometrijskim svojstvima, može biti primijenjen unutar akademske zajednice hrvatske kulturološke sredine u svrhu pronalaženja izvora stresa te njegova smanjenja (31, 32).

Međutim, treba napomenuti da ova studija ima određena ograničenja, koja uključuju relativno mali broj studenata na svakoj godini koji su ispunili DES upitnik (oko 25 posto studenata). Pretpostavlja se da su vjerojatno studenti bili prezaузeti učenjem i drugim obvezama na fakultetu i izvan fakulteta.

## Zaključak

Zaključno, ovo istraživanje potvrđuje kako je DES upitnik s 41 pitanjem pogodan instrument za procjenu razine stresa kod studenata dentalne medicine te se može koristiti u longitudinalnim, transverzalnima te međukulturalnim istraživanjima.

## Sukob interesa

Nije bilo sukoba interesa.

of the School of Dental Medicine, University of Zagreb are predominantly females: about 80% female students.

In Croatia, no instrument has existed to measure influence of different stressors during study of dental medicine. Therefore, to perform a research and find out the level of stress in Croatian dental students we could develop a new instrument or adapt the existing one (26-29). The development of a new instrument would not allow any comparison with dental students in other countries. Hence, it seemed reasonable to adapt the existing instrument, which had already been adapted in many other countries. Therefore, we decided to adapt the 41-Item DES questionnaire which measures stress levels in both, preclinical and clinical students (9). After the translation and a pilot study which proved a good understanding of questions, psychometric properties of the instrument were investigated.

The Cronbach  $\alpha$  is a summary statistics, which captures the extent of agreement between all possible subsets of questions. The Cronbach  $\alpha$  values >0.80 indicate a reliable scale, although at the initial stages of the study, values >0.70 are also acceptable (30). This study showed satisfactory values for the Cronbach  $\alpha$  coefficient. Test-retest also showed no significant differences between the two completions of the DES questionnaire during the 14 day vacation period.

Convergent validity measures constructs that, theoretically, should be related to each other. Adequate convergent validity in this study was shown by a significant association between the DES summary score and the self-perceived level of stress.

Divergent validity measures constructs that, theoretically, should not be related to each other and this was proved for the DES questionnaire by significantly lower DES summary scores in students not studying dental medicine compared to dental medicine students.

Due to its good psychometric properties, the DES questionnaire can be implemented in the Croatian dental academic community in order to find out stressors and to cope with them (31,32).

It should be noted that this study has some limitation, which include relatively a small number of students on each year who completed the DES questionnaire (about 25 percent of students). It is presumed that students were probably too busy by learning and other responsibilities at the faculty as well as outside the faculty.

## Conclusion

In conclusion, this study confirmed the fact that the 41-Item DES questionnaire is a suitable instrument for the assessment of stress level in dental students and can be used in longitudinal, cross-sectional, and cross-cultural studies.

## Conflict of interest

None declared

**Abstract**

**Objective:** To develop the Croatian version of the 41-item Dental Environment Stress questionnaire (DES) for stress assessment of dental students in both, preclinical and clinical years of study and to test its psychometric properties in Croatian dental student population. **Materials and Methods:** The English version of the 41-Item DES questionnaire was first translated into the Croatian language. Subsequently, it was set on the google drive and filled out by a total of 202 students from the School of Dental Medicine, University of Zagreb and 30 additional students from other Faculties. Students also assessed their overall level of stress on the Likert scale (1=no stress, 5=highest level of stress). Internal consistency was tested on 202 dental students; test-retest reliability on 30 dental students who filled out the same questionnaire twice; convergent validity on 202 dental students; and divergent validity on 202 dental students and 30 students from faculties not belonging to the biomedicine group. **Results:** Internal consistency showed high Cronbach alpha coefficient (0.9) and test-retest reliability showed no significant difference ( $P>0.05$ ) within the period of 14 days when stress level had not changed (vacation). Convergent validity was confirmed by the significant association between the DES summary scores and the self-perceived level of stress (Spearman's  $\rho=0.881$ ;  $P<0.001$ ). Divergent validity was confirmed by significantly lower DES summary scores in students not belonging to the Biomedicine group ( $t=7.5$ ,  $P<0.001$ ). **Conclusion:** Excellent psychometric properties of the Croatian version of the DES questionnaire enable its utilization for assessment of stress level in Croatian dental students.

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