POKAZATELJI MENTALNOG ZDRAVLJA I PSIHOLOŠKIH OSOBINA STUDENATA MEDICINE I ZDRAVSTVENIH STUDIJA

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SVEUČILIŠTE JOSIPA JURJA STROSSMAYERA U OSIJEKU
MEDICINSKI FAKULTET OSIJEK

Jakov Milić

POKAZATELJI MENTALNOG ZDRAVLJA I PSIHOLOŠKIH OSOBINA STUDENATA MEDICINE I ZDRAVSTVENIH STUDIJA

Doktorska disertacija

Osijek, 2024.

Mentor rada: prof. dr. sc. Livia Puljak, dr. med.

Komentor rada: prof. dr. sc. Maja Miškulin, dr. med.

Rad ima 72 lista, 12 tablica i 2 slike.

Predgovor

„Tko traži Istinu, traži Boga, bio toga svjestan ili ne.“

Sv. Terezija Benedikta od Križa

Svaki znanstveni doprinos jedan je korak prema otkrivanju Istine, otkrivanju Boga u Njegovu stvorenju. Zato neka i ovaj rad bude jedan korak na tome putu.

Bog mi je tijekom obrazovanja na put redovito stavljao prekrasne ljude koji su u meni budili ljubav prema znanosti zbog čega sam Mu zahvalan.

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Na poseban način želim zahvaliti svojoj mentorici prof. dr. sc. Liviji Puljak od koje sam uistinu mnogo naučio o znanstvenoj metodologiji i koja mi je bila velik poticaj za izradu ovog doktorata. Zahvaljujem i komentorici prof. dr. sc. Maji Miškulin s kojom sam još kao student surađivao i koja je rado prihvatila biti komentor ovoga rada te mi je svojim savjetima i sugestijama mnogo pomogla u njegovoj izradi.

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Sadržaj

Popis kratica:

DSM-IV – engl. *Diagnostic and Statistical Manual of Mental Disorders, fourth edition,* dijagnostički i statistički priručnik za mentalne poremećaje, četvrto izdanje.

EU – Europska Unija

GAD-7 – engl. *The Generalized Anxiety Disorder – 7*

IQR – engl. *Interquartile range*

MEQ – engl. *Morningness-Eveningness Questionnaire*

MLD – Medicinsko-laboratorijska dijagnostika

PHQ-9 – engl. *Patient Health Questionnaire-9*

rMEQ – engl. *Reduced Morningness-eveningness Questionnaire*

SAD – Sjedinjene Američke Države

SD – Standardna devijacija

SHS – engl. *The Subjective Happiness Scale*

UEMS – engl. *The European Union of Medical Specialists'*

UK – Ujedinjeno Kraljevstvo

$\bar{x}$ – srednja vrijednost

1. Uvod

Doktorska disertacija obuhvaća pet objavljenih znanstvenih radova koji će u radu biti označeni kao Istraživanje 1 (1), Istraživanje 2 (2), Istraživanje 3 (3), Istraživanje 4 (4) i Istraživanje 5 (5).

1.1. Mentalno zdravlje studenata medicine i zdravstvenih studija

Studiji medicine i srodnih zdravstvenih studija poznati su kao vrlo zahtjevni studiji koji od studenata traže velik angažman što se može negativno odraziti na mentalno zdravlje (6).

Uz sam akademski rigorozan program studija koji može dovesti do deprivacije sna i kroničnog stresa, kao i kompetitivnosti među kolegama koja može dodatno dovesti i do socijalne izolacije, studenti se susreću s dodatnim stresorom ljudske patnje pacijenata, etičkih dilema, ali i svijesti o odgovornosti službe koju će nakon diplome vršiti, što može dovesti do emocionalnog iscrpljivanja (7). Studenti medicine imaju i dodatne čimbenike rizika koji mogu dovesti do problema s mentalnim zdravljem. Oni uključuju visoke razine perfekcionizma, strah od neuspjeha, nedostatak socijalne podrške i stigmu povezanu s traženjem pomoći koja je česta među zdravstvenim djelatnicima (8-10). Primjerice, polovica liječnica koje su zadovoljavale dijagnostičke kriterije za mentalne poremećaje nisu bile sklone tražiti profesionalnu pomoć zbog straha od stigmatizacije (11). Brojna istraživanja svjedoče o povećanoj prevalenciji problema s mentalnim zdravljem u populaciji studenata medicine. U literaturi se može naći podatak o prevalenciji simptoma depresije kod sveučilišnih studenata u rasponu od 8,6 % do 71 % (6,12–24). Metaanaliza prevalencije depresije u populaciji studenata sestrinstva pokazala je stopu od 34 % i ta se prevalencija nije razlikovala od opće studentske populacije (25). Prevalencija depresije u populaciji studenata medicine viša je 10 – 15 % od prevalencije u općoj populaciji (9). Istraživanja pokazuju da su simptomi anksioznosti još prevalentniji u studentskoj populaciji te da se ne razlikuju znatno od prevalencije kod studenata medicine (26,27). Prevalencija simptoma anksioznosti u populaciji studenata medicine kreće se u rasponu od

7,7 % do 65,5 %, uz procijenjenu srednju vrijednost od 33,8 %, što je značajno više u odnosu na opću populaciju gdje se ista vrijednost kreće u rasponu 3 – 25 %, ovisno o mjernom instrumentu i protokolu istraživanja (28,29). Studenti medicine imaju i visoku prevalenciju izgaranja, koja se kreće od 75 % do čak 95 %, ovisno o istraživanju (15,30–32).

Visoke razine anksioznosti i depresivnosti u studentskoj populaciji razlog su za brigu zato što mogu dovesti do ozbiljnijih mentalnih poremećaja, izgaranja, suicidalnih ideacija, lošeg akademskog uspjeha, korištenja opojnih sredstava, akademske nepoštenosti prouzrokovane stresom i snižene empatije koja je posebno značajna za zdravstvene djelatnike (15,21,33). Osim toga, ti problemi mogu dovesti i do pada kognitivne funkcije i kliničke prosudbe što također može smanjiti kvalitetu skrbi za pacijente (34). Još jedan značajan čimbenik koji je poseban razlog za brigu visoka je učestalost suicida u studentskoj populaciji i u populaciji zdravstvenih djelatnika (31,35,36). Suicidalne su ideacije prisutne u populaciji studenata medicine u stopama od 7,4 do 24,2 % te se radi o stopama koje su više u odnosu na populaciju studenata općenito, kod kojih iznosi od 6,7 % do 21 % (6,26,37–39). Tome mogu pridonijeti čimbenici kao što je akademski pritisak, društvena izoliranost, financijske brige i prilagodba na novo akademsko okruženje (35). S obzirom na osjetljivost i važnost navedene populacije i opsega problema, potrebno je učiniti korake za njegovo rješavanje. Neki od predloženih koraka podrazumijevaju zdravstveno opismenjavanje, intervencije za borbu sa stresom, izgradnju otpornosti, poticanje brige za sebe, programe međusobne podrške studenata te pružanje usluga savjetovanja i mentorstva na razini fakulteta (40). Osim toga, korisni su i programi probira i rane intervencije koji mogu pomoći otkriti studente u povećanom riziku što može olakšati pristup uslugama pružanja pomoći za mentalno zdravlje (40).

1.2. Karakterne osobine

Karakterne osobine svojstvene su osobi i uvjetuju način na koji funkcionira u svijetu. Jedan od najkorištenijih modela istraživanja karakternih osobina je model 5 velikih dimenzija (engl. *Big*

Five), koji uključuje otvorenost novim iskustvima (koju pojedini autori nazivaju varijablom intelekt), savjesnost, ekstroverziju, ugodnost (engl. *agreeableness*) i neuroticizam i na taj način obuhvaća najvažnije aspekte ljudske osobnosti (41,42). Varijabla neuroticizam u pojedinim je upitnicima zamijenjena varijablom emocionalna stabilnost, koja joj je suprotna. Karakterne osobine utječu na karijerne opcije te na izbor specijalizacije, mogu doprinijeti većem zadovoljstvu na radnome mjestu, ali mogu biti i čimbenik rizika za razvoj mentalnih poremećaja (43–45). Visoke razine otvorenosti iskustvu podrazumijevaju da su osobe znatiželjne, da promišljaju, da su kreativne i prilagodljive (46,47). Ta se varijabla ponekad naziva intelektom (47). Te osobine u kontekstu zdravstvenih djelatnika mogu dovesti do rješavanja problema na nove načine, da se mogu snalaziti uspješnije u neočekivanim situacijama te da su otvoreniji novim medicinskim dostignućima i promjenama paradigmi koje mogu nastati tijekom medicinske karijere (48). Savjesnost se odnosi na sklonost da osobe budu organizirane, odgovorne i usmjerene cilju, da paze na detalje i protokole u zdravstvu te da su pouzdani u njezi pacijenata (48,49). Savjesnost je dobar prediktor akademskog uspjeha i kliničkih kompetencija zbog čega je to poželjna osobina u kontekstu studenata medicine (50–53). U skupinama psihijatrijskih bolesnika prisutne su niže razine savjesnosti, što može upućivati na zaštitnu ulogu savjesnosti (44). Ekstroverzija odražava društvenost, asertivnost i energičnost te entuzijazam u društvenim interakcijama (47). U kontekstu zdravstvenih djelatnika utječe na komunikacijske vještine, timski rad i odnos s pacijentima (46). Ugodnost označava sklonost empatiji, suosjećanju i ljubaznosti (47). Može se opisati i kao razina suradljivosti, umjerenosti, povjerljivosti i fleksibilnosti (54). U kontekstu zdravstvenih djelatnika ima svoju važnost u izgradnji povjerenja pacijenata, u njegovanju terapijskih saveza i pružanju suosjećajne njege (48). Osim toga, omogućuje učinkovitiji timski rad i suradnju, što u kontekstu zdravstvenih djelatnika može voditi boljim ishodima liječenja (55). Neuroticizam je varijabla suprotna emocionalnoj stabilnosti i može se promatrati kao sklonost iritabilnosti, ćudljivosti te

osjetljivosti na stres (47,48). Osobe s mentalnim poremećajima češće pokazuju visoke stope neuroticizma (44) koje mogu učiniti pojedince sklonijima izgaranju i emocionalnom iscrpljivanju u okruženjima visokog stresa, kao što je medicina (48,56). Autori ističu i adaptivnu ulogu neuroticizma, budući da dovodi po pojačane budnosti i pozornosti na potencijalne rizike, što može biti od koristi u medicini (49,57). S druge strane, neuroticizam kod studenata medicine negativno se odražava na emocionalnu inteligenciju i empatiju (58).

Pojedine osobine modela *Big Five* važni su prediktori uspjeha na studiju, ali i u kliničkoj praksi. Otvorenost iskustvu, ugodnost, savjesnost i ekstroverzija prediktori su kognitivne i afektivne empatije koja je iznimno važna za zdravstvene djelatnike (59–63). Ugodnost, otvorenost iskustvu i ekstroverzija najvažniji su čimbenici koji pozitivno utječu na komunikacijske sposobnosti studenata (64,65). Emocionalna inteligencija pozitivno korelira s ekstroverzijom, savjesnosti, ugodnosti i otvorenosti iskustvu te negativno korelira s neuroticizmom (66). Savjesnost, otvorenost, ugodnost i ekstroverzija pozitivno koreliraju s akademskim uspjehom (55,67). Savjesnost najsnažnije korelira s akademskim uspjehom (52). Međutim, dok savjesnost pozitivno utječe na stjecanje pretkliničkog znanja, smanjuje stjecanje kliničkog znanja, a anksioznost povećava stjecanje kliničkog znanja (68,69).

Ekstroverzija također pozitivno korelira s uspjehom, a zanimljivo je da studenti s umjereno visokim stopama neuroticizma pokazuju bolji uspjeh u kliničkim vještinama (64,68).

Zdravstveni djelatnici određenih specijalizacija češće pokazuju pojedine karakterne osobine. Tako je, primjerice, uočeno da kirurzi imaju niže vrijednosti ugodnosti u odnosu na liječnike u primarnoj zdravstvenoj zaštiti i internističkim strukama, dok psihijatri pokazuju niže vrijednosti savjesnosti u odnosu na kirurge (70). Studenti koji su željeli kirurške specijalnosti bili su ekstrovertiraniji, savjesniji i imali su manje negativnih emocija u odnosu na one koji su željeli druge specijalizacije (71–73). Studenti s višom razinom ugodnosti bili su skloniji kliničkim specijalnostima u odnosu na nekliničke, koji su pokazivali više vrijednosti otvorenosti novim

iskustvima (74). Prema istraživanju Siera i suradnika, kirurzi pokazuju više vrijednosti ekstroverzije, savjesnosti, otvorenosti iskustvu i ugodnosti i niže vrijednosti negativne emocionalnosti u usporedbi s općom populacijom (75).

Karakterne osobine mogu biti povezane sa životnim zadovoljstvom (76). Osobe koje pokazuju više razine ekstroverzije, ugodnosti i savjesnosti imaju bolje navike spavanja, dok neurotičnije osobe spavaju manje (64,77). Ekstroverzija, ugodnost i savjesnost pozitivno koreliraju sa životnim zadovoljstvom, dok neuroticizam negativno korelira (78,79). Usporedba studenata koji su pokazali visoku razinu zadovoljstva životom s onima koji su pokazali nižu razinu pokazala je da imaju nižu razinu ranjivosti (koja je dimenzija neuroticizma), imaju manje akademskih briga, smatrali su da medicinski fakultet manje ometa njihov društveni i osobni život, bolje su se nosili sa stresom koristeći pristup usmjeren na problem i tražili su socijalnu podršku te su bili manje skloni utopijskome razmišljanju (64,80). Prema Suciu i suradnicima, visoke razine savjesnosti, ugodnosti i otvorenosti iskustvu povezane s niskom razinom neuroticizma najpogodnija su kombinacija za postizanje profesionalnog zadovoljstva u medicini (60). Premda su osobine ispitivane modelom *Big Five* uglavnom trajne, prema longitudinalnom istraživanju Abbiati i Ceruttija, tijekom studija medicine dolazi do laganih promjena u navedenim osobinama (81). Pronašli su pozitivne promjene u razinama ugodnosti i negativne male promjene u razinama neuroticizma i savjesnosti (81).

1.3. Problem nedostatka zdravstvenih djelatnika, etnocentrizam i emigracija

Jedan od većih problema zdravstvenih sustava u svijetu je nedostatak liječnika, koji zahvaća čak i zemlje u koje liječnici imigriraju (82–88). Kad emigriraju, liječnici idu u smjeru boljeg standarda života, kvalitete života, bolje plaćenosti za svoj rad te pristupa razvijenim tehnologijama i boljim političkim uvjetima (4,84,89). Liječnici stoga najčešće migriraju iz zemalja u razvoju u razvijene zemlje, što može dovesti do sloma zdravstvenih sustava u zemljama u razvoju (90). Svjetska zdravstvena organizacija prepoznala je navedene migracije

kao uzrok nejednake distribucije zdravstvene radne snage u svijetu, što može dovesti do još veće nejednakosti u dostupnosti zdravstvenih usluga (91).

Otkako je Republika Hrvatska postala dio EU-a u lipnju 2013., mnogo je liječnika emigriralo u razvijenije države, a problem s nedostatkom liječnika rezultat je i ranijih odlijeva radne snage (92). Hrvati su najviše migrirali u Njemačku, Sloveniju, UK, Irsku i Švicarsku (93). Istraživanja su pokazala da godišnje Hrvatsku napusti oko 140 liječnika, što ju čini jednom od triju članica EU-a iz koje liječnici najviše emigriraju (93,94). Istraživanje na hrvatskim studentima medicine, provedeno 2013. godine, pokazalo je da čak 35 % studenata želi emigrirati, a najviše ih je htjelo emigrirati u Njemačku (40 %), SAD i Kanadu (17 %) i UK (11 %) (94). Čimbenici koji povećavaju sklonost migraciji u kontekstu zdravstvenog sustava su muški spol, mlađa životna dob, nevjenčanost, bolja educiranost, prethodan studijski boravak u inozemstvu i postojanje rodbine ili prijatelja u inozemstvu (96,97). Stavovi vezani uz emigraciju mijenjaju se s vremenom i moguće je da su, uz društvene čimbenike, uvjetovani i karakternim osobinama osobe i osjećajem pripadnosti određenom društvenom okruženju. Etnocentrizam je varijabla koja se može koristiti kao mjera pripadnosti određenom društvenom okruženju (4,98). Termin je skovao Sumner 1906. godine pri čemu ga je definirao kao shvaćanje svijeta u kojem pojedinac stavlja svoju skupinu u središte svega i koji procjenjuje druge skupine u odnosu s njom (99).

Poveznice s grupom koje dovode do etnocentričnog ponašanja su jezik, naglasak, fizičke karakteristike i religija, a važan čimbenik je visoko razvijena teritorijalna komponenta (100). Promocija kontakta između grupa i dijaloga preko inicijativa angažmana zajednice, kulturalnih razmjena i projekata suradnje, može potaknuti empatiju, suradnju i solidarnost među različitim grupama (101). Pregledom literature nisu pronađeni radovi koji povezuju etnocentrizam i migracije.

2. Hipoteze

Studenti medicine i zdravstvenih studija pokazuju visoke razine depresije i anksioznosti, a studenti različitih studija pokazuju razlike u karakternim osobinama te kronotipu. Razlike u introverziji i etnocentrizmu povezane su sa sklonosti studenata emigraciji. Karakterne osobine studenata povezane su s preferiranom specijalizacijom.

3. Cilj

3. Cilj

Glavni cilj: Istražiti razine depresije, anksioznosti i subjektivne sreće kao indikatora mentalnog zdravlja i karakternih osobina, etnocentrizma i cirkadijane preference kao indikatora osobnosti studenata medicine i zdravstvenih studija te istražiti utjecaj pojedinih osobina na sklonost emigraciji i izbor pojedine specijalizacije.

Specifični ciljevi:

Cilj 1: Ispitati razinu depresije, anksioznosti i subjektivne sreće studenata medicine i zdravstvenih studija.

Cilj 2: Ispitati razine jutarnjosti, etnocentrizma, introverzije i karakternih osobina studenata medicine i zdravstvenih studija prema modelu *Big Five*.

Cilj 3: Ispitati utjecaj etnocentrizma, introverzije i preference vezane uz izbor specijalizacije na odluku o emigraciji studenata medicine.

Cilj 4: Ispitati utjecaj karakternih osobina prema modelu *Big Five* na preference vezane uz izbor specijalizacije studenata medicine.

Cilj 5: Ispitati utjecaj izabranih sociodemografskih čimbenika na razinu depresije, aksioznosti, subjektivne sreće studenata medicine i zdravstvenih studija.

4. Ispitanici i metode

Ova doktorska disertacija obuhvaća pet objavljenih znanstvenih radova srodne metodologije.

4.1. Ustroj istraživanja

Sva istraživanja uključena u disertaciju bila su ustrojena kao presječna istraživanja (102–106).

4.2. Ispitanici

Sva su istraživanja ishodila odobrenja etičkih povjerenstava mjerodavnih ustanova koje su nakon uvida u potpunu dokumentaciju odobrila istraživanja (Medicinski fakultet Osijek: Klasa: 602-04/15-08/08, br. 2158-61-07-15-77 i br. 2158-61-07-15-01; Hrvatsko katoličko sveučilište: Klasa: 641-03/22-03/034; Urbroj: 498-15-06-22-002 od 1. rujna 2022.).

Ispitivanja su se provodila u skladu sa smjernicama za sigurnost osoba koje sudjeluju u ovakvim znanstvenim istraživanjima, uključujući Helsinšku deklaraciju. Svi su ispitanici dali informirani pristanak prije uključivanja u istraživanje.

Prvo je istraživanje (1) provedeno od 7. siječnja do 15. lipnja 2016. godine i uključilo je studente medicine i sestrinstva Medicinskog fakulteta Osijek.

Drugo je istraživanje (2) provedeno od 7. siječnja do 15. lipnja 2016. godine i uključilo je studente medicine, medicinsko-laboratorijske dijagnostike (MLD) i sestrinstva Medicinskog fakulteta Osijek.

Treće je istraživanje (3) provedeno od 7. siječnja do 15. lipnja 2016. godine i uključilo je studente medicine Medicinskog fakulteta Osijek.

Četvrto je istraživanje (4) provedeno u dvije susljedne godine, u svibnju i lipnju 2015. i 2016. godine i uključilo je studente šeste godine medicine Medicinskog fakulteta Osijek.

Peto istraživanje (5) uključilo je zdravstvenih studija ukupno deset visokoškolskih ustanova u Republici Hrvatskoj: Hrvatskog katoličkog sveučilišta, Sveučilišta Jurja Dobrile u Puli, Sveučilišta Libertas, Zdravstvenog veleučilišta, Veleučilišta u Bjelovaru, Sveučilišta Sjever,

Sveučilišta u Dubrovniku, Sveučilišta u Rijeci, Sveučilišta u Splitu i Sveučilišta u Zadru. Ispitanici su bili studenti sestrinstva, dentalne higijene, fizioterapije, medicinsko-laboratorijske dijagnostike, primaljstva, radiološke tehnologije, radne terapije i sanitarnog inženjerstva. Istraživanje je provedeno u razdoblju od 6. ožujka do 23. travnja 2023.

4.3. Metode

U istraživanjima koja su uključena u ovu disertaciju korišteno je više validiranih psiholoških upitnika kao i upitnik sociodemografskih obilježja. U istraživanjima 1 – 4 ispitanici su ispunjavali upitnike uživo, dok je u istraživanju 5 ispitanici ispunili online anketu na serveru SurveyMonkey. Detaljniji opis korištenih metoda može se naći u člancima koji su priloženi ovoj disertaciji (1-5). U nastavku će biti prikazane najvažnije psihološke skale i varijable koje su njima bile ispitane.

Popis medicinskih specijalizacija korišten u istraživanju preuzet je sa stranice Europskog udruženja medicinskih specijalista (engl. *The European Union of Medical Specialists'*, UEMS) (107).

4.3.1. Razina depresije

Za procjenu razina depresije ispitanika korišten je Upitnik o zdravlju pacijenta - 9 (engl. *Patient Health Questionnaire-9,* PHQ-9). Radi se o validiranoj psihološkoj skali koja je pokazala dobru specifičnost i osjetljivost u detekciji depresivnih poremećaja (108). Sastoji se od devet pitanja na koja se odgovara na Likertovoj ljestvici i koja odgovaraju dijagnostičkim kriterijima za veliki depresivni poremećaj prema DSM-IV (engl. *Diagnostic and Statistical Manual of Mental Disorders, fourth edition*), pitanja odgovaraju sljedećim kriterijima: depresivno raspoloženje veći dio dana, smanjeno zanimanje ili zadovoljstvo za sve ili većinu aktivnosti, značajno nenamjerno dobivanje ili gubitak tjelesne mase, insomnija ili previše spavanja, agitacija ili psihomotorna retardacija koju uočavaju drugi, umor ili gubitak energije, osjećaj beskorisnosti

ili pretjerane krivnje, smanjena mogućnost razmišljanja ili koncentriranja ili neodlučnost te ponavljajuće misli o smrti (109–115). Ukupni zbroj bodova je u rasponu od 0 do 27. Prema literaturi, rezultat se može podijeliti u kategorije s prijelaznim vrijednostima (engl. *cut-off point*) 5, 10, 15 i 20, koje odgovaraju blagim, umjerenim, umjereno visokim i visokim razinama depresije (108). Rezultat je moguće i orijentacijski koristiti pri čemu se može postaviti binarna kategorizacija. U tome slučaju autori predlažu prijelaznu vrijednost od 10 (116). Autori navode mogućnost da se ova skala koristi i kao dijagnostički instrument (116).

4.3.2. Razine anksioznosti

Za procjenu razina anksioznosti koristili smo upitnik engl. *The Generalized Anxiety Disorder – 7* (GAD-7). Radi se validiranoj psihološkoj skali koja se sastoji od sedam pitanja na koja se odgovara na Likertovoj ljestvici (117,118). Razvijena je kao instrument za dijagnozu generaliziranog anksioznog poremećaja, a pokazala je dobru osjetljivost i specifičnost kao instrument za probir za panični poremećaj, socijalnu anksioznost i PTSP (108). Ukupni rezultat je u rasponu od 0 do 21 te postoje predložene prijelazne vrijednosti (engl. *cut-off point*) koje rezultat dijele u kategorije s obzirom na težinu simptoma anksioznosti. Prijelazne vrijednosti su na razinama 5, 10 i 15 čime se stvaraju kategorije blagih, umjerenih i teških razina simptoma anksioznosti (119).

4.3.3. Subjektivna sreća

Za procjenu subjektivne razine sreće, koristili smo engl. *The Subjective Happiness Scale* (SHS). Radi se o validiranoj psihološkoj skali koja se sastoji od četiri pitanja na koja se odgovara na Likertovoj ljestvici. Ukupni rezultat je u rasponu od 4 do 28, pri čemu viši broj podrazumijeva više razine subjektivne sreće (120). Budući da nije postojao hrvatski prijevod skale, tim prevoditelja preveo je skalu koristeći metodu povratnog prevođenja (engl. *back-translation method*) koju je predložilo nekoliko autora (120,121,121–128). U prvom su koraku dva zdravstvena stručnjaka svaki zasebno preveli skalu na hrvatski jezik. Nakon toga, raspravili su

o prijevodima i dogovorili se oko jedne verzije prijevoda. Nakon toga uslijedilo je povratno prevođenje na engleski jezik. Usporedbom izvornika i povratnog prijevoda nisu nađene značajne razlike u značenju, već samo male stilističke razlike zbog čega je prijevod ocijenjen kao uspješan i prikladan za upotrebu.

4.3.4. Karakterne osobine

Za analizu karakternih osobina korišten je upitnik engl. *IPIP Big-5 questionnaire*. Upitnik ima inačice s 50 i 100 pitanja na koja se odgovara na Likertovoj ljestvici u ovisnosti koliko se tvrdnja snažno odnosi na ispitanika (129). U ovom je radu korišten upitnik od 50 pitanja, od čega se deset pitanja bavi svakim od pet faktora u sklopu modela *Big Five*: ekstroverzija, ugodnost, emocionalna stabilnost, savjesnost i intelekt (41,130–132). Također treba napomenuti da korištena skala koristi varijablu „emocionalna stabilnost“ koja je suprotna varijabli „neuroticizam“, kao i varijablu „intelekt“ koja je sinonimna varijabli „otvorenost iskustvu“ koji se učestalije koristi u sličnim skalama (133–136). Hrvatski je prijevod prethodno učinjen, validiran i korišten u sličnim istraživanjima te je pokazao dobra psihometrijska obilježja (130,131,137). Izvorni je upitnik imao vrijednosti Cronbach alpha 0,87 za ekstroverziju, 0,82 za ugodnost, 0,79 za savjesnost, 0,86 za emocionalnu stabilnost i 0,84 za intelekt; hrvatska je inačica imala slične vrijednosti 0,87 za ekstroverziju, 0,79 za ugodnost, 0,81 za savjesnost, 0,88 za emocionalnu stabilnost i 0,79 za intelekt (130).

4.3.5. Jutarnjost

Za analizu osobina cirkadijanog ritma, odnosno varijable „jutarnjosti“ (engl. *morningness*), korišten je upitnik rMEQ (engl. *Reduced Morningness-Eveningness Questionnaire).* Izvorni su upitnik razvili Horne i Östberg te se radi o najupotrebljivanijem instrumentu za procjenjivanje jutarnjosti (138). Adan i Almirall napravile su reduciranu verziju izvorne skale koja se sastoji od pet pitanja (139). Reducirana je skala pokazala korelaciju s izvornom skalom koja je bila u rasponu od zadovoljavajuće do odlične (0,69–0,90) (140). Rezultat reducirane skale u rasponu

je od 4 do 25, pri čemu više vrijednosti označavaju jaču jutarnju preferencu (139). U istraživanju su korištene prijelazne vrijednosti koju su preporučile autorice reducirane verzije pri čemu se ispitanici mogu podijeliti u tri cirkadijane kategorije: jutarnji tip, nijedan tip i večernji tip (139). U ovom smo istraživanju pitanja koja su uključena u rMEQ preuzeli iz hrvatskog prijevoda MEQ-a (127). Prevedeni je instrument prethodno korišten u sličnim istraživanjima (141).

4.3.6. Etnocentrizam

Etnocentrizam je procijenjen koristeći skalu *Revised Ethnocentrism Scale* (142). Skala se sastoji od 15 pitanja na koja ispitanici odgovaraju koliko se slažu s navedenim tvrdnjama na skali od jedan do pet, tako da se ukupan rezultat kreće u rasponu od 15 do 75. Veći broj podrazumijeva višu razinu etnocentrizma.

4.3.7. Introverzija

Razine introverzije ispitane su skalom *McCroskey introversion scale* (143). Skala se sastoji od 18 pitanja na koja ispitanici odgovaraju na Likertovoj ljestvici od jedan do pet u kojoj se mjeri slažu s navedenom tvrdnjom. Ukupan rezultat je u rasponu od 12 do 60. Rezultat 12 – 24 predstavlja izrazito ekstrovertirane osobe, rezultat 25 – 36 predstavlja umjereno esktrovertirane osobe, rezultat 37 – 48 predstavlja umjereno introvertirane osobe, a rezultat 49 – 60 predstavlja visoko introvertirane osobe (143).

4.4. Statističke metode

Brojčani podatci opisani su osnovnim mjerama sredine i raspršenja: medijanima i interkvartilnim rasponima za skalarne varijable koje nisu pokazale normalnu distribuciju, te srednjom vrijednosti ($\bar{x}$) i standardnom devijacijom za normalno distribuirane varijable. Normalnost raspodjele promatranih numeričkih varijabli testirana je Kolmogorov-Smirnovljevim i Shapiro-Wilkovim testovima (144). Premda je uvjet za primjenu

parametrijskih testova normalna distribucija podataka (145–148), zbog velikog broja ispitanika u skupinama, u Istraživanju 2 (2) korišteni su parametrijski testovi, neovisno o testovima normalnosti distribucije podataka, zbog toga što više autora navodi da u slučaju velikog broja ispitanika distribucija treba biti normalna, odnosno, da u slučaju uzorka većeg od 30 ili 40 ispitanika kršenje pretpostavke normalnosti distribucije neće izazvati probleme, odnosno, da je moguće raditi parametrijske testove čak i kada podatci nisu normalno distribuirani (149–151). Budući da su u objavljenom članku korišteni parametrijski testovi, da ne bi došlo do razlike u podatcima u disertaciji u odnosu na članak, podatci u disertaciji također će sadržavati rezultate dobivene parametrijskim testovima. Kategorijske varijable opisane su apsolutnim i relativnim frekvencijama. Za utvrđivanje razlika u mjerenim pokazateljima između dviju skupina upotrijebljeni su Mann-Whitneyev U-test za varijable koje nisu slijedile normalnu distribuciju te Studentov t-test za normalno distribuirane varijable. Za utvrđivanje razlika između tri i više skupina upotrijebljen je Kruskal-Wallisov test za varijable koje nisu slijedile normalnu distribuciju te jednosmjerna analiza varijance (ANOVA) za varijable koje su slijedile normalnu distribuciju. Analiza kovarijance korištena je za analizu promjene varijance u ovisnosti o kovarijancama. Multipla analiza kovarijance (MANCOVA) korištena je za analizu utjecaja više kovarijanci na ispitivane varijable. Parcijalna eta kvadrat (η_p^2) je korištena kao mjera snage učinka (engl. *effect size*) (152,153). Za utvrđivanje razlika među udjelima između nezavisnih uzoraka upotrijebljen je χ^2 - test i Fisherov egzaktni test. Za ocjenu povezanosti pojedinih pokazatelja korišten je Spearmanov koeficijent korelacije. Višestrukom linearnom regresijom (engl. *Stepwise Multiple Linear Regression Analysis*) ocijenjen je utjecaj više čimbenika na ispitivane varijable. Cronbachov alfa test korišten je za ocjenu nutarnje konzistencije psiholoških instrumenata. Za ocjenu značajnosti dobivenih rezultata odabrana je razina značajnosti $\alpha = 0.05$. Statistička obrada podataka napravljena je korištenjem program IBM SPSS Statistics (ver. 16.0, SPSS Inc., Chicago, IL, USA) (117,154).

5. Rezultati

5.1. Istraživanje 1 (1)

Istraživanje je obuhvatilo ukupno 562 studenta Medicinskog fakulteta Osijek (173 muška ispitanika). Odaziv (engl. *Response rate)* je bio 72,7 %. Medijan dobi ispitanika iznosio je 22 (20-24). Ispitanici su bili raspoređeni u dvije skupine, ovisno o studijskom programu. Prvu su skupinu sačinjavali studenti medicine [N = 407, medijana dobi 22 (20-23)], a drugu su skupinu sačinjavali studenti sestrinstva [N = 155, medijana dobi 22 (20-31)].

Cronbach alfa hrvatskog prijevoda SHS-a u ispitivanom uzorku iznosio je 0,818.

Medijani i interkvartilni rasponi skorova i razlike među grupama studenata prikazani su u tablici 5.1.1. Studenti sestrinstva pokazali su značajno više vrijednosti subjektivne sreće i savjesnosti te značajno niže vrijednosti rezultata na domeni intelekt te niže razine depresivnih simptoma u odnosu na studente medicine (Tablica 5.1.1).

Tablica 5.1.1. Medijani i interkvartilni rasponi (IQR) skorova studenata medicine i sestrinstva na skalama SHS (engl. *Subjective Happiness Scale*), na domenama *IPIP Big-5 questionnaire*, te na skalama PHQ-9 (engl. *The patient health questionnaire-9*) i GAD-7 (engl. *Generalized Anxiety Disorder-7*) i razlika između skupina (N = 562)

Varijabla	Medicina	Sestrinstvo	p-vrijednost*
	Medijan (IQR)		
Subjektivna sreća	18 (16-22)	19 (16-21)	0,018
PHQ-9	6 (4-10)	5 (3-8)	0,027
GAD-7	5 (3-8)	5 (3-8)	0,992
Ekstroverzija	33 (29-38)	34 (30-38)	0,343
Ugodnost	38 (34-42)	39 (35-42)	0,073
Savjesnost	36 (31-40)	37 (33-42)	<0,001
Emocionalna stabilnost	32 (27-37)	32 (29-36)	0,624
Intelekt	36 (33-41)	34 (32-39)	0,002

* Mann-Whitneyev test

Nisu pronađene statistički značajne razlike u samoizvještenom prosjeku ocjena na studiju (p = 0,067, Mann-Whitneyev test). Premda razlike nisu bile statistički značajne, studenti medicine imali su viši srednji prosjek ocjena: medijan 4 (4-4,45), studenti sestrinstva imali su medijan ocjena 4 (3,8-4,25).

Korelacije između ispitivanih numeričkih varijabla (dob, samoizvješteni prosjek ocjena, domene skale *IPIP Big-5 questionnaire*, razine depresije i anksioznosti) prikazane su u Tablici 5.1.2.

Značajne negativne korelacije uočene su između dobi i prosjeka (r = -0,218), depresije (r = -0,037) te domene intelekt (r = -0,101) te pozitivna korelacija između dobi i subjektivne sreće (r = 0,145, Tablica 5.1.2.).

Uočene su značajne pozitivne korelacije između prosjeka i ekstroverzije (r = 0,092), savjesnosti (r = 0,131) te domene intelekt (r = 0,101, Tablica 5.1.2.).

Uočene su značajne pozitivne korelacije simptoma depresije i anksioznosti (r = 0,729), savjesnosti (r = 0,226) te značajne negativne korelacije simptoma depresije i subjektivne sreće (r = -0,342), ekstroverzije (r = -0,184) te emocionalne stabilnosti (r = -0,568, Tablica 5.1.1.).

Uočene su značajne negativne korelacije simptoma anksioznosti i subjektivne sreće (r = -0,325), ekstroverzije (r = -0,187), savjesnosti (r = -0,139) te emocionalne stabilnosti (r = -0,604, Tablica 5.1.2.).

Uočene su značajne pozitivne korelacije subjektivne sreće i ekstroverzije (r = 0,215), savjesnosti (r = 0,139) te emocionalne stabilnosti (r = 0,384, Tablica 5.1.2.). Uočene su značajne pozitivne korelacije domene ekstroverzija te ugodnost (r = 0,239), savjesnost (r = 0,144), emocionalna stabilnost (r = 0,243) te intelekt (r = 0,308, Tablica 4.1.2.). Uočene su značajne pozitivne korelacije domene ugodnost i savjesnost (r = 0,271) te intelekt (r = 0,353, Tablica 5.1.1.).

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Uočene su značajne pozitivne korelacije domene savjesnost i emocionalna stabilnost (r = 0,290) te intelekt (r = 0,219, Tablica 5.1.2.).

Tablica 5.1.2. Korelacije (Spearmanov ro) dobi, prosjeka, rezultata na skalama engl. *Subjective Happiness Scale* (SHS), domenama *IPIP Big-5 questionnaire*, PHQ-9 (engl. *The Patient Health Questionnaire-9*) i GAD-7 (engl. *Generalized Anxiety Disorder-7*, N = 562).

	Prosjek	PHQ-9	GAD-7	SHS	Ekstro-verzija	Ugodnost	Savjesnost	Stabilnost	Intelekt
Dob	-0,218**	-0,037*	0,044	0,145*	0,017	-0,081	0,032	0,024	-0,101*
Prosjek		-0,072	-0,047	-0,003	0,092*	0,033	0,1307*	0,009	0,101*
PHQ-9			0,729**	-0,342**	-0,184**	-0,024	0,226**	-0,568**	0,034
GAD-7				-0,325**	-0,187**	-0,006	-0,139*	-0,604**	0,007
SHS					0,215**	0,030	0,139*	0,384**	0,068
Ekstro-verzija						0,239**	0,144*	0,243**	0,308**
Ugodnost							0,271**	0,066	0,353**
Savjesnost								0,290**	0,219**
Stabilnost									0.090

*p<0,05, Spearmanov ro
**p<0,01, Spearmanov ro

Razlike u ispitivanim skalarnim varijablama u ovisnosti o spolu prikazane su u Tablici 5.1.3. Ispitanice su imale statistički značajno više rezultate na skali domene ugodnosti (p<0,001), anksioznosti (p = 0,022) te značajno niže rezultate na skali domene ekstroverzije (p = 0,040), emocionalne stabilnosti (p<0,001) i intelekta (p = 0,021) u odnosu na ispitanike (Mann-Whitneyev test, Tablica 5.1.3).

Budući da se rezultati skala GAD-7 i PHQ-9 mogu podijeliti u kategorije na temelju prethodno definiranih prijelaznih vrijednosti, frekvencije tih kategorija prikazane su u Tablici 5.1.4.

Ukupno 54 % studenata medicine i 55,7 % studenata sestrinstva pokazalo je barem blage simptome anksioznosti (Tablici 5.1.4). Ukupno 64,8 % studenata medicine i 57,3 % studenata sestrinstva pokazalo je barem blage simptome depresije (Tablici 5.1.4). Ukupno 2 % studenata pokazalo je teške simptome anksioznosti, a 1 % studenata pokazalo je teške simptome depresije (Tablici 5.1.4).

Tablica 5.1.3. Medijani i interkvartilni rasponi (IQR) prosjeka ocjena, rezultata na skalama SHS (engl. *Subjective Happiness Scale*), PHQ-9 (engl. *The Patient Health Questionnaire-9*) i GAD-7 (engl. *Generalized Anxiety Disorder-7*) te domena *IPIP Big-5 questionnaire* te razlike između spolova (N = 562).

Varijabla	Muško	Žensko	Svi studenti	p-vrijednost*
	Medijan (IQR)			
Prosjek	4 (3,9-4,5)	4 (4-4,37)	4 (3,9-4,4)	0,310
Subjektivna sreća	18 (16-20)	16 (16-20)	18 (16-20)	0,920
PHQ-9	6 (3-9,5)	6 (4-10)	6 (3-10)	0,249
GAD-7	4 (2-8)	5 (3-8)	5 (3-8)	0,022
Ekstroverzija	34 (30-39)	33 (29-37)	33 (29-38)	0,040
Ugodnost	37 (31,5-40)	39 (35-42,5)	38 (34-42)	<0,001
Savjesnost	36 (31-41)	37 (32-41)	36 (32-41)	0,377
Emocionalna stabilnost	34 (29-39)	32 (28-36)	32 (28-37)	<0,001
Intelekt	37 (33-41)	35 (32-40)	36 (32-40)	0,021

*Mann-Whitneyev test

Tablica 5.1.4. Frekvencije i postotci kategorija razina depresivnih i anksioznih simptoma prema skalama GAD-7 (engl. *Generalized Anxiety Disorder-7*) and PHQ-9 (engl. *The Patient Health Questionnaire-9*). Skupine su podijeljene prema spolu i studijskom programu – medicina i sestrinstvo (N = 562).

		N (%)				
		Muško	Žensko	Medicina	Sestrinstvo	Ukupno
GAD-7	Niska anksioznost	88 (52,4)	157 (42,4)	179 (46)	66 (44,3)	245 (45,5)
	Blaga anksioznost	58 (34,5)	156 (42,2)	152 (39,1)	62 (41,6)	214 (39,8)
	Umjerena anksioznost	21 (12,5)	47 (12,7)	49 (12,6)	19 (12,8)	68 (12,6)
	Teška anksioznost	1 (0,6)	10 (2,7)	9 (2,3)	2 (1,3)	11 (2)
PHQ-9	Niske razine depresivnih simptoma	70 (41,4)	133 (35,4)	139 (35,2)	64 (42,7)	203 (37,2)
	Blage razine depresivnih simptoma	60 (35,5)	154 (41)	158 (40)	56 (37,3)	214 (39,3)
	Umjerene razine depresivnih simptoma	30 (17,8)	58 (15,4)	67 (17)	21 (14)	88 (16,1)
	Umjereno teške razine depresivnih simptoma	9 (5,3)	30 (8)	31 (7,8)	8 (5,3)	39 (7,2)
	Teške razine depresivnih simptoma	0	1 (0,3)	0	1 (0,7)	1 (0,2)

5.2. Istraživanje 2 (2)

Istraživanje je obuhvatilo ukupno 712 studenata Medicinskog fakulteta Osijek (201 muška ispitanika). Odaziv je bio 75,43 %. Prosječna dob ispitanika bila je 22,93±5,88. Ispitanici su bili podijeljeni u tri skupine, ovisno o studijskom programu. Prvu su skupinu sačinjavali studenti medicine (N = 407, srednje dobi 21,63±2,06), drugu su skupinu sačinjavali studenti sestrinstva (N = 155, srednje dobi 26,79±8,94), a treću su skupinu činili studenti medicinsko-laboratorijske dijagnostike (MLD, N = 150, srednje dobi 22,53±7,17).

Cronbach alfa skale rMEQ u ispitivanom uzorku iznosio je 0,638. Više podataka o pouzdanosti skale prisutno je u radu priloženom ovoj disertaciji (2). Razlike u dobi, jutarnjosti i rezultatima na domenama *IPIP Big-5 questionnaire* između skupina studenata s obzirom na studijski program prikazane su u Tablici 4.2.1. Uočena je statistički značajna razlika u dobi između grupa (p<0,001, ANOVA, F (2) = 49,23, η^2 = 0,12, Tablica 5.2.1.). Studenti sestrinstva bili su značajno stariji od studenata medicine (p<0,001, t-test, t (558) = 10,93, Cohenov d = 1,04) i medicinsko-laboratorijske dijagnostike (p<0,001, t-test, t (301) = 4,56, Cohenov d = 0,53, Tablica 5.2.1.). Studenti MLD-a bili su značajno stariji od studenata medicine (p<0,001, t-test, t (555) = 2,29, Cohenov d = 0,22, Tablica 5.2.1.).

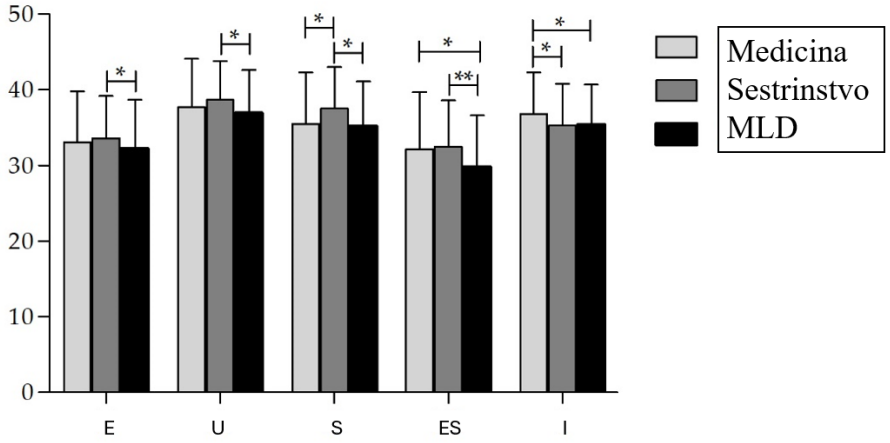
Studenti sestrinstva imali su značajno više rezultate na skali rMEQ u odnosu na studente medicine (p = 0,001, t-test, t (560) = 3,45, Cohenov d = 0,33) i medicinsko-laboratorijske dijagnostike (p<0,001, t-test, t (303) = 5,24, Cohenov d = 0,60), a studenti medicine imali su više rezultate u odnosu na studente medicinsko-laboratorijske dijagnostike (p = 0,023, t-test, t (555) = 2,28, Cohenov d = 0,22).

Tablica 5.2.1. Sredine i standardne devijacije (SD) reduciranog *Morningness-Eveningness questionnaire* (rMEQ) i domena skale *IPIP 50 Big-Five Questionnaire* te razlike između skupina s obzirom na studijski program [(studij medicine, sestrinstva i medicinsko-laboratorijske dijagnostike (MLD)] (N = 712).

Varijabla	Medicina	Sestrinstvo	MLD	Svi studenti	ANOVA*		
	n = 407	n = 155	n = 150				
	Sredina ± SD				F	p-vrijednost	η^2
Dob	21,63 ± 2,1	26,79 ± 8,94	22,53 ± 7,17	22,93 ± 5,88	49,23	<0,001	0,12
rMEQ	13,23 ± 4,1	14,47 ± 3,13	12,35 ± 3,89	13,32 ± 3,89	11,84	<0,001	0,03
Ekstroverzija	33,14 ± 6,69	33,62 ± 5,56	32,15 ± 6,52	33,04 ± 6,44	2,12	0,121	0,01
Ugodnost	37,66 ± 6,35	38,68 ± 5,12	36,93 ± 5,72	37,73 ± 5,99	3,32	0,037	0,01
Savjesnost	35,49 ± 6,75	37,53 ± 5,49	35,24 ± 5,88	35,89 ± 6,37	6,78	0,001	0,02
Emocionalna stabilnost	32,16 ± 7,49	32,45 ± 6,06	29,81 ± 6,83	31,73 ± 7,13	7,09	0,001	0,02
Intelekt	36,84 ± 5,46	35,27 ± 5,49	35,39 ± 5,28	36,19 ± 5,47	6,77	0,001	0,02

*Jednosmjerna (engl. *One-way*) ANOVA df 2, 711.

Studenti medicine imali su značajno niže rezultate savjesnosti u odnosu na studente sestrinstva (p = 0,001, t-test, t (560) = 3,35, Cohenov d = 0,32), ali više rezultate intelekta (p = 0,002, t-test, t (560) = 3,05, Cohenov d = 0,29). Studenti medicine imali su više rezultate intelekta (p = 0,005, t-test, t (555) = 2,79, Cohenov d = 0,27) i emocionalne stabilnosti u odnosu na studente MLD-a (p = 0,001, t-test, t (555) = 3,36, Cohenov d = 0,32). Studenti sestrinstva imali su značajno više rezultate ekstroverzije (p = 0,035, t-test, t (303) = 2,12, Cohenov d = 0,24), ugodnosti (p = 0,005, t-test, t (303) = 2,81, Cohenov d = 0,32), savjesnosti (p = 0,001, t-test, t (303) = 3,51, Cohenov d = 0,40) i emocionalne stabilnosti (p<0,001, t-test, t (303) = 3,57, Cohenov d = 0.41) u odnosu na studente MLD-a (Slika 5.2.1). Detaljniji rezultati o razlikama u domenama karaktera između skupina ispitanika u ovisnosti o studijskom programu navedeni su u radu priloženom doktorskoj disertaciji (2). Ukupno 86 studenata pokazalo je jutarnju cirkadijanu preferencu (12,1 %), 406 nije pokazalo nijednu preferencu (57,2 %), dok ih je 218 pokazalo večernju preferencu (30,7 %).



Slika 5.2.1. Dimenzije karaktera prema *IPIP Big-Five* (sredina ± Standardna devijacija) u ovisnosti o studijskom programu. E – ekstroverzija; U – ugodnost; S – savjesnost; ES - emocionalna stabilnost; I – intelekt; MLD – medicinsko-laboratorijska dijagnostika; t-test, **p*<0,05; ***p*<0,001 (N = 712).

Distribucija cirkadijane preference mjerene skalom rMEQ ovisno o studijskom programu prikazana je u Tablici 5.2.4. Uočena je statistički značajna razlika u cirkadijanoj preferenci kad se kontrolira dob ($F_{(2,706)}$ = 7,210; *p*<0,001; η_p^2 = 0,02, ANCOVA). *Post-hoc* usporedba cirkadijane preference s obzirom na studijski program pokazala je da su studenti MLD-a imali značajno niže rezultate kad se usporede sa studentima medicine (-0,96, *p* = 0,025) i sestrinstva (-1,69, *p* = 0,001). Nije bilo značajne razlike u cirkadijanoj preferenci između studenata sestrinstva i medicine (-0,73, *p* = 0,176).

Tablica 5.2.4. Frekvencije i postotci te srednja vrijednost ($\bar{x}$) i standarna devijacija (SD) jutarnjosti prema rezultatima skale rMEQ (engl. *reduced Morningness-Eveningness questionnaire*) te podjela s obzirom na studijski program (N = 712).

	Jutarnji tip		**Nijedan tip**		**Večernji tip**	
	n (%)	$\bar{x}$ ± SD	n (%)	$\bar{x}$ ± SD	n (%)	$\bar{x}$ ± SD
Medicina (n = 406)	48 (11,8)	20,1 ± 3,4	223 (54,9)	14,5 ± 1,1	135 (33,3)	8,9 ± 1,8
Sestrinstvo (n = 155)	26 (16,8)	19,6 ± 1,7	104 (67,1)	14,4 ± 1,1	25 (16,1)	10,2 ± 0,9
MLD (n = 149)	12 (8,1)	19,4 ± 0,8	79 (53)	14,3 ± 1,2	58 (38,9)	8,4 ± 2,0

MLD – medicinsko-laboratorijska dijagnostika

Razlike s obzirom na spol prikazane su u tablicama u dodatku članka u privitku ove disertacije (2). Nije bilo statistički značajne razlike u rezultatu rMEQ-a s obzirom na spol (t (710) = 0,30, p = 0,764, t-test). Ispitanici su imali niže vrijednosti ugodnosti u skupini onih s večernjom cirkadijanom preferencom, dok razlike u drugim skupinama cirkadijane preference nisu bile značajne.

Tablica 5.2.5. prikazuje korelacije između rezultata skala rMEQ i domena skale *IPIP Big-Five*. Cirkadijana preferenca pozitivno je korelirala sa savjesnosti (r = 0,232, p<0,01, Pearsonov r) i emocionalnom stabilnosti (r = 0,133, p<0,01, Pearsonov r).

Tablica 5.2.5. Korelacije (Pearsonov r) dobi, rezultat skala rMEQ (engl. *reduced Morningness-Eveningness*) i domena skale *IPIP 50 Big-Five questionnaire* (N = 712).

	rMEQ	Ekstroverzija	Ugodnost	Savjesnost	Emocionalna stabilnost	Intelekt
Dob	0,178*	-0,032	-0,040	0,022	-0,006	-0,179*
rMEQ		-0,033	0,012	0,232*	0,133*	-0,031
Ekstroverzija			0,265*	0,160*	0,237*	0,289*
Ugodnost				0,317*	0,012	0,308*
Savjesnost					0,280*	0,224*
Emocionalna stabilnost						0,067

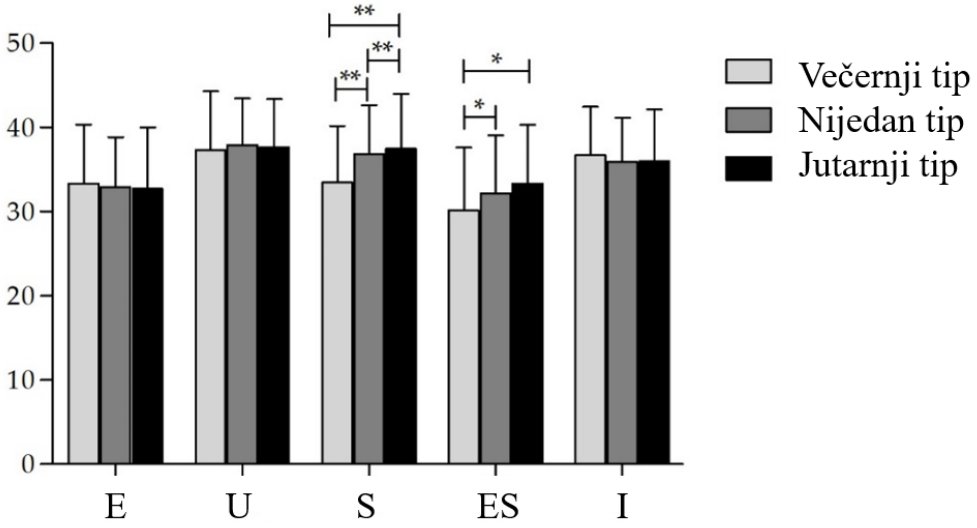
*p<0,01; Pearsonov r.

Tablica 5.2.6. pokazuje deskriptivnu statistiku rezultata domena skale *IPIP 50 Big-Five questionnaire* podijeljeno na skupine s obzirom na cirkadijanu preferencu. Slika 5.2.2. pokazuje razlike u rezultatima domena skale *IPIP 50 Big-Five questionnaire* s obzirom na cirkadijanu preferencu. Skupine s obzirom na cirkadijanu preferencu mjerenu skalom rMEQ značajno su se razlikovala s obzirom na savjesnost ($F_{(2,706)}$ = 24,573; p<0,0001; η_p^2 = 0,065, ANCOVA) i emocionalnu stabilnost ($F_{(2,706)}$ = 8,703; p<0,0001; η_p^2 = 0,024, ANCOVA). Post-hoc analiza između skupina cirkadijane preference pokazala je da su večernji tipovi imali niže razine savjesnosti u odnosu s onima nijednoga tipa cirkadijane preference (−3,42, p<0,0001) i jutarnjih tipova (−4,04, p<0,0001). Večernji su tipovi također imali značajno niže razine emocionalne stabilnosti u usporedbi s nijednim tipom (−2,06, p = 0,002) i jutarnjim tipom (−3,29, p = 0,001).

Tablica 5.2.6. Srednja vrijednost i standardna devijacija (SD) rezultata domena skale *IPIP 50 Big-Five questionnaire* podijeljeno na skupine s obzirom na cirkadijanu preferencu mjereno skalom rMEQ (engl. r*educed Morningness-Eveningness*) (N = 712).

IPIP 50	**rMEQ**			**ANOVA***		
	Jutarnji tip n = 86	Nijedan tip n = 406	Večernji tip n = 218	F	p-vrijednost	η^2
Ekstroverzija	32,7 ± 7,3	32,9 ± 5,9	33,4 ± 6,9	0,44	0,643	<0,01
Ugodnost	37,7 ± 5,7	37,9 ± 5,5	37,4 ± 6,9	0,67	0,499	<0,01
Savjesnost	37,4 ± 6,5	36,8 ± 5,8	33,5 ± 6,7	24,39	<0,001	0,06
Emocionalna stabilnost	33,4 ± 6,9	32,2 ± 6,9	30,2 ± 7,5	8,31	<0,001	0,02
Intelekt	36,0 ± 6,1	35,9 ± 5,2	36,7 ± 5,7	1,42	0,241	<0,01

*jednosmjerna (engl. *one-way*) ANOVA df 2, 711.



Slika 5.2.2. Rezultati domena skale *IPIP Big-Five* (sredina ± standardna devijacija) s obzirom na pripadnost skupini cirkadijane preference mjerene skalom rMEQ. E – ekstroverzija; U – ugodnost; S – savjesnost; ES – emocionalna stabilnost; I – intelekt; *p<0,005; **p<0,001 (N = 712).

5.3. Istraživanje 3 (3)

Istraživanje je obuhvatilo ukupno 407 studenata medicine Medicinskog fakulteta Osijek (150 muških ispitanika). Odaziv je bio 81,89 %. Medijan dobi ispitanika bio je je 22 (20-23).

Među studentima, 34,7 % se izjasnilo da preferiraju kirurške specijalizacije, 32,7 % da preferiraju internu medicine, 12 % javno zdravstvo, 8 % anesteziologiju i hitnu medicine,

7,3 % dijagnostičke specijalizacije i 5,3 % psihijatrijske specijalizacije. Među studenticama, 52,9% se izjasnilo da preferiraju internu medicinu, 21,8 % kirurške specijalizacije, 8,2 % psihijatrijske specijalizacije, 7,8 % dijagnostičke specijalizacije, 5,4 % anesteziologiju i hitnu medicinu te 3,9 % javno zdravstvo.

Tablice 2 i 3 u članku u privitku ove disertacije prikazuju frekvencije studenata s obzirom na preferiranu specijalizaciju ili skupinu specijalizacija te njihove prosjeke ocjena (4). Postojale su statistički značajne razlike u preferenci skupina specijalizacija (Pearsonov hi-kvadrat = 25,579, df = 5, p<0,001) i pojedinih specijalizacija (Pearsonov hi-kvadrat = 79,965, df = 39, p<0,001) među spolovima. Nije postojala razlika u domenama ekstroverzije (Kruskal-Wallisov tTest, p = 0,489), ugodnosti (Kruskal-Wallisov test, p = 0,239), savjesnosti (Kruskal-Wallisov test, p = 0,367) i emocionalne stabilnosti (Kruskal-Wallisov test, p = 0,245) *IPIP Big-Five questionnairea* s obzirom na skupinu specijalizacija koju studenti preferiraju. Uočena je statistički značajna razlika u domeni intelekta (Kruskal-Wallisov test, p = 0,002). Medijani rezultata na skali *IPIP Big-Five questionnaire* i prosjeka ocjena te razlike među spolovima prikazani su u tablici 4.3.1.

Tablica 5.3.1. Medijani i interkvartilni rasponi (IQR) rezultata domena *IPIP Big-Five questionnairea* i prosjeka ocjena te razlike s obzirom na spol (N = 407).

Varijabla	Muški Medijan (IQR)	Ženski	Ukupno	p-vrijednost*
Ekstroverzija	33 (30-39)	33 (28-37,5)	33 (29-38)	0,104
Ugodnost	36 (31-40)	39 (35-43)	38 (34-42)	<0,001
Savjesnost	35 (31-40,25)	36 (31-40)	36 (31-40)	0,832
Emocionalna stabilnost	34 (28,75-37,5)	31 (27-36)	32 (27-37)	<0,001
Intelekt	37 (33-41)	36 (33-41)	36 (33-41)	0,458
Prosjek ocjena	4 (3,9-4.5)	4 (4-4,4)	4 (4-4,45)	0,753

*Mann-Whitneyev test

MANCOVA test je pokazao razlike u domeni intelekta *IPIP Big-Five questionnaire* s obzirom na preferencije specijalizacija ($F_{(5,394)}$ = 3,78; p = 0,002; η_p^2 = 0,046), pri čemu su najviše vrijednosti pokazali studenti koji su preferirali psihijatriju, a najniže oni koji su preferirali javno zdravstvo (Tablica 5.3.2).

Tablica 5.3.2. Medijani i interkvartilni rasponi (IQR) rezultata domena *IPIP Big-Five questionnairea* s obzirom na preference specijalizacije (N = 407).

Skupina specijalizacije	Ekstro-verzija	Ugodnost	Savjesnost	Emocionalna stabilnost	Intelekt
Kirurgija	34 (29-39)	37 (33-41)	36 (21-41)	33 (28-38)	37 (34-41)
Interna medicina	33 (29-37)	38 (34-42)	36 (32-40)	31 (37-36)	36 (33-41)
Javno zdravstvo	33 (30-36)	37 (33-41)	34 (29-39)	32 (26-38)	34 (30-37)
Psihijatrija	33 (26-40)	40 (37-43)	36 (32-40)	32 (24-40)	39 (35-45)
Anesteziologija i hitna medicina	33 (28-38)	38 (34-42)	38 (32-44)	32 (27-37)	37 (34-41)
Dijagnostika	35 (30-40)	39 (36-42)	37 (32-42)	33 (29-37)	38 (33-40)

5.4. Istraživanje 4 (4)

Istraživanje je obuhvatilo ukupno 124 studenta šeste godine integriranog preddiplomskog i diplomskog studija medicine Medicinskog fakulteta Osijek (34 muških ispitanika). Odaziv je bio 96 %. Srednja dob ispitanika bila je je 24,14 ± 1,074. Akademske godine 2014./2015. ispitan je 61 ispitanik, a akademske godine 2015./2016. ispitano ih je 63.

Većina ispitivanih studenata navela je da preferira karijeru u kliničkoj medicini. Najpopularnije specijalizacije bile su pedijatrija i interna medicina koje je preferiralo 11 % studenata svaku. Tendenciju za emigracijom nakon diplome izrazio je 31 (25 %) student, dok ih je 29 (24 %) izrazilo tendenciju za emigracijom nakon specijalizacije. Više podataka o sklonosti emigraciji prikazano je u tablici 2 u članku u privitku ove disertacije u kojoj su uspoređeni studenti dviju ispitivanih generacija s obzirom na sklonost emigraciji (4).

U ispitivanom uzorku, studenti koji su preferirali endokrinologiju i psihijatriju imali su najviše medijane na pitanjima vezanim uz sklonost emigraciji. Više podataka o sklonosti emigraciji s obzirom na preferenciju specijalizacije vidljivo je u tablici 3 u članku u privitku ove disertacije (4). Srednja vrijednost rezultata (SD) etnocentrizma bila je 32,58 (6,129), a medijan (IQR)

rezultata na skali introverzije bio je 41 (36-44). Više vrijednosti etnocentrizma bile su povezane s nižom sklonosti za emigracijom (Tablica 5.4.1).

Tablica 5.4.1. Korelacije prosjeka, introverzije i etnocentrizma te sklonost emigraciji nakon diplome i nakon specijalizacije (N = 124)

	Diploma	Specijalizacija	Introverzija	Etnocentrizam
Prosjek	0,007	-0,037	0,004	0,070
Diploma		0,686**	0,108	-0,135
Specijalizacija			0,061	-0,191*
Introverzija				0,161

*p<0,05, Spearmanov ro
**p<0,01, Spearmanov ro

5.5. Istraživanje 5 (5)

Istraživanje je obuhvatilo 2137 studenata (237 muških ispitanika). Odaziv je bio 29 %. Medijan dobi ispitanika bio je 22 (20-26). Sociodemografski pokazatelji ispitivanog uzorka prikazani su u Tablici 1 u članku u privitku ove disertacije (5). Većina ispitanika bile su žene (86,3 %). Medijan dobi ispitanika bio je 22 (20-26). Većina ispitanika studirala je sestrinstvo. Suicidalne ili autodestruktivne ideacije bile su prisutne kod 414 (19,4 %) studenata. Medijani rezultata bili su: GAD-7 7 (4-12), PHQ-9 8 (4-13), SHS 19 (15,25-22) i prosjek ocjena 4 (4-4). Nije bilo značajne razlike u prosjeku ocjena s obzirom na spol (p = 0,064, Mann-Whitneyev test). Razlike u rezultatima na skalama PHQ-9, GAD-7 i SHS s obzirom na različite nezavisne varijable prikazane su u tablici 2 u članku u privitku ove disertacije (5). Uočene su statistički značajne razlike u razinama depresije u ovisnosti o spolu, tome jesu li student radili puno radno vrijeme ili na dio radnog vremena, godini studija, zaposlenosti, samoizvještenom financijskom stanju, prosječnom mjesečnom dohotku i prethodnom padu godine. Uočene su statistički značajne razlike u razinama anksioznosti u ovisnosti o spolu, godini studija, zaposlenosti,

samoizvještenom financijskom stanju, prosječnom mjesečnom dohotku i prethodnom padu godine. Uočene su statistički značajne razlike u razinama subjektivne sreće u ovisnosti o tome jesu li studenti radili puno radno vrijeme ili na dio radnog vremena, godini studija, zaposlenosti, samoizvještenom financijskom stanju, prosječnom mjesečnom dohotku i prethodnom padu godine. Postojala je snažna pozitivna korelacija depresije i anksioznosti (ro = 0,826, p<0,001), a te su varijable imale jaku negativnu korelaciju sa subjektivnom srećom (depresija: ro = -0,600, p<0,001; anksioznost, ro = -0,556, p<0,001). Dob je negativno korelirala s depresijom (-0,145, p<0,001) i anksioznošću (ro = -0,091, p<0,001) i pozitivno sa subjektivnom srećom (ro = 0,083, p<0,001). Tablica 5.5.1 prikazuje frekvencije studenata u kategorijama s obzirom na stupanj izraženosti simptoma depresije i anksioznosti. Studenti su imali više frekvencije niske i blage anksioznosti, dok su studentice imale više frekvencije umjerene i teške anksioznosti. Studenti su imali više frekvencije niskih simptoma depresije, dok su studentice imale više frekvencije blagih, umjerenih, umjereno teških i teških simptoma depresije.

Tablica 5.5.1. Frekvencije i postotci kategorija simptoma anksioznosti i depresije mjerenih skalama GAD-7 (engl. *Generalized Anxiety Disorder-7*) i PHQ-9 (engl. *The patient health questionnaire-9*) i razlike među spolovima (N = 2138).

		n (%)			p (hi kvadrat)
		Muški	Ženski	Ukupno	<0,001
GAD-7	Niska anksioznost	81 (32,5)	398 (22,4)	484 (23,6)	
	Blaga anksioznost	103 (41,4)	646 (36,3)	752 (36,8)	
	Umjerena anksioznost	41 (16,5)	445 (25,0)	488 (23,9)	
	Teška anksioznost	24 (9,6)	291 (16,3)	324 (15,8)	
PHQ-9	Niske razine simptoma depresije	189 (69,2)	1056 (57,2)	1253 (58,6)	0,003
	Blage razine simptoma depresije	42 (15,4)	383 (20,8)	427 (20,0)	
	Umjerene razine simptoma depresije	26 (9,5)	216 (11,7)	246 (11,5)	
	Umjereno teške razine simptoma depresije	15 (5,5)	152 (8,2)	172 (8,0)	
	Teške razine simptoma depresije	1 (0,4)	38 (2,1)	39 (1,8)	

Rezultati regresijske analize za rezultate skala PHQ-9, GAD-7 i SHS prikazani su u članku u privitku ove disertacije (5).

6. Rasprava

Istraživanja provedena u okviru ove disertacije pružaju uvid u mentalno zdravlje studenata medicine i zdravstvenih studija, što je značajno s obzirom na važnost te populacije za održavanje zdravstvenog sustava i s obzirom na osjetljivost te populacije. Rizik od psihijatrijske bolesti u studentskoj populaciji povećava se s razinom stresa (155). Zbog ograničenog prostora za raspravu, u ovom će poglavlju biti raspravljeni samo najznačajniji rezultati, a detaljnija rasprava prisutna je u odgovarajućim poglavljima članaka u privitku ove disertacije (1–5).

U prvom istraživanju provedenom 2016. godine na studentima Medicinskog fakulteta Osijek pronašli smo zabrinjavajuće podatke o tome da je 54,5 % svih studenata pokazivalo simptome anksioznosti. Ta je prevalencija viša od one zabilježene u literaturi, kako za studente medicine (44 %), tako i za studente drugih studija (52 %) (156,157). Prevalencija kod studenata bila je niža u odnosu na studentice, što je u skladu s podatcima iz literature (158). U istraživanju je ukupno 62,8 % studenata pokazivalo simptome depresije. Ova je prevalencija značajno viša od one u literaturi, kako za studente medicine (43 %), tako i za studente drugih studija (48,2 %) (159,160). Prevalencija simptoma depresije u našem je uzorku bila viša kod studenata medicine (64,8 %), u odnosu na studente sestrinstva (57,3 %). U našem je uzorku dob pozitivno korelirala sa subjektivnom srećom, što je u skladu s podatcima iz literature iz kojih je vidljivo da stariji pojedinci izvještavaju o većem životnom zadovoljstvu i kvaliteti života (161), premda podatci nisu jednolični te drugi istraživači govore o padu životnog zadovoljstva s dobi koji slijedi U-krivulju (162). U našem je istraživanju subjektivna sreća snažno korelirala s emotivnom stabilnosti i ekstroverzijom što je u skladu s literarnim podatcima (163–165). Kao što se moglo očekivati, subjektivna je sreća negativno korelirala s razinama depresije i anksioznosti. Razine depresije i anksioznosti negativno su korelirale s emocionalnom stabilnosti i ekstroverzijom. To je u skladu s literaturom zato što su simptomi depresije i anksioznosti povezani s visokim razinama neuroticiteta i niskim razinama ekstroverzije (44). Razine savjesnosti pozitivno su

korelirale s razinama depresije i negativno s razinama anksioznosti. U literaturi se može naći korelacija niskih razina savjesnosti s razinama depresije i anksioznosti (44).

Studenti sestrinstva imali su više razine subjektivne sreće, savjesnosti te niže razine na domeni intelekta i depresivnosti u odnosu na studente medicine. Čimbenik koji bi mogao utjecati na taj nesrazmjer razlika je u dobi ispitanika zato što su u ispitivanom uzorku studenti sestrinstva bili značajno stariji, a prethodno je rečeno da dob korelira sa subjektivnom srećom.

Više razine savjesnosti koje su zapažene kod studenata sestrinstva također mogu doprinijeti višim razinama subjektivne sreće. Niže razine subjektivne sreće djelomično se mogu pripisati zahtjevnosti akademskog programa zato što na blagostanje studenata utječe medicinska naobrazba i njihovo zadovoljstvo životom se smanjuje tijekom edukacije (80). Ipak, nema dokaza da studenti medicine imaju više simptoma depresije i anksioznosti (160), premda imaju više razine psihološkog distresa u odnosu na opću populaciju (166). Povišene razine stresa i smanjenje zadovoljstva životom zabilježeni su i kod studenata sestrinstva (167–169).

S obzirom na zabrinjavajuće rezultate prethodno navedenog istraživanja iz 2016., studija je ponovljena 2023. godine na većem uzorku studenata zdravstvenih studija. Kao i u prošloj studiji, studentice su pokazale više razine depresivnosti i anksioznosti u odnosu na studente. Suicidalne ili autodestruktivne ideacije bile su prisutne kod 19,4 % studenata. Studenti nižih godina pokazali su više razine anksioznosti, depresije i niže razine subjektivne sreće. Studenti s nižim samoprocijenjenim financijskim statusom imali su više razine depresivnosti i anksioznosti. Studenti koji su pali godinu također su imali više razine depresivnosti i anksioznosti. U odnosu na prvu studiju, u ponovljenoj smo studiji pronašli značajno više vrijednosti anksioznosti, budući da je u novijoj studiji 76,4 % studenata pokazalo barem blage simptome anksioznosti, u odnosu na 55,7 % u prvoj studiji. Razine depresije su u drugoj studiji bile niže nego u prvoj (41,4 % u odnosu na 57,3 %). Ipak, treba istaknuti da rezultati nisu u

potpunosti usporedivi zato što su u novije istraživanje bili uključeni studenti više sveučilišta i studijskih programa te je više čimbenika moglo dovesti do promjene u ispitivanim varijablama. Visoko obrazovanje stresno je razdoblje za mnoge studente zato što je to za mnoge razdoblje osamostaljivanja od roditelja te je često praćeno financijskim opterećenjem, dugim satima učenja i pritiskom članova obitelji (36). Pronašli smo povezanost lošijeg samoprocijenjenog financijskog statusa i viših razina depresije i anksioznosti. U literaturi je pronađena i povezanost boljeg financijskog statusa i viših razina sreće kod studenata sestrinstva (170).

Mnogi su studenti prisiljeni raditi na dio radnog vremena ili puno radno vrijeme da bi olakšali financijski teret visokog obrazovanja, a postotak studenata koji su zaposleni u pojedinim državama doseže 85 % (171,172). Zaposleni studenti imaju češće fizičke i mentalne probleme uslijed povećanog opsega posla, deprivacije sna i manjka socijalnog kontakta s dragim osobama (172–174). U ovom je radu pronađeno da su zaposleni studenti imali više razine depresije i anksioznosti i niže razine subjektivne sreće u usporedbi sa studentima koji su bili nezaposleni. Usporedbom zaposlenih studenata s obzirom na vrstu zaposlenja, uočeno je da studenti koji su zaposleni u struci imaju najniže razine depresije i anksioznosti u odnosu na studente koji su zaposleni izvan medicinske struke. Moguće je da rad u struci daje studentima osjećaj stabilnosti i kompetencija, što može voditi boljem mentalnom zdravlju. Rezultat da studenti nižih godina imaju više razine depresivnosti i anksioznosti može se tumačiti činjenicom da se studenti moraju naviknuti na nove obveze, a preddiplomski se studij također često smatra zahtjevnijim od diplomskih studija u Republici Hrvatskoj. S obzirom na činjenicu da istraživanja pokazuju da je sam studij glavni stresor za studente, u budućim bi istraživanjima trebalo više usporediti utjecaj težine studija na mentalno zdravlje (9). To je posebno važno s obzirom na činjenicu da istraživanja govore o prevalenciji sindroma izgaranja u populaciji studenata medicine u rasponu 70 – 95 % (30–32,175). Prevalencija depresije među studentima medicine je za 10 – 15 % viša nego u općoj populaciji (9). Premda su razine depresije visoke u populaciji studenata medicine

i više od onih u populaciji studenata zdravstvenih studija, ne postoje statistička značajna razlika u anksioznosti između ovih dviju skupina (1,27). Jedna je studija pokazala da studenti sestrinstva imaju višu prevalenciju mentalnih problema u odnosu na studente drugih studija i u odnosu na opću populaciju (176). Druge su studije pokazale da studenti sestrinstva i javnog zdravstva imaju manje problema s mentalnim zdravljem u odnosu na studente drugih studijskih programa (177). U ovome je istraživanju prevalencija barem blagih simptoma depresije bila prisutna kod 41,4 % studenata, što je u skladu s prethodnim studijama (1,9,14,178). Prethodna su istraživanja pokazala da 6 – 26 % studenata ima dijagnozu mentalnih poremećaja (9,12,14,179). Anksioznost je pri tome učestalija od depresije, što je u skladu s rezultatima ovoga rada (9). Studentice su obično pogođenije (178,180), premda je nedavna meta-analiza pronašla da ne postoje razlike u anksioznosti u ovisnosti o spolu u populaciji studenata medicine (27).

Većina mentalnih problema dolazi do izražaja u ranoj odrasloj dobi, pri čemu se 75 % mentalnih bolesti pojavi do dobi od 25 godina, što se preklapa s vremenom fakultetskog obrazovanja (181). Unatoč problemima, tek trećina njih traži pomoć, što upućuje na činjenicu da stigma vezana uz mentalne bolesti još uvijek postoji i među studentima zdravstvenih studija te je ona najvažnija prepreka za traženje pomoći (38). Istraživanja su pokazala da neliječene mentalne bolesti mogu progredirati u složenije mentalne poremećaje, napuštanje obrazovanja, izgaranje, suicidalne ideacije i druge oblike autodestruktivnog ponašanja (37,182). Ipak, moguće je da se situacija mijenja zato što studenti sve češće traže pomoć stručnjaka za mentalno zdravlje (182,183). Poznato je da zdravstveni djelatnici imaju visoke stope suicida (31,36). U populaciji studenata medicine stope suicidalnih ideacija kreću se u rasponu 7,4 – 24,2 %, što je više u odnosu na opću studentsku populaciju gdje je ta stopa 6,7 % (6,26,37,182). Premda u istraživanju nismo ispitivali studente izravno o suicidalnim ideacijama, pitali smo ih o autodestruktivnim i suicidalnim ideacijama u sklopu devetog pitanja skale PHQ-9 te smo

pronašli da 19,4 % studenata ima autodestruktivne ili suicidalne ideacije, što je u skladu s podatcima iz literature. Bolje razine mentalnog blagostanja pozitivno utječu na empatiju, koja je jedna od najvažnijih osobina za zdravstvene djelatnike (184). Distribucija kronotipova u našem ispitivanom uzorku slična je onima iz literature (185,186). Postojala je razlika između studijskih programa zato što su studenti sestrinstva imali ravnomjerniju rasporedbu kronotipova, dok su studenti medicine i MLD-a imali više studenata koji su spadali u večernji tip i manji broj onih koji su spadali u jutarnji tip. Ova razlika može biti uvjetovana razlikom u dobi ispitanika zato što su studenti sestrinstva u našem uzorku bili stariji od ostalih studenata, a poznato je da s dobi raste jutarnja preferenca (187–189).

Činjenica da studenti sestrinstva imaju češće jutarnju preferencu u odnosu na druge studente u skladu je s podatcima Mura i suradnika (190). To je pozitivno zato što su istraživanja pokazala da večernja preferenca vodi slabijoj kvaliteti sna kod medicinskih sestara koje rade u smjenama, a to može voditi dnevnoj pospanosti i kroničnom umoru (191,192). Valja istaknuti da su studenti medicine pokazali više vrijednosti na skali emocionalne stabilnosti u odnosu na studente sestrinstva, a jutarnjost korelira s emocionalnom stabilnosti. To može upućivati na činjenicu da je večernja preferenca studenata medicine uvjetovana izvanjskim čimbenicima, posebno učenjem, što može negativno utjecati na njihovo zdravlje. To može biti značajan čimbenik rizika za izgaranje zato što večernji tipovi češće imaju simptome izgaranja (193). Večernji tipovi češće imaju simptome depresije, kognitivne i bihevioralne probleme te su skloniji impulzivnosti (194,195). U ovom istraživanju nisu pronađene razlike u kronotipu s obzirom na spol, što je u skladu s istraživanjem Prat i Adan (196), ali ne i drugih istraživanja (141,197,198).

Što se tiče preferencija vezanih uz izbor specijalizacija, 45,5 % studenata izrazilo je želju za internističkim specijalizacijama, a najmanje ih je izrazilo želju za anesteziologijom i hitnom medicinom (6,4 %). Studentice su u odnosu na studente bile sklonije izraziti preferenciju za

patologiju, endokrinologiju, ginekologiju i porodništvo, nefrologiju, oftalmologiju i psihijatriju. Bile su manje sklone u odnosu na studente pokazati preferenciju prema kirurgiji, ortopediji i medicini rada. Ti su rezultati slični rezultatima Boylea i suradnika (199). Prema rezultatima istraživanja iz Švicarske, spol je najvažniji čimbenik koji utječe na izbor specijalizacije, nakon kojega slijede karakterne osobine (200). Premda su druge studije pokazale da su kod internista nađene više razine savjesnosti i ugodnosti, u ovom su istraživanju studenti koji preferiraju internističke specijalizacije pokazali najviše vrijednosti emocionalne stabilnosti (201–203). Najviši prosjek ocjena i najviše razine savjesnosti pokazali su studenti koji su preferirali anesteziologiju i hitnu medicinu. U drugim istraživanjima anesteziolozi su otvoreniji iskustvu i višim razinama ekstroverzije (202). Studenti koji su preferirali kirurgiju imali su više razine emocionalne stabilnosti i niže razine ugodnosti. Druga su istraživanja kirurge povezivala s višim razinama savjesnosti, ekstroverzije i emocionalne stabilnosti te nižim razinama ugodnosti (201–203). Studenti koji su preferirali javno zdravstvo pokazali su najniže razine ugodnosti, savjesnosti i intelekta. Studenti koji su pokazali najviše razine ekstroverzije pokazali su preferencu za dijagnostičkim specijalizacijama, što nije u skladu s podatcima iz literature gdje se patologe povezuje s visokim razinama introverzije (202).

Što se tiče sklonosti emigraciji studenata šestih godina medicine, četvrtina je izrazila želju za emigracijom nakon diplome ili specijalizacije. Ta je razina ipak niža od one iz drugog istraživanja na hrvatskim studentima iz 2013. godine koje je pokazalo da 35 % studenata ima sklonost emigraciji (95). Rezultat trenutnog istraživanja niži je od sklonosti k emigraciji drugih europskih studenata. Istraživanje na poljskim studentima pokazalo je da ih 62,1 % želi emigrirati nakon diplome (204). Budući da Hrvatska ima niži broj liječnika na 100 000 stanovnika u odnosu na europski prosjek i činjenicu da projekcije pokazuju kako će Hrvatska zbog emigracije i umirovljenja izgubiti trećinu liječnika do 2025. godine, ti su podatci zabrinjavajući (94).

6. Rasprava

Nije pronađena povezanost introverzije i sklonosti k emigraciji, što nije u skladu s podatcima iz literature u kojima se ekstroverzija povezuje sa sklonosti k emigraciji (205). Nije pronađena ni poveznica etnocentrizma i sklonosti k emigraciji nakon diplome, premda su studenti s višim razinama etnocentrizma bili manje skloni emigraciji nakon specijalizacije. Varijabla etnocentrizma nije dobro istražena te nije bilo moguće pronaći druga istraživanja koja povezuju etnocentrizam i sklonost k emigraciji.

6.1. Ograničenja istraživanja

Istraživanja su bila presječna, što ograničava pouzdanost dobivenih rezultata. Za detaljnu sliku mentalnog zdravlja i karakternih osobina bilo bi potrebno uključiti znatno veći broj psiholoških instrumenata, posebno onih koji nisu temeljeni na samoprocjeni. Neke od varijabli koje bi bilo korisno ispitati u budućim istraživanjima su: kvaliteta života, kvaliteta i trajanje sna, sklonost autodestrukciji i suicidalnim ideacijama, religiozni stavovi, povijest bolesti, posebno psihijatrijskih bolesti, socijalna podrška, izgaranje, sindrom varalice (engl. *imposter syndrome*), razine stresa, empatije, perfekcionizma, stigme mentalnih bolesti te sklonosti traženja pomoći. Nadalje, uzorak je istraživanjima 1 – 4 bio relativno malen, premda je reprezentativan, dok je u istraživanju 5 uzorak bio velik, ali temeljen na 29 % odaziva. S obzirom na činjenicu malenog odaziva, moguće je da su ispitanici u petom istraživanju koji su pokazivali simptome mentalnih poteškoća bili previše zastupljeni zbog pristranosti pri odabiru (engl. *self-selection biasa*) (206). Budući da su se u istraživanjima koristile prijelazne vrijednosti za blagu anksioznost i depresiju, prevalencija je možda viša od realne (engl. *overestimation*). Uzorak dominantno sačinjavaju žene, što je u skladu s ispitivanom populacijom i trendom feminizacije medicine (207).

7. Zaključak

Temeljem provedenih istraživanja i dobivenih rezultata mogu se izvesti sljedeći zaključci:

- Studenti medicine i zdravstvenih studija pokazuju visoke razine depresije i anksioznosti i niske razine subjektivne sreće.
- Studenti medicine skloniji su večernjim kronotipovima u odnosu na studente sestrinstva, što se može odraziti na njihovo mentalno zdravlje.
- Nije bilo značajnih razlika u domenama *Big Five*, osim u domeni savjesnosti koja je bila viša kod studenata sestrinstva i intelekta koji je bio viši kod studenata medicine.
- Razine introverzije i etnocentrizma nisu bile povezane sa sklonosti studenata k emigraciji nakon diplome, ali su više razine etnocentrizma bile povezane s manjom sklonosti k emigraciji nakon specijalizacije.
- Razlike u preferenci određenoj specijalizaciji nisu se mogle jednostavno povezati s karakternim osobinama. Studenti koji su imali najviše vrijednosti ugodnosti i intelekta bili su skloniji psihijatriji, a oni savjesniji bili su skloniji anesteziologiji i hitnoj medicini.
- Lošije financijsko stanje, zaposlenost uz studij te prethodni pad godine bili su čimbenici koji su povisivali razine depresije i anksioznosti ispitivanoga uzorka.
- Gotovo 20 % ispitanika pokazalo je autodeskruktivne ili suicidalne ideacije.
- Visoka prevalencija mentalnih problema u ovom istraživanju, na razinama višim od onih u općoj populaciji, ukazuje na problem kojim se odgovarajuće institucije moraju ozbiljno pozabaviti. Potrebno je studentima pružiti odgovarajuću brigu da bi se spriječila progresija simptoma.

8. Sažetak

Cilj: Istražiti razine depresije, anksioznosti i subjektivne sreće, karakternih osobina, etnocentrizma i cirkadijane preference studenata medicine i zdravstvenih studija te istražiti utjecaj pojedinih osobina na sklonost emigraciji i izbor pojedine specijalizacije.

Materijal i metode: U okviru disertacije provedeno je 5 istraživanja u koje su bili uključeni studenti medicine i zdravstvenih studija (N = 562; N = 712; N = 407; N = 124; N = 2137) s visokoobrazovnih ustanova u Hrvatskoj. U istraživanjima su korišteni psihološki upitnici te sociodemografski upitnici koji su uključivali pitanja vezana uz istraživačka pitanja pojedinih istraživanja.

Rezultati: Pronađene su visoke prevalencije simptoma depresije (62,8 % i 41,4 %) i anksioznosti (54,5 % i 76,4 %) među ispitanicima. Ispitanice su imale značajno više razine depresije i anksioznosti u odnosu na studente. Razlike u karakternim osobinama s obzirom na preferiranu skupinu specijalizacije uočene su za domenu intelekta. Studenti sestrinstva imali su najviše razine jutarnjosti, a studenti medicinsko-laboratorijske dijagnostike (MLD) najniže. Studenti sestrinstva pokazali su više razine ugodnosti i savjesnosti u odnosu na druge studente, a studenti medicine imali su više razine intelekta u odnosu na studente MLD-a. Četvrtina studenata medicine izrazila je sklonost emigraciji nakon diplome (25,0 %) i specijalizacije (23,39 %).

Zaključak: Studenti medicine i zdravstvenih studija iskazali su visoke razine depresije i anksioznosti, što predstavlja ozbiljan problem. Četvrtina studenata izrazila je sklonost emigraciji, što je problematično s obzirom na stanje hrvatskog zdravstvenog sustava.

Ključne riječi: mentalno zdravlje; studenti medicine; depresija; anksioznost; kronotip; Big Five

9. Summary

INDICATORS OF MENTAL HEALTH AND PSYCHOLOGICAL CHARACTERISTICS OF STUDENTS OF MEDICINE AND HEALTH SCIENCES

Aim: To investigate the levels of depression, anxiety and subjective happiness, character traits, ethnocentrism and circadian preferences of students of medicine and health sciences, and to investigate the influence of certain traits on the tendency to emigrate and the choice of specialization.

Material and methods: Five studies were conducted within this dissertation among medical and health sciences students (N=562; N=712; N=407; N=124; N=2137) from multiple higher education institutions in Croatia. Psychological and sociodemographic questionnaires containing questions related to the research questions of individual studies were used.

Results: High prevalence of symptoms of depression (62.8% and 41.4%) and anxiety (54.5% and 76.4%) were found among the participants. Women students had significantly higher levels of depression and anxiety compared to men students. Differences in character traits with regard to the preferred specialization group were observed for the domain of intellect. Nursing students had the highest levels of morningness, and medical laboratory diagnostics (MLD) students had the lowest. Nursing students showed higher levels of agreeableness and conscientiousness compared to other students, and medical students had higher levels of intellect compared to MLD students. A quarter of medical students expressed a preference for emigration after graduation (25.0%) and specialization (23.39%).

Conclusion: Medical and health sciences students showed high levels of depression and anxiety which is a serious problem. A quarter of students expressed a preference for emigration, which is problematic considering the state of the Croatian health system.

Keywords: mental health; medical students; depression; anxiety; chronotype; The big five

10. Popis literature

1. Milić J, Škrlec I, Milić Vranješ I, Podgornjak M, Heffer M. High levels of depression and anxiety among Croatian medical and nursing students and the correlation between subjective happiness and personality traits. Int Rev Psychiatry. 2019;31(7–8):653–60.
2. Milić J, Milić Vranješ I, Krajina I, Heffer M, Škrlec I. Circadian Typology and Personality Dimensions of Croatian Students of Health-Related University Majors. Int J Environ Res Public Health. 2020;17(13):4794.
3. Milić J, Škrlec I, Milić Vranješ I, Jakab J, Plužarić V, Heffer M. Importance of the big-five in the future medical specialty preference. BMC Med Educ. 2020;20(1):234.
4. Milić J, Vuksan-Ćusa Z, Jakab J, Ćurčić M, Puljak L, Milić Vranješ I, i sur. Tendencies towards emigration and their association with introversion and ethnocentrism among final-year medical students from Osijek, Croatia: a cross-sectional study. BMC Med Educ. 2023;23(1):632.
5. Milić J, Skitarelić N, Majstorović D, Zoranić S, Čivljak M, Ivanišević K, i sur. Levels of depression, anxiety and subjective happiness among health sciences students in Croatia: a multi-centric cross-sectional study. BMC Psychiatry. 2024;24(1):50.
6. Slavin SJ. Medical Student Mental Health: Culture, Environment, and the Need for Change. JAMA. 2016;316(21):2195–6.
7. Dyrbye LN, West CP, Satele D, Boone S, Tan L, Sloan J, i sur. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. Acad Med J Assoc Am Med Coll. 2014;89(3):443–51.
8. Kaushik A, Kostaki E, Kyriakopoulos M. The stigma of mental illness in children and adolescents: A systematic review. Psychiatry Res. 2016;243:469–94.

10. Popis literature

9. Castaldelli-Maia JM, Lewis T, Marques Dos Santos N, Picon F, Kadhum M, Farrell SM, et al. Stressors, psychological distress, and mental health problems amongst Brazilian medical students. Int Rev Psychiatry. 2019;31(7–8):603–7.
10. Brenneisen Mayer F, Souza Santos I, Silveira PSP, Itaqui Lopes MH, de Souza ARND, Campos EP, i sur. Factors associated to depression and anxiety in medical students: a multicenter study. BMC Med Educ. 2016;16(1):282.
11. Hankir A, Fletcher-Rogers J, Ogunmuyiwa J, Carrick FR, Zaman R. Reducing Mental Health Stigma in Medical Students and Doctors towards their Peers with Mental Health Difficulties: A Protocol. Psychiatr Danub. 2020;32(Suppl 1):130–4.
12. Almeida T, Kadhum M, Farrell SM, Ventriglio A, Molodynski A. A descriptive study of mental health and wellbeing among medical students in Portugal. Int Rev Psychiatry. 2019;31(7–8):574–8.
13. Hamasha AAH, Kareem YM, Alghamdi MS, Algarni MS, Alahedib KS, Alharbi FA. Risk indicators of depression among medical, dental, nursing, pharmacology, and other medical science students in Saudi Arabia. Int Rev Psychiatry. 2019;31(7–8):646–52.
14. Volpe U, Ventriglio A, Bellomo A, Kadhum M, Lewis T, Molodynski A, i sur. Mental health and wellbeing among Italian medical students: a descriptive study. Int Rev Psychiatry. 2019;31(7–8):569–73.
15. Wilkes TC, Lewis T, Paget M, Holm J, Brager N, Bulloch A, i sur. Wellbeing and mental health amongst medical students in Canada. Int J Soc Psychiatry. 2022;68(6):1283–8.
16. Auerbach RP, Mortier P, Bruffaerts R, Alonso J, Benjet C, Cuijpers P, i sur. WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. J Abnorm Psychol. 2018;127(7):623–38.

10. Popis literature

17. Alshahrani AM, Al-Shahrani MS, Miskeen E, Alharthi MH, Alamri MMS, Alqahtani MA, i sur. Prevalence of Depressive Symptoms and Its Correlates among Male Medical Students at the University of Bisha, Saudi Arabia. Healthc Basel Switz. 2024;12(6):640.
18. Zeng W, Chen R, Wang X, Zhang Q, Deng W. Prevalence of mental health problems among medical students in China: A meta-analysis. Medicine (Baltimore). 2019;98(18):e15337.
19. Demenech LM, Oliveira AT, Neiva-Silva L, Dumith SC. Prevalence of anxiety, depression and suicidal behaviors among Brazilian undergraduate students: A systematic review and meta-analysis. J Affect Disord. 2021;282:147–59.
20. Wang J, Liu M, Bai J, Chen Y, Xia J, Liang B, i sur. Prevalence of common mental disorders among medical students in China: a systematic review and meta-analysis. Front Public Health. 2023;11:1116616.
21. Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, i sur. Prevalence of Depression, Depressive Symptoms, and Suicidal Ideation Among Medical Students: A Systematic Review and Meta-Analysis. JAMA. 2016;316(21):2214–36.
22. Anbesaw T, Zenebe Y, Necho M, Gebresellassie M, Segon T, Kebede F, i sur. Prevalence of depression among students at Ethiopian universities and associated factors: A systematic review and meta-analysis. PloS One. 2023;18(10):e0288597.
23. Jupina M, Sidle MW, Rehmeyer Caudill CJ. Medical student mental health during the COVID-19 pandemic. Clin Teach. 2022;19(5):e13518.
24. Maddalena N de CP, Lucchetti ALG, Moutinho ILD, Ezequiel O da S, Lucchetti G. Mental health and quality of life across 6 years of medical training: A year-by-year analysis. Int J Soc Psychiatry. 2024;70(2):298–307.
25. Tung YJ, Lo KKH, Ho RCM, Tam WSW. Prevalence of depression among nursing students: A systematic review and meta-analysis. Nurse Educ Today. 2018;63:119–29.

10. Popis literature

26. Pedrelli P, Nyer M, Yeung A, Zulauf C, Wilens T. College Students: Mental Health Problems and Treatment Considerations. Acad Psychiatry J Am Assoc Dir Psychiatr Resid Train Assoc Acad Psychiatry. 2015;39(5):503–11.
27. Quek TTC, Tam WWS, Tran BX, Zhang M, Zhang Z, Ho CSH, i sur. The Global Prevalence of Anxiety Among Medical Students: A Meta-Analysis. Int J Environ Res Public Health. 2019;16(15):2735.
28. Son C, Hegde S, Smith A, Wang X, Sasangohar F. Effects of COVID-19 on College Students' Mental Health in the United States: Interview Survey Study. J Med Internet Res. 2020;22(9):e21279.
29. Ruiz-Aranda D, Extremera N, Pineda-Galán C. Emotional intelligence, life satisfaction and subjective happiness in female student health professionals: the mediating effect of perceived stress. J Psychiatr Ment Health Nurs. 2014;21(2):106–13.
30. Farrell SM, Kar A, Valsraj K, Mukherjee S, Kunheri B, Molodynski A, i sur. Wellbeing and burnout in medical students in India; a large scale survey. Int Rev Psychiatry Abingdon Engl. 2019;31(7–8):555–62.
31. Molodynski A, Lewis T, Kadhum M, Farrell SM, Lemtiri Chelieh M, Falcão De Almeida T, i sur. Cultural variations in wellbeing, burnout and substance use amongst medical students in twelve countries. Int Rev Psychiatry. 2021;33(1–2):37–42.
32. Erschens R, Keifenheim KE, Herrmann-Werner A, Loda T, Schwille-Kiuntke J, Bugaj TJ, i sur. Professional burnout among medical students: Systematic literature review and meta-analysis. Med Teach. 2019;41(2):172–83.
33. Peng P, Hao Y, Liu Y, Chen S, Wang Y, Yang Q, i sur. The prevalence and risk factors of mental problems in medical students during COVID-19 pandemic: A systematic review and meta-analysis. J Affect Disord. 2023;321:167–81.

10. Popis literature

34. Mata DA, Ramos MA, Bansal N, Khan R, Guille C, Di Angelantonio E, i sur. Prevalence of Depression and Depressive Symptoms Among Resident Physicians: A Systematic Review and Meta-analysis. JAMA. 2015;314(22):2373–83.
35. Mortier P, Auerbach RP, Alonso J, Bantjes J, Benjet C, Cuijpers P, i sur. Suicidal Thoughts and Behaviors Among First-Year College Students: Results From the WMH-ICS Project. J Am Acad Child Adolesc Psychiatry. 2018;57(4):263-273.e1.
36. Molodynski A, Ventriglio A, Bhugra D. A crisis brewing for the healthcare system and a crisis already happening for our students. Int Rev Psychiatry. 2019;31(7–8):545–7.
37. MacLean L, Booza J, Balon R. The Impact of Medical School on Student Mental Health. Acad Psychiatry. 2016;40(1):89–91.
38. Bhugra D, Sauerteig SO, Bland D, Lloyd-Kendall A, Wijesuriya J, Singh G, i sur. A descriptive study of mental health and wellbeing of doctors and medical students in the UK. Int Rev Psychiatry. 2019;31(7–8):563–8.
39. Sivertsen B, Hysing M, Knapstad M, Harvey AG, Reneflot A, Lønning KJ, i sur. Suicide attempts and non-suicidal self-harm among university students: prevalence study. BJPsych Open. 2019;5(2):e26.
40. Slavin SJ, Schindler DL, Chibnall JT. Medical Student Mental Health 3.0: Improving Student Wellness Through Curricular Changes. Acad Med. 2014;89(4):573–7.
41. Zillig LMP, Hemenover SH, Dienstbier RA. What Do We Assess when We Assess a Big 5 Trait? A Content Analysis of the Affective, Behavioral, and Cognitive Processes Represented in Big 5 Personality Inventories. Pers Soc Psychol Bull. 2002;28(6):847–58.
42. Goldberg LR. The structure of phenotypic personality traits. Am Psychol. 1993;48(1):26–34.
43. Wang S, Li H, Chen X, Yan N, Wen D. Learning burnout and its association with perceived stress, social support, and the Big Five personality traits in Chinese medical

students during the COVID-19 pandemic: a cross-sectional study. BMC Psychiatry. 2022;22(1):785.

44. Kotov R, Gamez W, Schmidt F, Watson D. Linking “big” personality traits to anxiety, depressive, and substance use disorders: a meta-analysis. Psychol Bull. 2010;136(5):768–821.
45. Sultan S, Labban OM, Hamawi AM, Alnajrani AK, Tawfik AM, Felemban MH, i sur. Relationship of big five personality traits and future specialty preference among undergraduate medical students: a cross-sectional study. Egypt J Neurol Psychiatry Neurosurg. 2023;59(1):103.
46. McCrae RR, Costa PT. Validation of the five-factor model of personality across instruments and observers. J Pers Soc Psychol. 1987;52(1):81–90.
47. Grice J. Five-factor model of personality. Dostupno na adresi: https://www.britannica.com/science/five-factor-model-of-personality. Datum pristupa: 4. 4. 2024.
48. Costa P, McCrae R. Normal Personality Assessment in Clinical Practice: The NEO Personality Inventory. Psychol Assess. 1992;4:5–13.
49. Judge TA, Bono JE. Relationship of core self-evaluations traits--self-esteem, generalized self-efficacy, locus of control, and emotional stability--with job satisfaction and job performance: a meta-analysis. J Appl Psychol. 2001;86(1):80–92.
50. Ferguson E, James D, Madeley L. Factors associated with success in medical school: systematic review of the literature. BMJ. 2002;324(7343):952–7.
51. Mammadov S. Big Five personality traits and academic performance: A meta-analysis. J Pers. 2022;90(2):222–55.

10. Popis literature

52. Poole A, Catano VM, Cunningham D. Predicting Performance in Canadian Dental Schools: The New CDA Structured Interview, a New Personality Assessment, and the DAT. J Dent Educ. 2007;71(5):664–76.
53. Jaber M, Al-Samarrai B, Salah A, Varma SR, Karobari MI, Marya A. Does General and Specific Traits of Personality Predict Students' Academic Performance? BioMed Res Int. 2022;2022:e9422299.
54. Sulea C, van Beek I, Sarbescu P, Virga D, Schaufeli WB. Engagement, boredom, and burnout among students: Basic need satisfaction matters more than personality traits. Learn Individ Differ. 2015;42:132–8.
55. Poropat AE. A meta-analysis of the five-factor model of personality and academic performance. Psychol Bull. 2009;135(2):322–38.
56. Bianchi R, Schonfeld IS, Laurent E. Burnout-depression overlap: a review. Clin Psychol Rev. 2015;36:28–41.
57. Steel P, Schmidt J, Shultz J. Refining the relationship between personality and subjective well-being. Psychol Bull. 2008;134(1):138–61.
58. Abe K, Niwa M, Fujisaki K, Suzuki Y. Associations between emotional intelligence, empathy and personality in Japanese medical students. BMC Med Educ. 2018;18(1):47.
59. Song Y, Shi M. Associations between empathy and big five personality traits among Chinese undergraduate medical students. PloS One. 2017;12(2):e0171665.
60. Suciu N, Meliț LE, Mărginean CO. A Holistic Approach of Personality Traits in Medical Students: An Integrative Review. Int J Environ Res Public Health. 2021;18(23):12822.
61. Bętkowska-Korpała B, Pastuszak-Draxler A, Olszewska-Turek K, Sikora-Zych K, Epa R, Starowicz-Filip A. Personality characteristics of empathy profiles - practical implications for education of medicine students. BMC Med Educ. 2022;22(1):376.

10. Popis literature

62. Guilera T, Batalla I, Forné C, Soler-González J. Empathy and big five personality model in medical students and its relationship to gender and specialty preference: a cross-sectional study. BMC Med Educ. 2019;19(1):57.
63. Magalhães E, Costa P, Costa MJ. Empathy of medical students and personality: evidence from the Five-Factor Model. Med Teach. 2012;34(10):807–12.
64. Liu M, Cai J, Chen H, Shi L. Association of Personality Traits with Life and Work of Medical Students: An Integrative Review. Int J Environ Res Public Health. 2022;19(19):12376.
65. Franco CAG dos S, Franco RS, Cecilio-Fernandes D, Severo M, Ferreira MA. The impact of personality traits on attitudes toward learning communication skills. Sci Medica. 2020;30(1):e37326–e37326.
66. Bertram K, Randazzo J, Alabi N, Levenson J, Doucette JT, Barbosa P. Strong Correlations between Empathy, Emotional Intelligence, and Personality Traits among Podiatric Medical Students: A Cross-sectional Study. Educ Health. 2016;29(3):186.
67. Richardson M, Abraham C, Bond R. Psychological correlates of university students' academic performance: a systematic review and meta-analysis. Psychol Bull. 2012;138(2):353–87.
68. Ferguson E, Semper H, Yates J, Fitzgerald JE, Skatova A, James D. The "dark side" and "bright side" of personality: when too much conscientiousness and too little anxiety are detrimental with respect to the acquisition of medical knowledge and skill. PloS One. 2014;9(2):e88606.
69. Busato VV, Prins FJ, Elshout JJ, Hamaker C. The relation between learning styles, the Big Five personality traits and achievement motivation in higher education. Personal Individ Differ. 1998;26(1):129–40.

10. Popis literature

70. Sjöberg Bexelius T, Olsson C, J Pettersson H, Parmskog M, Ponzer S, Dahlin M. Association between personality traits and future choice of specialisation among Swedish doctors: a cross-sectional study. Postgrad Med J. 2016;92(1090):441-6.
71. Nawaiseh MB, Haddadin RR, Al Droubi B, Nawaiseh HB, Alarood S, Aborajooh E, i sur. The Association Between Personality Traits and Specialty Preference Among Medical Students in Jordan. Psychol Res Behav Manag. 2020;13:599–607.
72. Al Sawafi A, Al Lawati A, Al Sinawi H. Personality Traits and Potential Career Choices Among Medical Students at Sultan Qaboos University: A Cross-Sectional Study. Cureus. 2024;16(1):e51994.
73. Barbosa-Camacho FJ, Miranda-Ackerman RC, Vázquez-Reyna I, Jimenez-Ley VB, Barrera-López FJ, Contreras-Cordero VS, i sur. Association between HEXACO personality traits and medical specialty preferences in Mexican medical students: a cross-sectional survey. BMC Psychol. 2020;8(1):23.
74. Kwon OY, Park SY. Specialty choice preference of medical students according to personality traits by Five-Factor Model. Korean J Med Educ. 2016;28(1):95–102.
75. Sier VQ, Schmitz RF, Putter H, Schepers A, van der Vorst JR. The big five: Studying the surgical personality. Surgery. 2022;172(5):1358–63.
76. Živković D, Nedeljković J, Veljković B, Đošić A, Bojanić Ž, Bratić M, i sur. The Role of Personality in Prediction of Satisfaction With Life in Recreational Athletes During the First Wave of Pandemic Covid-19. Front Psychol. 2022;12:820045 77.
77. Hintsanen M, Puttonen S, Smith K, Törnroos M, Jokela M, Pulkki-Råback L, i sur. Five-factor personality traits and sleep: Evidence from two population-based cohort studies. Health Psychol. 2014;33(10):1214–23.
78. Navarro-Prados AB, Serrate-Gonzalez S, Muñoz-Rodríguez JM, Díaz-Orueta U. Relationship Between Personality Traits, Generativity, and Life Satisfaction in

Individuals Attending University Programs for Seniors. Int J Aging Hum Dev. 2018;87(2):184–200.

79. Heilmann K, Hinrichs R, Herke M, Richter M, Rathmann K. Die Bedeutung der „Big Five“-Persönlichkeitsmerkmale für die subjektive Gesundheit und Lebenszufriedenheit im Jugendalter: Ergebnisse des Nationalen Bildungspanels (NEPS). Gesundheitswesen. 2021;83(01):8–16.
80. Kjeldstadli K, Tyssen R, Finset A, Hem E, Gude T, Gronvold NT, i sur. Life satisfaction and resilience in medical school--a six-year longitudinal, nationwide and comparative study. BMC Med Educ. 2006;6:48.
81. Abbiati M, Cerutti B. Do students' personality traits change during medical training? A longitudinal cohort study. Adv Health Sci Educ Theory Pract. 2023;28(4):1079–92.
82. Zhang X, Lin D, Pforsich H, Lin VW. Physician workforce in the United States of America: forecasting nationwide shortages. Hum Resour Health. 2020;18(1):8.
83. Krajewski-Siuda K, Szromek A, Romaniuk P, Gericke CA, Szpak A, Kaczmarek K. Emigration preferences and plans among medical students in Poland. Hum Resour Health. 2012;10(1):8.
84. Ebeye T, Lee H. Down the brain drain: a rapid review exploring physician emigration from West Africa. Glob Health Res Policy. 2023;8:23.
85. Zimbudzi E. Stemming the Impact of Health Professional Brain Drain from Africa: A Systemic Review of Policy Options. J Public Health Afr. 2013;4(1):e4.
86. Yuksekdag Y. Health Without Care? Vulnerability, Medical Brain Drain, and Health Worker Responsibilities in Underserved Contexts. Health Care Anal. 2018;26(1):17–32.
87. El Saghir NS, Anderson BO, Gralow J, Lopes G, Shulman LN, Moukadem HA, i sur. Impact of Merit-Based Immigration Policies on Brain Drain From Low- and Middle-Income Countries. JCO Glob Oncol. 2020;6:185-189.

10. Popis literature

88. Lofters AK. The “Brain Drain” of Health Care Workers: Causes, Solutions and the Example of Jamaica. Can J Public Health Rev. 2012;103(5):e376–8.
89. Kolcić I, Polasek O, Mihalj H, Gombac E, Kraljević V, Kraljević I, i sur. Research involvement, specialty choice, and emigration preferences of final year medical students in croatia. Croat Med J. 2005;46(1):88–95.
90. Dodani S, LaPorte RE. Brain drain from developing countries: how can brain drain be converted into wisdom gain? J R Soc Med. 2005;98(11):487.
91. Hagopian A, Thompson MJ, Fordyce M, Johnson KE, Hart LG. The migration of physicians from sub-Saharan Africa to the United States of America: measures of the African brain drain. Hum Resour Health. 2004;2(1):17.
92. World Health Organization. Increasing Access to Health Workers in Remote and Rural Areas Through Improved Retention: Global Policy Recommendations. Dostupno na adresi: http://www.ncbi.nlm.nih.gov/books/NBK138618/. Datum pristupa: 4. 4. 2024.
93. Gruber E, Sarajlic Vukovic I, Musovic M, Moravek D, Starcevic B, Martic Biocina S, i sur. Migration of Croatian physicians in the global context. Med Flum. 2020;56(2):88–96.
94. Jurić T. Medical Brain Drain From Southeastern Europe: Using Digital Demography to Forecast Health Worker Emigration. JMIRx Med. 2021;2(4):e30831.
95. Kolčić I, Čikeš M, Boban K, Bućan J, Likić R, Ćurić G, i sur. Emigration-related attitudes of the final year medical students in Croatia: a cross-sectional study at the dawn of the EU accession. Croat Med J. 2014;55(5):452–8.
96. Ferreira PL, Raposo V, Tavares AI, Correia T. Drivers for emigration among healthcare professionals: Testing an analytical model in a primary healthcare setting. Health Policy. 2020;124(7):751–7.

10. Popis literature

97. Santric-Milicevic MM, Terzic-Supic ZJ, Matejic BR, Vasic V, Ricketts TC. First- and fifth-year medical students' intention for emigration and practice abroad: A case study of Serbia. Health Policy. 2014;118(2):173–83.
98. Ramos Halbout Carrão PV, Atique MW. The evolution of ethnocentrism revisited: An agent-based model with inductive reasoning. EconomiA. 2020;21(2):297–310.
99. Neuliep JW, Hintz SM, McCroskey JC. The influence of ethnocentrism in organizational contexts: perceptions of interviewee and managerial attractiveness, credibility, and effectiveness. Commun Q. 2005;53(1):41–56.
100. Hammond RA, Axelrod R. The Evolution of Ethnocentrism. J Confl Resolut. 2006;50(6):926–36.
101. Pettigrew TF, Tropp LR. A meta-analytic test of intergroup contact theory. J Pers Soc Psychol. 2006;90(5):751–83.
102. Kolčić I, Vorko Jović A, ur. Epidemiologija. Zagreb: Medicinska naklada; 2012.
103. Marušić M, ur. Uvod u znanstveni rad. Zagreb: Medicinska naklada; 2013.
104. Setia MS. Methodology Series Module 3: Cross-sectional Studies. Indian J Dermatol. 2016;61(3):261–4.
105. Levin KA. Study design III: Cross-sectional studies. Evid Based Dent. 2006;7(1):24–5.
106. Kumar R. Research methodology: a step - by - step guide for beginners. London: SAGE Publication Ltd; 2011.
107. Union Européenne des Médecins Spécialistes – UEMS. Main UEMS - Medical Specialties. Dostupno na adresi: https://www.uems.eu/about-us/medical-specialties. Datum pristupa: 11. 4. 2024.
108. Kroenke K, Spitzer RL, Williams JBW, Löwe B. The Patient Health Questionnaire Somatic, Anxiety, and Depressive Symptom Scales: a systematic review. Gen Hosp Psychiatry. 2010;32(4):345–59.

10. Popis literature

109. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606–13.

110. Errazuriz A, Beltrán R, Torres R, Passi-Solar A. The Validity and Reliability of the PHQ-9 and PHQ-2 on Screening for Major Depression in Spanish Speaking Immigrants in Chile: A Cross-Sectional Study. Int J Environ Res Public Health. 2022;19(21):13975.

111. Kocalevent RD, Hinz A, Brähler E. Standardization of the depression screener patient health questionnaire (PHQ-9) in the general population. Gen Hosp Psychiatry. 2013;35(5):551–5.

112. Pinto-Meza A, Serrano-Blanco A, Peñarrubia MT, Blanco E, Haro JM. Assessing depression in primary care with the PHQ-9: can it be carried out over the telephone? J Gen Intern Med. 2005;20(8):738–42.

113. Löwe B, Kroenke K, Herzog W, Gräfe K. Measuring depression outcome with a brief self-report instrument: sensitivity to change of the Patient Health Questionnaire (PHQ-9). J Affect Disord. 2004;81(1):61–6.

114. Keenan L, Ingram Y, Green B, Daltry R, Harenberg S. Validation and Clinical Utility of the Patient Health Questionnaire-9 and Center for Epidemiologic Studies Depression Scale as Depression Screening Tools in Collegiate Student-Athletes. J Athl Train. 2023;58(10):821–30.

115. Rosenthal RN. Managing Depressive Symptoms in Substance Abuse Clients During Early Recovery: Treatment Improvement Protocol. Rockville: DIANE Publishing; 2010.

116. Kroenke K, Spitzer RL. The PHQ-9: A New Depression Diagnostic and Severity Measure. Psychiatr Ann. 2002;32(9):509–15.

117. Donker T, van Straten A, Marks I, Cuijpers P. Quick and easy self-rating of Generalized Anxiety Disorder: validity of the Dutch web-based GAD-7, GAD-2 and GAD-SI. Psychiatry Res. 2011;188(1):58–64.

10. Popis literature

118. Swinson RP. The GAD-7 scale was accurate for diagnosing generalised anxiety disorder. Evid Based Med. 2006;11(6):184.

119. Löwe B, Decker O, Müller S, Brähler E, Schellberg D, Herzog W, i sur. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. Med Care. 2008;46(3):266–74.

120. Lyubomirsky S, Lepper HS. A Measure of Subjective Happiness: Preliminary Reliability and Construct Validation. Soc Indic Res. 1999;46(2):137–55.

121. Brislin R. Back-Translation for Cross-Cultural Research. J Cross - Cult Psychol. 1(3):185–216.

122. Cha ES, Kim KH, Erlen JA. Translation of scales in cross-cultural research: issues and techniques. J Adv Nurs. 2007;58(4):386–95.

123. Ozolins U. Back translation as a means of giving translators a voice. Transl Interpret. 2009;1(2):1–13.

124. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, i sur. Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: report of the ISPOR Task Force for Translation and Cultural Adaptation. Value Health. 2005;8(2):94–104.

125. Berlančić T, Kuharić M, Janković D, Milić J, Badak K, Zibar L. Croatian Translation and Linguistic Adaptation of the Short Assessment of Health Literacy for Spanish Adults (SAHLSA-50). Southeast Eur Med J SEEMEDJ. 2020;4(2):121–8.

126. Čarapina Zovko I, Milić J, Vucemilovic FB, Jemrić N, Sulić P, Vidović D, i sur. Translation of the Clance Impostor Phenomenon Scale Into the Croatian Language. 2021;5(1).

10. Popis literature

127. Milić J, Škrlec I, Milić Vranješ I, Matić M, Sertić D, Heffer M. The Croatian Translation of the Horne and Östberg Morningness-Eveningness Questionnaire With a Brief Review of Circadian Typology. Southeast Eur Med J SEEMEDJ. 2018;2(1):1–11.

128. Milić Vranješ I, Podgornjak M, Milić J, Šijan I, Jakab J, Krajina I, i sur. The Croatian version of the Body Image Scale: translation and validation. Croat Med J. 2021;62(6):598–605.

129. Goldberg LR. A Broad-Bandwidth, Public Domain Personality Inventory Measuring the Lower-Level Facets of Several Five-Factor Models. U: Mervielde I, Deary I, De Fruyt F, Ostendorf F, urednici. Personality Psychology in Europe, Vol. 7. Tilburg: Tilburg University Press; 1999. str. 7-28.

130. Mlačić B, Goldberg LR. An Analysis of a Cross-Cultural Personality Inventory: The IPIP Big-Five Factor Markers in Croatia. J Pers Assess. 2007;88(2):168–77.

131. Čuljak Z, Mlačić B. The Big-Five Model of Personality and the Success of High School Students in Physical Education. Croat J Educ. 2014;16(2):471–90.

132. Goldberg LR. The development of markers for the Big-Five factor structure. Psychol Assess. 1992;4(1):26–42.

133. Hayes N, Joseph S. Big 5 correlates of three measures of subjective well-being. Personal Individ Differ. 2003;34(4):723–7.

134. Sharpe JP, Martin NR, Roth KA. Optimism and the Big Five factors of personality: Beyond Neuroticism and Extraversion. Personal Individ Differ. 2011;51(8):946–51.

135. DeYoung CG, Shamosh NA, Green AE, Braver TS, Gray JR. Intellect as distinct from Openness: Differences revealed by fMRI of working memory. J Pers Soc Psychol. 2009;97(5):883–92.

10. Popis literature

136. Kaufman SB, Quilty LC, Grazioplene RG, Hirsh JB, Gray JR, Peterson JB, i sur. Openness to Experience and Intellect differentially predict creative achievement in the arts and sciences. J Pers. 2016;84(2):248–58.

137. Goldberg LR, Johnson JA, Eber HW, Hogan R, Ashton MC, Cloninger CR, i sur. The international personality item pool and the future of public-domain personality measures. J Res Personal. 2006;40(1):84–96.

138. Horne JA, Ostberg O. A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. Int J Chronobiol. 1976;4(2):97–110.

139. Adan A, Almirall H. Horne & Östberg morningness-eveningness questionnaire: A reduced scale. Personal Individ Differ. 1991;12(3):241–53.

140. Adan A, Archer SN, Hidalgo MP, Di Milia L, Natale V, Randler C. Circadian Typology: A Comprehensive Review. Chronobiol Int. 2012;29(9):1153–75.

141. Milić J, Kvolik A, Ivković M, Cikes AB, Labak I, Benšic M, i sur. Are there differences in students' school success, biorhythm, and daytime sleepiness depending on their school starting times? Coll Antropol. 2014;38(3):889–94.

142. Neuliep JW, McCroskey JC. The development of a U.S. and generalized ethnocentrism scale. Commun Res Rep. 1997;14(4):385–98.

143. McCroskey JC, Richmond VP. Willingness to communicate: Differing cultural perspectives. South Commun J. 1990;56(1):72–7.

144. Royston P. Estimating departure from normality. Stat Med. 1991;10(8):1283–93.

145. Nahm FS. Nonparametric statistical tests for the continuous data: the basic concept and the practical use. Korean J Anesthesiol. 2016;69(1):8–14.

146. Kitchen CMR. Nonparametric vs Parametric Tests of Location in Biomedical Research. Am J Ophthalmol. 2009;147(4):571–2.

147. Siegel S. Nonparametric Statistics. Am Stat. 1957; 11(3):13-19.

10. Popis literature

148. Savage IR. Nonparametric Statistics. J Am Stat Assoc. 1957;52(279):331–44.

149. Ghasemi A, Zahediasl S. Normality Tests for Statistical Analysis: A Guide for Non-Statisticians. Int J Endocrinol Metab. 2012;10(2):486–9.

150. Elliott AC, Woodward WA. Statistical Analysis Quick Reference Guidebook: With SPSS Examples. SAGE; 2007.

151. Pallant J. SPSS Survival Manual. A step by step guide to data analysis using IBM London: Routledge; 2020.

152. Tomczak M, Tomczak E. The need to report effect size estimates revisited. An overview of some recommended measures of effect size. Trends in Sport Sciences. 2014; 1(21): 19-25.

153. Fritz CO, Morris PE, Richler JJ. Effect size estimates: current use, calculations, and interpretation. J Exp Psychol Gen. 2012;141(1):2–18.

154. Walliman N. Research Methods: The Basics. Oxfordshire: Routledge; 2010.

155. Nestor PG, Boodai SB, O'Donovan K, Choate Hasler V, Hunter R. College student mental health: Psychiatric risk and psychological wellbeing. J Am Coll Health J ACH. 2024;28;1–9.

156. Bunevicius A, Katkute A, Bunevicius R. Symptoms of Anxiety and Depression in Medical Students and in Humanities Students: Relationship With Big-Five Personality Dimensions and Vulnerability To Stress. Int J Soc Psychiatry. 2008;54(6):494–501.

157. Ley AF, Han JJ, Hare E, Sikorskii A, Taylor JR, Shahed A, i sur. Beyond burnout: a four-year survey of osteopathic medical student mental health and the implications for the development of wellness and mental health programs. J Osteopath Med. 2023;123(5):225–33.

10. Popis literature

158. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. Acad Med. 2006;81(4):354–73.

159. Bayram N, Bilgel N. The prevalence and socio-demographic correlations of depression, anxiety and stress among a group of university students. Soc Psychiatry Psychiatr Epidemiol. 2008;43(8):667–72.

160. Bunevicius A, Katkute A, Bunevicius R. Symptoms of anxiety and depression in medical students and in humanities students: relationship with big-five personality dimensions and vulnerability to stress. Int J Soc Psychiatry. 2008;54(6):494–501.

161. Horley J, Lavery JJ. Subjective Well-Being and Age. Soc Indic Res. 1995;34(2):275–82.

162. Steptoe A, Deaton A, Stone AA. Subjective wellbeing, health, and ageing. Lancet Lond Engl. 2015 Feb 14;385(9968):640–8.

163. Furnham A, Petrides K V. Trait Emotional Intelligence And Happiness. Soc Behav Personal Int J. 2003;31(8):815–23.

164. Kjeldstadli K, Tyssen R, Finset A, Hem E, Gude T, Gronvold NT, i sur. Life satisfaction and resilience in medical school – a six-year longitudinal, nationwide and comparative study. BMC Med Educ. 2006;6(1):48.

165. Furnham A, Christoforou I. Personality Traits, Emotional Intelligence, and Multiple Happiness. North Am J Psychol. 2007;9(3):439–62.

166. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. Acad Med. 2006;81(4):354–73.

167. Deary IJ, Watson R, Hogston R. A longitudinal cohort study of burnout and attrition in nursing students. J Adv Nurs. 2003 Jul;43(1):71–81.

10. Popis literature

168. Lo R. A longitudinal study of perceived level of stress, coping and self-esteem of undergraduate nursing students: an Australian case study. J Adv Nurs. 2002;39(2):119–26.

169. Warbah L, Sathiyaseelan M, Vijayakumar C, Vasantharaj B, Russell S, Jacob KS. Psychological distress, personality, and adjustment among nursing students. Nurse Educ Today. 2007;27(6):597–601.

170. Kumar TKA, Khakha DC, Joshi P, Das S, Manu KJ. Happiness and its determinants among nursing students. Ind Psychiatry J. 2022;31(2):293–8.

171. Häkkinen I. Working while enrolled in a university: does it pay? Labour Econ. 2006;13(2):167–89.

172. Verulava T, Jorbenadze R. The impact of part-time employment on students' health. Malta Med J. 2022;34(1):50–7.

173. Hulla R. Working College Students: How Work Demands, Psychosocial Factors, and Health Impact Academic Performance. Arlington:The University of Texas; 2021.

174. Carney C, McNeish S, McColl J. The impact of part time employment on students' health and academic performance: a Scottish perspective. J Furth High Educ. 2005; 29(4): 307–19.

175. Wilkes C, Lewis T, Brager N, Bulloch A, MacMaster F, Paget M, i sur. Wellbeing and mental health amongst medical students in Canada. Int Rev Psychiatry. 2019;31(7–8):584–7.

176. Karaca A, Yildirim N, Cangur S, Acikgoz F, Akkus D. Relationship between mental health of nursing students and coping, self-esteem and social support. Nurse Educ Today. 2019;76:44–50.

10. Popis literature

177. Ketchen Lipson S, Gaddis SM, Heinze J, Beck K, Eisenberg D. Variations in Student Mental Health and Treatment Utilization Across US Colleges and Universities. J Am Coll Health J ACH. 2015;63(6):388–96.

178. Talapko J, Perić I, Vulić P, Pustijanac E, Jukić M, Bekić S, i sur. Mental Health and Physical Activity in Health-Related University Students during the COVID-19 Pandemic. Healthc Basel Switz. 2021;9(7):801.

179. Wilkes C, Lewis T, Brager N, Bulloch A, MacMaster F, Paget M, i sur. Wellbeing and mental health amongst medical students in Canada. Int Rev Psychiatry. 2019;31(7–8):584–7.

180. Ramón-Arbués E, Gea-Caballero V, Granada-López JM, Juárez-Vela R, Pellicer-García B, Antón-Solanas I. The Prevalence of Depression, Anxiety and Stress and Their Associated Factors in College Students. Int J Environ Res Public Health. 2020;17(19):7001.

181. Brown JSL. Student mental health: some answers and more questions. J Ment Health Abingdon Engl. 2018;27(3):193–6.

182. Duffy A, Saunders KEA, Malhi GS, Patten S, Cipriani A, McNevin SH, i sur. Mental health care for university students: a way forward? Lancet Psychiatry. 2019;6(11):885–7.

183. Le JT, McAuliffe T, Agrawal H, Cipriano D. Utilization of Mental Health Services by Medical College of Wisconsin Trainees. WMJ Off Publ State Med Soc Wis. 2024;123(1):39–42.

184. Pacheco JP, Giacomin HT, Tam WW, Ribeiro TB, Arab C, Bezerra IM, i sur. Mental health problems among medical students in Brazil: a systematic review and meta-analysis. Rev Bras Psiquiatr. 2017;39(4):369–78.

10. Popis literature

185. Liaghatdar MJ, Ashoorion V, Avizhgan M. Compare the educational achievement of medical students with different circadian rhythms in difficult courses of basic sciences. Adv Biomed Res. 2016;5:58.

186. Raoof AM, Asaad YA, Al-Hadithi TS. Distribution of Chronotypes among a Sample of Iraqi Kurdish Medical Students. Sultan Qaboos Univ Med J. 2014;14(3):e356-360.

187. Yoon IY, Kripke DF, Elliott JA, Youngstedt SD, Rex KM, Hauger RL. Age-related changes of circadian rhythms and sleep-wake cycles. J Am Geriatr Soc. 2003;51(8):1085–91.

188. Carrier J, Semba K, Deurveilher S, Drogos L, Cyr-Cronier J, Lord C, i sur. Sex differences in age-related changes in the sleep-wake cycle. Front Neuroendocrinol. 2017;47:66–85.

189. Akpınar Ş, Tek NA. Age-Related Changes in Circadian Rhythm and Association with Nutrition. Curr Nutr Rep. 2023;12(3):376–82.

190. Muro A, Gomà-i-Freixanet M, Adan A, Cladellas R. Circadian typology, age, and the alternative five-factor personality model in an adult women sample. Chronobiol Int. 2011;28(8):690–6.

191. Yoo GS, Kim TW. The Effect of Morningness-Eveningness on Shift Work Nurses: Sleep Quality, Depressive Symptoms and Occupational Stress. Sleep Med Res. 2017;8(1):39–43.

192. Vignatelli L, Bisulli F, Naldi I, Ferioli S, Pittau F, Provini F, i sur. Excessive daytime sleepiness and subjective sleep quality in patients with nocturnal frontal lobe epilepsy: a case-control study. Epilepsia. 2006;47(Suppl 5):73–7.

193. Mokros L, Koprowicz J, Nowakowska-Domagała K, Rodak J, Pietras T. Eveningness and its possibility of predicting burnout symptoms among physicians and nurses – preliminary results. Curr Probl Psychiatry. 2018;19(1):23–9.

10. Popis literature

194. Selvi FF, Karakaş SA, Boysan M, Selvi Y. Effects of shift work on attention deficit, hyperactivity, and impulsivity, and their relationship with chronotype. Biol Rhythm Res. 2015;46(1):53–61.

195. Hasler BP, Allen JJB, Sbarra DA, Bootzin RR, Bernert RA. Morningness-eveningness and depression: preliminary evidence for the role of the behavioral activation system and positive affect. Psychiatry Res. 2010;176(2–3):166–73.

196. Prat G, Adan A. Relationships among circadian typology, psychological symptoms, and sensation seeking. Chronobiol Int. 2013;30(7):942–9.

197. Randler C. Gender differences in morningness–eveningness assessed by self-report questionnaires: A meta-analysis. Personal Individ Differ. 2007;43(7):1667–75.

198. Adan A, Natale V. Gender differences in morningness-eveningness preference. Chronobiol Int. 2002;19(4):709–20.

199. Boyle V, Shulruf B, Poole P. Influence of gender and other factors on medical student specialty interest. N Z Med J. 2014;127(1402):78–87.

200. Buddeberg-Fischer B, Klaghofer R, Abel T, Buddeberg C. Swiss residents' speciality choices – impact of gender, personality traits, career motivation and life goals. BMC Health Serv Res. 2006;6(1):137.

201. Mullola S, Hakulinen C, Presseau J, Gimeno Ruiz de Porras D, Jokela M, Hintsa T, et al. Personality traits and career choices among physicians in Finland: employment sector, clinical patient contact, specialty and change of specialty. BMC Med Educ. 2018;27;18(1):52.

202. Borges NJ, Savickas ML, Hassan MQ. Personality and Medical Specialty Choice: A Literature Review and Integration. J Career Assess. 2002;10(3):362–80.

10. Popis literature

203. Bexelius TS, Olsson C, Järnbert-Pettersson H, Parmskog M, Ponzer S, Dahlin M. Association between personality traits and future choice of specialisation among Swedish doctors: a cross-sectional study. Postgrad Med J. 2016;92(1090):441–6.

204. Krajewski-Siuda K, Szromek A, Romaniuk P, Gericke CA, Szpak A, Kaczmarek K. Emigration preferences and plans among medical students in Poland. Hum Resour Health. 2012;10(1):8.

205. Fouarge D, Özer MN, Seegers P. Personality traits, migration intentions, and cultural distance. Pap Reg Sci. 2019;98(6):2425–54.

206. Elston DM. Participation bias, self-selection bias, and response bias. J Am Acad Dermatol. 2021 Jun 18;S0190-9622(21)01129-4.

207. Puljak L, Kojundzic SL, Sapunar D. Gender and academic medicine: a good pipeline of women graduates is not advancing. Teach Learn Med. 2008;20(3):273–8.

11. Životopis

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Obrazovanje:

2024. – Sveučilište J. J. Strossmayera u Osijeku, Medicinski fakultet Osijek, Doktorski studij Biomedicina i zdravstvo.

2023. – Sveučilište u Zagrebu, Katolički bogoslovni fakultet, Licencijatski i doktorski studij teologije, modul: Etičko-moralna i društvena relevantnost teologije i Crkve

2016. – 2022.: Sveučilište u Zagrebu, Katolički bogoslovni fakultet, integrirani preddiplomski i diplomski filozofsko-teološki studij, srednja ocjena 5,00. Diplomski rad: „Teološka i psihološka analiza tamne noći svetog Ivana od Križa", mentor: izv. prof. dr. sc. Franjo Podgorelec, komentorica: doc. dr. sc. Bjanka Vuksan-Ćusa, dr. med.

2015. – 2016.: KBC Osijek, Pripravnički staž za doktore medicine

2009. – 2015.: Sveučilište J. J. Strossmayera u Osijeku, Medicinski fakultet Osijek, integrirani preddiplomski i diplomski studij medicine, srednja ocjena 5,00. Diplomski rad: "Utjecaj kuprizona na distribuciju molekularnih markera aksona," mentorica: prof. dr. sc. Marija Heffer, dr. med.

2005. – 2009.: III. gimnazija Osijek, srednja ocjena 5,00

Nagrade i stipendije:

2023.: Katolički bogoslovni fakultet, Nagrada Velikog Kancelara za najuspješnijeg diplomiranog studenta u akademskoj god. 2021./2022.

2023.: Katolički bogoslovni fakultet, Nagrada Dekana za najbolji studentski znanstveni rad u akademskoj god. 2021./2022.

10. Životopis

2019., 2020., 2021., 2022., 2023.: Katolički bogoslovni fakultet, Nagrada Dekana za najbolji uspjeh na integriranom prediplomskom i diplomskom Filozofsko-teološkom studiju u akademskoj godini 2017./2018., 2018./2019., 2019./2020., 2020./2021., 2021./2022.

2021.: Katolički bogoslovni fakultet, Nagrada Dekana za dobitnike Rektorove nagrade u akademskoj god. 2019./2020.

2020.: Sveučilište u Zagrebu, Rektorova nagrada za akademsku godinu 2019./2020.

2013. – 2015.: Stipendist Zaklade Adris

2012., 2013., 2015.: Nagrada za najbolju poster prezentaciju, Zagreb International Medical Summit (ZIMS12, ZIMS13, ZIMS15)

2015.: Sveučilište J. J. Strossmayera u Osijeku, Rektorova nagrada najboljem studentu

2014.: Nagrada Lions kluba za najbolje studente

2010. – 2013.: Stipendist Nacionalne zaklade za potporu učeničkom i studentskom standardu

2012.: Zahvalnica Medicinskog fakulteta Osijek za organizaciju Tjedna mozga

2009. – 2010.: Stipendist Ministarstva znanosti, obrazovanja i športa (Državna stipendija)

2009.: Izravan upis na Medicinski fakultet Osijek ostvarenim prvim mjestom na prijemnom ispitu

Jezici
engleski (C1); talijanski (B1); španjolski (A2); njemački (A1); mađarski (A1.1)

Demonstrature:

Katolički bogoslovni fakultet Zagreb:

2020. Katedra fundamentalne teologije: Kršćanska objava

Medicinski fakultet Osijek:

2012. – 2015.: Katedra za farmakologiju: Farmakologija

2012. – 2015.: Katedra za mikrobiologiju i parazitologiju: Mikrobiologija i parazitologija

2012. – 2015.: Katedra za medicinsku patofiziologiju: Patofiziologija

2012. – 2013.: Katedra za patologiju i sudsku medicinu: Patologija

2011. – 2013.: Katedra za fiziologiju i imunologiju: Fiziologija

2011. – 2013.: Katedra za fiziologiju i imunologiju: Imunologija

2011. – 2012.: Katedra za histologiju i embriologiju: Histologija i embriologija

2010. – 2012.: Katedra za anatomiju i neuroznanost: Anatomija

2010. – 2011.: Katedra za medicinsku kemiju, biokemiju i kliničku kemiju: Medicinska kemija i biokemija 1

Članstva:

2016. – Hrvatska liječnička komora

2013. – Hrvatsko katoličko liječničko društvo

Ostale aktivnosti:

2015.: Suradnik na znanstveno-istraživačkom projektu „Varijabilnost gena cirkadijanog ritma u osoba s infarktom miokarda RH“, voditeljice doc. dr. sc. Jasenke Wagner, koje financira Sveučilište J. J. Strossmayera u Osijeku, IZIP-2014-150

2008.: Vozačka dozvola B kategorije

2010. – 2015.: Volontiranje u Laboratoriju za neurobiologiju Medicinskog Fakulteta Osijek

2010. – 2012.: Tajnik studentskih udruga EMSA Osijek i SSHLZ Osijek

2011. – 2015.: Organizacija Tjedna mozga i aktivno sudjelovanje na Festivalu znanosti

rujan 2011: Volontiranje u Laboratoriju za neurokardiologiju Medicinskog fakulteta Sveučilišta u Splitu

ljeto 2012.: Volontiranje u Laboratoriju za medicinsku genetiku Medicinskog fakulteta Osijek

2012. – 2014.: Predsjednik studentskih udruga EMSA Osijek i SSHLZ Osijek

2013. – 2015.: Član Studentskog zbora i Fakultetskog vijeća Medicinskog fakulteta Osijek

2014.: Položeni online tečajevi Sveučilišta u Edinburghu preko Coursere: "Fundamentals of Music Theory" i "The Clinical Psychology of Children and Young People"

2014.-2016.: Vanjski suradnik-volonter opernog zbora HNK Osijek

10. Životopis

Popis publikacija

Kvalifikacijski radovi:

1. Diplomski rad. Sveučilište u Zagrebu, Katolički bogoslovni fakultet. 2022. Teološka i psihološka analiza tamne noći svetoga Ivana od Križa, mentor: izv. prof. dr. sc. Franjo Podgorelec, komentorica: doc. dr. sc. Bjanka Vuksan-Ćusa, dr. med.
2. Diplomski rad. Sveučilište J. J. Strossmayera u Osijeku, Medicinski Fakultet Osijek. 2015. Utjecaj kuprizona na distribuciju molekularnih markera aksona, mentorica: prof. dr. sc. Marija Heffer, dr. med.

Knjige:

1. Br. Jakov od Križa (Milić). Tamna noć ili depresija? Teološka i psihološka analiza tamne noći sv. Ivana od Križa. Zagreb. 2023.

Znanstveni radovi:

A) WoSCC, SCOPUS ili MEDLINE

1. Milić J, Skitarelić N, Majstorović D, Zoranić S, Čivljak M, Ivanišević K, i sur. Levels of depression, anxiety and subjective happiness among health sciences students in Croatia: a multi-centric cross-sectional study. BMC Psychiatry. 2024;24:50.
2. Faletar Živković V, Piškur I, Milić Vranješ I, Milić J, Ćosić V, Jakab J, i sur. Cervical Intraepithelial Neoplasia (CIN) - Comparison of Histological and Pap Results. Acta Med Sal. 2023;53(2):11-16
3. Milić J, Vuksan-Ćusa Z, Jakab J, Ćurčić M, Puljak L, Milić Vranješ I, i sur. Tendencies towards emigration and their association with introversion and ethnocentrism among final-year medical students from Osijek, Croatia: a cross-sectional study. BMC Med Educ. 2023;23:632
4. Runjic R, Jelicic Kadic A, Runjic E, Gudelj K, Milić J, Leite Pacheco R, i sur. Systematic review nomenclature: term "update" in the title/abstract does not necessarily

mean an update of a previous/existing systematic review. J Clin Epidemiol. 2023;154(1):1-7

5. Milić J, Vuksan-Ćusa B. Inducirani pobačaj i njegove moralne i psihičke implikacije. Nova prisutnost. 2022;20 (3):655-668
6. Milić Vranješ I, Podgornjak M, Milić J, Šijan I, Božić I, Zibar L, i sur. The Croatian version of the Body Image Scale (BIS) - Translation and Validation. Croat Med J. 2021;62:598-605.
7. Krajina I, Milić J, Vuković D, Jakić M, Zibar L. Pulmonary Rhodococcus Equi Infection In A Renal Transplant Patient: Case Report With Review Of Literature. Medica Jadertina. 2021;51(3):283-288.
8. Milić J, Škrlec I, Milić Vranješ I, Jakab J, Plužarić V, Heffer M. Importance of the Big-five in the future medical specialty preference. BMC Med Educ. 2020;20,234.
9. Milić J, Milić Vranješ I, Krajina I, Heffer M, Škrlec I. Circadian Typology and Personality Dimensions of Croatian Students of Health-related University Majors. Int J Env Res Public Health. 2020;17,4794.
10. Škrlec I, Milić J, Steiner R. The impact of circadian variations on myocardial infarction. J Clin Med. 2020;9:484.
11. Franjić BS, Milić Vranješ I, Milić J, Mrčela M. The difference in histological grades of endometrial carcinoma in curettage and hysterectomy - cross-sectional study. Med Fluminensis. 2020;56 (1):36-44.
12. Milić J, Škrlec Š, Milić Vranješ I, Podgornjak M, Heffer M. High Levels of Depression and Anxiety Among Croatian Medical and Nursing Students and the Correlation between Subjective Happiness and Personality Traits. Int Rev Psychiatry. 2019;31(7-8):653-660.

13. Škrlec I, Milić J, Cilenšek I, Petrovič D, Wagner J, Peterlin B. Circadian Clock Genes and Myocardial Infarction in Patients with Type 2 Diabetes Mellitus. Gene 2019;701:98-103.
14. Škrlec I, Milić J, Peterlin B, Wagner J, Heffer M. Circadian Clock Genes and Circadian Phenotypes in Patients with Myocardial Infarction. Adv Med Sci. 2019;64:224–229.
15. Škrlec I, Milić J, Heffer M, Steiner R, Peterlin B, Wagner J. Association of chronotype and sleepiness with myocardial infarction. Acta Clin Croat. 2018;57(3):480-486
16. Škrlec I, Milić J, Heffer M, Peterlin B, Wagner J. Genetic variations in circadian rhythm genes and susceptibility for myocardial infarction. Genet Mol Biol. 2018;41(2):403–9.
17. Hegeduš I, Milić J, Ćosić A, Buljan K, Drenjančević I. Cerebrovascular reactivity in acute hyperoxia in patients with acute ischaemic stroke. Brain Inj. 2017;31(4):560-566
18. Šimić Klarić A, Milić J, Gotovac N. Epilepsy in a boy with a developmental venous anomaly — case-based update. Childs Nerv Syst. 2015;31(6):843-846
19. Milić J, Kvolik A, Ivković M, et al. Are There Differences in Students' School Success, Biorhythm, and Daytime Sleepiness Depending on Their School Starting Times? Coll Antropol. 2014;38:889–94.

B) OSTALO

1. Milić J, Milić Vranješ I, Šantić K, Šantić A, Vuksan-Ćusa Z, Zibar L. Levels of depression and anxiety and the body image of female patients on renal replacement therapy. Psych Danub. 2022;34.(Suppl 10):79-85
2. Čarapina Zovko I, Milić J, Vucemilovic FB, Jemrić N, Sulić P, Turudić M, i sur. Translation of the Clance Impostor Phenomenon Scale Into the Croatian Language. Southeastern European Medical Journal. 2021;5(1);145-156.
3. Milić J. Sv. Elizabeta od Presvetoga Trojstva – ulazak u tišinu. Sveta Cecilija 2021;91(1-2);24-29.

4. Rad nagrađen Rektorovom nagradom. Sveučilište u Zagrebu. 2020. Milić J. Bioetički aspekti proglašenja smrti prema neurološkim kriterijima: temeljna pitanja i pitanja proizašla iz istraživanja Vrselje i suradnika. Dostupno na: https://apps.unizg.hr/rektorova-nagrada/javno/akademske-godine/2019/nagradeni-radovi
5. Berlančić T, Kuharić M, Janković D, Milić J, Badak K, Zibar L. Croatian Translation and Linguistic Adaptation of the Short Assessment of Health Literacy for Spanish Adults (SAHLSA-50). Southeastern European Medical Journal 2020;4(2);121-128.
6. Milić J, Škrlec I, Milić Vranješ I, Matić M, Sertić D, Heffer M. The Croatian translation of the Horne and Östberg Morningness-Eveningness Questionnaire with a brief review of circadian typology. Southeastern European Medical Journal 2018;2(1):1-11.
7. Hrkač H, Milić J, Zibar L. Mogući darovatelji bubrega nakon cirkulacijske smrti u Kliničkome bolničkom centru Osijek. Med Vjesnik. 2016;48(1-2):49-57.
8. Šijan I, Božić I, Milić J. Severe epileptic encephalopathies in children: West and Lennox – Gastaut syndromes. Gyrus 2015;3(2):92-96.
9. Božić I, Milić J, Šijan I. Zrcalni neuroni i njihova potencijalna uloga u psihopatologiji. Gyrus 2015;3(1):32–4.

Kongresni sažetci:

1. Krajina I, Kolobarić N, Milić J, et al. Two-Week Low-Salt Diet Significantly Reduces Serum IL-23 Levels in Psoriasis Patients – Results from a Preliminary Study. 19th RECOOP Bridges in Life Sciences Conference, Bratislava, Slovačka, 11. -12. 4. 2024.
2. Krajina I, Plužarić V, Tolušić Levak M, et al. Exclusive Low-Salt Diet Improves Clinical Outcome of Mild to Moderate Psoriasis as Soon as After a Two- Week Period. EADV Congress 2023, Berlin, Njemačka, 11. 10. 2023. - 14. 10. 2023.

10. Životopis

3. Mihalj M, Krajina I, Plužarić V, et al. 2-Week Low-Salt Diet Improves Overall Vascular Reactivity and Endothelium-Dependent Vasodilation in Psoriasis Patients. EADV Congress 2023, Berlin, Njemačka, 11. 10. 2023. - 14. 10. 2023.
4. Škrlec I, Milić J, Steiner R: The influence of the circadian genes CLOCK and ARNTL on myocardial infarction. European Human Genetics Virtual Conference 2020, Online; 6/2020.
5. Škrlec I, Milić J, Steiner R, Peterlin B: Does the Circadian Rhythm Influence Myocardial Infarction Differently in Females And Males? HDBMB 2019 Crossroads in Life Sciences, Lovran, Croatia; 9/2019.
6. Škrlec I, Milić J, Cilenšek I, Petrovič D, Peterlin B. Circadian Clock Genes and Myocardial Infarction in Patients with type 2 Diabetes Mellitus. European Human Genetics Conference, Gothenburg, Sweden, 7/2019.
7. Milić J: Salvifici Doloris – Redemptive Suffering According to st. John Paul II. 25th FIAMC Congress, Zagreb, Croatia; 5/2018.
8. Šijan I, Milić J, Božić I, Luketić V, Heffer M, Kristek J: Body image in operated breast cancer patients: the effect of surgery type and social support. The 2nd SaMED – International medical students' congress in Sarajevo, Sarajevo, Bosnia and Herzegovina; 2/2016.
9. Šijan I, Jakab J, Ćurčić M, Milić J, Sertić D, Miškulin M: Specialty preference and tendencies towards emigration of final year medical students of the Faculty of Medicine Osijek. 15th Zagreb International Medical Summit, Zagreb, Croatia; 11/2015.
10. Čurčić M, Ilinić M, Milić M, Kristek J, Šego K: Complications of surgical treatment of ischemic heart disease. 15th Zagreb International Medical Summit, Zagreb, Croatia; 11/2015.

10. Životopis

11. Šijan I, Jakab J, Milić J, Juranić B, Včev A: C-Reactive Protein and leukocytes in acute myocardial infarction. 15th Zagreb International Medical Summit, Zagreb, Croatia; 11/2015.
12. Škrlec I, Milić J, Heffer M, Steiner R, Peterlin R, Wagner J: Genetic variability in circadian rhythm genes and myocardial infarction. 6th Croatian Congress of Human Genetics, Split, Croatia, 11/2015.
13. Hrkač H, Milić J, Rnjak D, Zibar L: Deceased persons that meet the Maastricht criteria for donating kidneys after circulatory death during the one-year period (2012) in Osijek University Medical Center. DiaTransplant 2015, The 6th Croatian Symposium on Renal Replacement Therapy, Opatija, Croatia; 10/2015.
14. Škrlec I, Milić J, Heffer M, Steiner R, Peterlin B, Wagner J: Association of chronotype and daytime sleepiness with myocardial infarction. Ninth ISABS Conference in Forensic, Anthropologic and Medical Genetics and Mayo Clinic Lectures in Individualized Medicine, Bol, Croatia; 6/2015.
15. Milić J, Mrđenović S, Tot OK, Heffer M: The effect of demyelinization and volatile anesthetics on murine motor activity. 14th Zagreb International Medical Summit, Zagreb, Croatia; 11/2014.
16. Tot OK, Mrđenović S, Viljetić B, Balog M, Puljak L, Heffer M, Milić J, Fenrich M: Učinak bolnog podražaja na C57Bl/6 miševe tretirane kuprizonom. 3. Hrvatski kongres iz liječenja boli s međunarodnim sudjelovanjem, Osijek, Croatia; 05/2014.
17. Mrđenović S, Tot OK, Viljetić B, Balog M, Puljak L, Heffer M, Milić J, Fenrich M: Kako testirati nociceptivni podražaj na modelu miša C57BL/6. 3. Hrvatski kongres iz liječenja boli s međunarodnim sudjelovanjem, Osijek, Croatia; 05/2014.

10. Životopis

18. Milić J, Dodig-Ćurković K, Kralik K, Ćurković M: Frequency and properties of auto-destructive behaviour in adolescents. 10th International CROatian Student Summit, University of Zagreb, School of Medicine; 04/2014.
19. Fenrich M, Milić J, Muremi H, Zelen A: Pain Responses in C57BL/6 Cuprizone Fed Mice. University of Pécs Medical School Students' Research Conference, Pécs, Hungary; 04/2014.
20. Milić J, Božić I, Šijan I, Zibar L, Ilakovac V, Heffer M: Study habits and chronotype of students of medicine in Osijek. 3rd Student Congress of Neuroscience - Neuri 2013, Rijeka, Croatia; 04/2013.
21. Milić J, Šijan I, Božić I, Zibar L, Ilakovac V, Heffer M. Habits of medical students and the effect on daytime sleepiness. 13th Zagreb International Medical Summit for students and young doctors, Zagreb, Croatia; 11/2013.
22. Gašpar T, Milić J, Vrselja Z, Ilakovac V, Heffer M: The emotion recognition in facial expressions, music and colors. 9th International Biomedical CROatian Student Summit, Zagreb, Croatia; 03/2013.
23. Babić M, Breškić Ž, Perković R, Milić J, Heffer M: Recognition of facial expressions by doctors at the Clinical hospital center Osijek. 12th Zagreb International Medical Summit for students and young doctors, Zagreb, Croatia; 11/2012.
24. Milić J, Kvolik A, Zibar L, Heffer M: Body mass index, chronotype, and daytime sleepiness in high school students and their effect on school success. 2. Studentski kongres neuroznanosti - Neuri 2012, Rijeka, Croatia; 04/2012.
25. Milić J, Kvolik A, Babić Čikeš A, Ilakovac V, Zibar L, Heffer M: The ability of students to adapt their biorhythm to school liabilities. 11th ZIMS - Zagreb International Medical Summit, Zagreb, Croatia; 11/2011.

10. Životopis

Prevodilaštvo:

1. Milić J, Đenović M, Vranjić I, Marić A, Radić R. Bol. U: Purves D, Augustine G, Fitzpatrick D, Hall W, LaMantia A, White L, urednici. Neuroznanost. 5. izd. Zagreb: Medicinska naklada; 2016. str. 209–27.
2. Milić J, Đogaš, Z. Spavanje i budnost. U: Purves D, Augustine G, Fitzpatrick D, Hall W, LaMantia A, White L, ur. Neuroznanost. 5. izd. Zagreb: Medicinska naklada; 2016. str. 625-46.
3. Milić J, Pongrac T, Balog M. Emocije. U: Purves D, Augustine G, Fitzpatrick D, Hall W, LaMantia A, White L, ur. Neuroznanost. 5. izd. Zagreb: Medicinska naklada; 2016. str. 647-67.

11. Prilozi

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Prilog 1. Milić J, Škrlec I, Milić Vranješ I, Podgornjak M, Heffer M. High levels of depression and anxiety among Croatian medical and nursing students and the correlation between subjective happiness and personality traits. Int Rev Psychiatry. 2019;31(7–8):653–60.

Prilog 2. Milić J, Milić Vranješ I, Krajina I, Heffer M, Škrlec I. Circadian Typology and Personality Dimensions of Croatian Students of Health-Related University Majors. Int J Environ Res Public Health. 2020;17(13):4794.

Prilog 3. Milić J, Škrlec I, Milić Vranješ I, Jakab J, Plužarić V, Heffer M. Importance of the big-five in the future medical specialty preference. BMC Med Educ. 2020;20(1):234.

Prilog 4. Milić J, Vuksan-Ćusa Z, Jakab J, Ćurčić M, Puljak L, Milić Vranješ I, i sur. Tendencies towards emigration and their association with introversion and ethnocentrism among final-year medical students from Osijek, Croatia: a cross-sectional study. BMC Med Educ. 2023;23(1):632.

Prilog 5. Milić J, Skitarelić N, Majstorović D, Zoranić S, Čivljak M, Ivanišević K, i sur. Levels of depression, anxiety and subjective happiness among health sciences students in Croatia: a multi-centric cross-sectional study. BMC Psychiatry. 2024;24(1):50.

Prilog 1. Milić J, Škrlec I, Milić Vranješ I, Podgornjak M, Heffer M. High levels of depression and anxiety among Croatian medical and nursing students and the correlation between subjective happiness and personality traits. Int Rev Psychiatry. 2019;31(7–8):653–60.

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High Levels of Depression and Anxiety Among Croatian Medical and Nursing Students and the Correlation between Subjective Happiness and Personality Traits

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ABSTRACT

High levels of stress, anxiety and depression are commonly reported among medical students. The aim of this study was to determine the levels of depressive and anxiety symptoms among medical and nursing students at the University of Osijek, Croatia and their relation to subjective happiness and personality traits. This cross-sectional study included a total of 562 students. To assess the levels of depression and anxiety the PHQ-9 (The Patient Health Questionnaire), GAD-7 (Generalized Anxiety Disorder), SHS (Subjective Happiness Scale), and IPIP Big-5 questionnaires were used. A very high prevalence of both anxiety (54.5%) and depressive (60.2%) symptoms was found among medical and nursing students. Subjective happiness most strongly correlated with emotional stability and extraversion, also emotional stability correlated negatively with anxiety and depression. Nursing students scored higher on subjective happiness and in the domain of conscientiousness, but lower on depression. We could not attribute the differences in depression and anxiety to personality traits. Although the reported symptoms were mostly mild in intensity, we believe that this represents a significant public mental health concern. Appropriate measures should be taken to motivate students to seek help for their symptoms and to increase the availability of mental health services for students.

Keywords: depression; anxiety; happiness; medical students; Big-Five.

INTRODUCTION

Medical and nursing students are distinct populations that face various challenges during their education which can have a profound impact on their well-being. This has been a great subject of interest in recent years. There are various studies which document stress and burnout in medical and nursing students(Dahlin & Runeson, 2007; Deary, Watson, & Hogston, 2003; Tyssen et al., 2007; Warbah et al., 2007) and anoverall decline inwell-being during the years of education(Kjeldstadli et al., 2006). It has been documented that a substantial proportion (27%) of medical students have an ongoing psychiatric condition, but few seek help (Dahlin & Runeson, 2007).Similar results have been found among nursing students; one study reported up to 20.7% students with psychiatric morbidity(Warbah et al., 2007). Anxiety and depressive disorders are prevalent among medical students,andthe prevalence is higher than in the general population(Dyrbye, Thomas, & Shanafelt, 2006). Prevalence of depressive symptoms among medical students ranges from 14 to 44% and prevalence of anxiety symptoms from 12 to 43%(Bunevicius, Katkute, & Bunevicius, 2008). Since medical students and adolescents, in general, are less likely to seek help for these symptoms, this represents a public mental health concern(Gulliver, Griffiths, & Christensen, 2010). Therefore, it is of importance to study subjective happiness in this population and factors that could influence it. The influence of personality on well-being has been widely studied. Personality traits can account for 4 to 37% variance in subjective well-being as documented in various studies(DeNeve & Cooper, 1998; Furnham & Christoforou, 2007; Tkach & Lyubomirsky, 2006). Emotional stability and extraversion are the personality traits most often connected with subjective well-being and mental health(Furnham & Christoforou, 2007; Kotov, Gamez, Schmidt, & Watson, 2010). The specific combination of personality traits can also predict vulnerability to stress among students(Tyssen et al., 2007). Personality

traits can also predict academic success among students, especially conscientiousness (Doherty & Nugent, 2011; McLaughlin, Moutray, & Muldoon, 2008).

In this study, we explore the interplay of personality, subjective happiness and symptoms of anxiety and depression among Croatian medical and nursing students. We hypothesized that there would be differences in personality traits between the two groups of students and that the medical students would have higher levels of depression and anxiety compared to nursing students.

PARTICIPANTS AND METHODS

Participants

We conducted a cross-sectional study of 562 students (173 males) from the Faculty of Medicine Osijek, Croatia. The response rate was 72.7%. The median age of the participants was 22 (20-24).The students were divided into two groups, based on their major. The first group included medical students (MD, n=407, age 22 (20-23) yrs.), and the second included nursing students (RN, n=155, age 22 (20-31) yrs.). Nursing students were significantly older than the medical students ($p<0.001$, Mann-Whitney Test). The study was approved by the Ethical Committee of the Faculty of Medicine Osijek, Croatia. Signed informed consent was acquired from all participants of the study, and the study protocol conforms to the provisions of the Declaration of Helsinki.

Questionnaire

Students were asked to fill in a questionnaire consisting of three parts. In the first part, they were asked about their sociodemographic and academic characteristics.

It should be noted that medical school in Croatia consists of 6 years of education, is an integrated undergraduate and graduate study, and uses a traditional curriculum with the pre-clinical and clinical division. Nursing program includes a 3-year undergraduate study and a 2-year graduate program. Students are graded on a scale from 1 to 5, 1 being the lowest, and 5 the highest grade.

The second part consisted of questionnaires dealing with the students affect. The students filled out the PHQ-9, GAD-7 and SHS questionnaires.

The PHQ-9 (The Patient Health Questionnaire) is a validated instrument that has good sensitivity and specificity for detecting depressive disorders(Kurt Kroenke, Spitzer, Williams, & Löwe, 2010). Each of the nine PHQ depression items that are answered on a Likert scale corresponds to one of the DSM-IV Diagnostic Criterion for symptoms of the major depressive disorder (Kocalevent, Hinz, & Brähler, 2013; K Kroenke, Spitzer, & Williams, 2001; Löwe, Kroenke, Herzog, & Gräfe, 2004; Pinto-Meza, Serrano-Blanco, Peñarrubia, Blanco, & Haro, 2005). The PHQ-9 scores range from 0 to 27 with cut points of 5, 10, 15 and 20 representing mild, moderate, moderately severe and severe levels of depressive symptoms (Kurt Kroenke et al., 2010).

The third part consisted of the GAD-7 questionnaire. The GAD-7 (Generalized Anxiety Disorder) is a 7-item self-report questionnaire; a validated instrument developed to diagnose a generalized anxiety disorder, with good sensitivity and specificity as a screener for panic, social anxiety and PTSD (Kurt Kroenke et al., 2010). Seven questions are answered on a Likert scale (Donker, van Straten, Marks, & Cuijpers, 2011; Swinson, 2006). GAD-7 scores range from 0 to 21, with scores of ≥5, ≥10, and ≥15 representing mild, moderate, and severe anxiety symptom levels, respectively (Löwe et al., 2008).

Since all the participants spoke Croatian, validated Croatian versions of the PHQ-9 and GAD-7 were used. Since, to the author's knowledge, a Croatian version of the Subjective Happiness

Scale was not previously done, a team of translators did a translation using a modified back-translation method proposed by several authors (Brislin, 1970; Cha, Kim, & Erlen, 2007; Francisco et al., 2017; Harkness & Schoua-Glusberg, 1998; Lyubomirsky & Lepper, 1999; Ozolins, 2009; Wild et al., 2005). Two fluently bilingual medical professionals each translated the Subjective Happiness Scale into Croatian. The two versions were discussed upon, and a single version was agreedupon. A back-translation into English followed. No differences in meaning, but only small stylistically differences were observed between the original and the back-translated version. The Subjective Happiness Scale is a 4-item scale of global subjective happiness. Two items ask respondents to characterize themselves using total ratings and ratings relative to peers, while the other two items provide descriptions of happy and unhappy individuals and ask respondents the extent to which each characterization describes them. Respondents rate items on a 7-point Likert scale (Lyubomirsky & Lepper, 1999).

In the third part, students were questioned about their characteristic traits using the IPIP Big-5 questionnaire. The IPIP Big – 5 questionnaire consists of 50 or 100 item inventory. In our study, we used the 50 item version, which consists of 10 items for each of the Big-5 personality factors: Extraversion, Agreeableness, Emotional Stability, Conscientiousness, and Intellect. It should be noticed that this scale deals with the variable inverse to "Neuroticism" - "Emotional Stability", and that the variable "Openness to experience" is called "Intellect". A sentence fragment form represents each item (e.g., ‘‘I Am the life of the party’’) and participants are requested to rate how well it describes them on a 5-point scale). A Croatian translation of the IPIP Big-5 was previously validated and used in similar research (Čuljak & Mlačić, 2014; Goldberg & R., 1992; Mlačić & Goldberg, 2007).

Statistical analysis

The Kolmogorov-Smirnov test was used to assess the normality of the data distribution. Since all scalar variables deviated from a normal distribution, numerical data were described with medians and inter quartile ranges (IQ Range), and the Mann-Whitney test was used to compare the means of two independent groups. Missing data was filled in by using the means of the values next to the missing value. Correlation between variables was determined using the Spearman's rank-order correlation coefficient. $P<0.05$ was considered statistically significant. To determine the internal consistency of the Subjective Happiness scale we used the Cronbach Alpha. The analysis was conducted using the SPSS software (ver. 16.0, SPSS Inc., Chicago, IL, USA).

RESULTS

The Cronbach Alpha of the Croatian translation of the Subjective Happiness Scale in our sample was 0.818.

The scores achieved by the students on the scales used in the research and the differences between the two groups of students are presented in Figure 1.

No significant differences were found between the self-reported GPAs of the students ($p=0.067$, Mann-Whitney Test). MD students had slightly better GPAs: median 4 (4-4.45), RN students had the median GPA 4 (3.8-4.25).

Correlations between the numeric variables can be observed in Table 1.

[Table 1. near here]

Gender-related differences in the tested scalar variables are presented in Table 2.

[Table 2. near here]

Since the scores of the GAD-7 and PHQ-9 questionnaires can be divided into categories based on predefined cut points, the frequencies of those categories are presented in Table 3.

[Table 3. near here]

DISCUSSION

In our sample, 54.5% of all students experienced anxiety symptoms: 39.8% had mild, 12.6% moderate and 2% severe anxiety symptoms. The prevalence is higher than in existing literature for both medical students (44%) and students of other majors (52%) (Bunevicius et al., 2008). Prevalence in males was lower than average (47.6 %) and in females higher than average (57.8%), with a significant difference in median GAD-7 score, which is consistent with previous findings (Dyrbye et al., 2006; Hojat, Glaser, Xu, Veloski, & Christian, 1999). 60.8% of all students experienced depressive symptoms: 39.3% had mild, 16.1% moderate, 7.2% severely moderate and 0.2% severe depressive symptoms. The prevalence is significantly higher than the highest prevalence found in the literature for both medical (43%) and students of other majors (48.2%) (Bayram & Bilgel, 2008; Bunevicius et al., 2008). Although there were no significant gender differences in median PHQ-9 scores, the prevalence of depressive symptoms was lower in men than in women. Prevalence of depressive symptoms was higher in medical (64.8%) than in nursing students (57.3%), with a

significant difference in median PHQ-9 score. We will reflect on possible causes for this difference later in the discussion.

Our finding that age weakly positively correlates with Subjective Happiness is consistent with results found in the literature. It has been documented that older individuals report higher life satisfaction and life quality, although this is also due to a personal situation or history (Horley & Lavery, 1995). Most research finds that subjective well-being stays stable over time or even increases (Diener, Napa Scollon, & Lucas, 2003).

In our study, Subjective Happiness most strongly correlated with Emotional Stability (r=0.384) and Extraversion (r=0.215). Correlation between traits of Emotional Stability and Extraversion with Subjective Happiness and subjective well-being is well established in the literature (DeNeve & Cooper, 1998; Furnham & Christoforou, 2007; Furnham & Petrides, 2003; Kjeldstadli et al., 2006; Steel & Ones, 2002; Vittersø, 2001). Our finding that Emotional Stability correlates more strongly with Subjective Happiness than it does with Extraversion is in line with some of the previous findings (DeNeve & Cooper, 1998; Kjeldstadli et al., 2006; Steel & Ones, 2002) and supports the notion that effect of Extraversion on subjective well-being has been overestimated in the past(Vittersø, 2001). However, the majority of our sample were medical students. It has been documented that medical students exhibit overall higher scores in Extraversion domain (Lievens, Coetsier, De Fruyt, & De Maeseneer, 2002) which could diminish the effect of Extraversion in our sample. However, there are contradictory findings on this matter (Bunevicius et al., 2008),and it is not currently possible to assert that there are personality traits that distinguish medical students from students of other majors. Even more so, in our sample of medical and nursing students, there has been no significant difference found in the domain of Extraversion. We also found that Subjective Happiness weakly correlates with Conscientiousness (r=0.139) which is consistent with previous findings (DeNeve & Cooper, 1998; Furnham & Petrides, 2003).

Subjective Happiness inversely correlated with PHQ-9 and GAD-7 scores (r= -0.342 and r= -0.325, respectively), as expected. PHQ-9 and GAD-7 scores most strongly inversely correlated with Emotional Stability (r= -0.568 and r= -0.604) respectively, and also with Extraversion (r= -0.184 and r= -0.187, respectively). Our resultsare consistent with the previous body of research that pinpoints the association of lifetime depressive and anxiety disorders with high neuroticism and low extraversion in community samples and student population (Bienvenu et al., 2004; Bunevicius et al., 2008; Chioqueta & Stiles, 2005; Gramstad, Gjestad, & Haver, 2013; Kotov et al., 2010).

We also found that Conscientiousness positively correlated with thePHQ-9 score (r=0.226) and negatively with theGAD-7 score (r= -0.139). Previous research suggests that low Conscientiousness correlates with both anxiety and depressive symptoms (Bunevicius et al., 2008; Kotov et al., 2010). However, some researchers have suggested that, while Conscientiousness may be advantageous in early years of medical training and decreases susceptibility to stress, it might be disadvantageous in later years unless the protective effects of Extraversion are present (Doherty & Nugent, 2011). This could lead to increased susceptibility to stress-related disorders and possibly explain our positive correlation between Conscientiousness and PHQ-9 score.

We found several differences between medical and nursing students in our study. Most notably, nursing students had higher Subjective Happiness scores, higher Conscientiousness, and somewhat lower Intellect and PHQ-9 scores when compared to medical students.

There are several possible reasons for higher Subjective Happiness score of nursing students. Firstly, the most notable difference between nursing and medical students in our sample is age – nursing students were significantly older. As mentioned before, in our study age weakly correlated with Subjective Happiness and the previous body of research suggests that older people report greater life satisfaction, which could partially explain the difference in

Subjective Happiness between the two groups. Secondly, higher Conscientiousness score in our group of nursing medical students could also contribute to their higher Subjective Happiness.

Thirdly, medical students scored higher on PHQ-9,and this could also contribute to their lower Subjective Happiness, although the difference between groups on PHQ-9 scores was very low, and the prevalence of symptoms was very high for both medical (64.8%) and nursing students (57.3%).

There are several possible causes of this. It has been documented that medical students are less likely to seek help for their mental health problems (Dahlin & Runeson, 2007). However, this phenomenon is not unique to medical students. Reviews of the literature report that adolescents, in general, tend not to seek help and that perceived stigma and their self-reliance are significant barriers to seeking help for mental health problems (Gulliver et al., 2010).

Lower Subjective Happiness of medical students and the higher PHQ-9 score could be related to their curriculum and overall stressful environment. However, while medical students well-being is affected by medical training and their life satisfaction decreases during medical training (Kjeldstadli et al., 2006), there is no evidence to suggest that medical students experience more anxiety or depressive symptoms (Bunevicius et al., 2008), although the levels of psychological distress are higher than in the general population (Dyrbye et al., 2006). Increased stress and decreasing life satisfaction have also been documented in nursing students (Deary et al., 2003; Lo, 2002; Warbah et al., 2007). Therefore, it is not possible to attribute higher Subjective Happiness to college curriculum or higher prevalence of depressive disorders.

Aside from Conscientiousness, there are no significant differences between the two groups of students in other Big-5 personality domains, and therefore it is very unlikely that personality traits of students contributed to the differences in Subjective Happiness. While the link

between personality traits and subjective well-being has been well established, overall personality accounts for only 4-37% of the variance in subjective well-being across several studies (DeNeve & Cooper, 1998; Furnham & Christoforou, 2007; Tkach & Lyubomirsky, 2006). Some studies have shown that other traits, like Emotional Intelligence (EI), can account for up to 50% of the variance in well-being (Furnham & Petrides, 2003) and that EI and Extraversion are together most important predictors of happiness. Other studies emphasize the role of response to stress and coping (Kjeldstadli et al., 2006), some indicating that coping strategies account for 56% variance in happiness among students (Tkach & Lyubomirsky, 2006). Emotional Intelligence and coping strategies are the factors that could account for differences in Subjective Happiness in our sample. However, it seems that EI of nursing students is comparable with EI of other groups (Por, Barriball, Fitzpatrick, & Roberts, 2011).

Personality is quite important for long-term subjective well-being (DeNeve & Cooper, 1998), but it is possible that in medical school settings, especially when conducting cross-sectional studies, other, situational factors like stress and coping could be more important.

In our sample males scored higher on Emotional Stability, Extraversion, and Intellect, while females scored higher on Agreeableness. This is consistent with previous findings (Costa, Terracciano, & McCrae, 2001). There have been no significant gender differences in Subjective Happiness scores which is also consistent with previous findings (Diener & Ryan, 2009).

This study has several limitations. Firstly, some possible variables that could have influenced the mental health of students were not examined, such as the medical history, emotional intelligence, religious beliefs, or levels of stress. The study was done on a specific sample that, although adequately represents the sample (response rate >70%), it is still rather small, and larger, multi centric studies are required to provide a better overview of the situation. The

personal views of the participants on the topic of their well-being and detailed commentary on the difficulties they face would also be valuable. Finally, self-reported questionnaires have a limited diagnostic value, and detailed psychiatric interviews are needed to confirm our findings.

CONCLUSION

Subjective happiness among students most strongly correlated with emotional stability and extraversion, emotional stability showed moderate negative and weak negative correlation with GAD-7 and PHQ-9 scores, respectively. This is consistent with previous findings. Nursing students scored higher on subjective happiness and in the domain of conscientiousness when compared to medical students. Medical students scored higher on PHQ-9. Since there was no significant difference in the domains of the Big Five aside from conscientiousness, we could not attribute this difference to personality traits. This difference could be accounted for by age, conscientiousness, PHQ-9 score and other factors that were not measured in this study, like emotional intelligence and strategies for coping with stress. Most notable finding in our study was the very high prevalence of both anxiety (54.5%) and depressive (60.2%) symptoms among medical and nursing students, higher than in all reviewed literature. Although the reported symptoms were mostly mild in intensity, we believe that this represents a significant public mental health concern. Appropriate measures should be taken to motivate students to seek help for their symptoms and to increase the availability of mental health services for students.

References

Bayram, N., & Bilgel, N. (2008). The prevalence and socio-demographic correlations of

depression, anxiety and stress among a group of university students. *Social Psychiatry and Psychiatric Epidemiology*, *43*(8), 667–672. https://doi.org/10.1007/s00127-008-0345-x

Bienvenu, O. J., Samuels, J. F., Costa, P. T., Reti, I. M., Eaton, W. W., & Nestadt, G. (2004). Anxiety and depressive disorders and the five-factor model of personality: A higher- and lower-order personality trait investigation in a community sample. *Depression and Anxiety*, *20*(2), 92–97. https://doi.org/10.1002/da.20026

Brislin, R. W. (1970). Back-Translation for Cross-Cultural Research. *Journal of Cross-Cultural Psychology*, *1*(3), 185–216. https://doi.org/10.1177/135910457000100301

Bunevicius, A., Katkute, A., & Bunevicius, R. (2008). Symptoms of Anxiety and Depression in Medical Students and in Humanities Students: Relationship With Big-Five Personality Dimensions and Vulnerability To Stress. *International Journal of Social Psychiatry*, *54*(6), 494–501. https://doi.org/10.1177/0020764008090843

Cha, E.-S., Kim, K. H., & Erlen, J. A. (2007). Translation of scales in cross-cultural research: issues and techniques. *Journal of Advanced Nursing*, *58*(4), 386–395. https://doi.org/10.1111/j.1365-2648.2007.04242.x

Chioqueta, A. P., & Stiles, T. C. (2005). Personality traits and the development of depression, hopelessness, and suicide ideation. *Personality and Individual Differences*, *38*(6), 1283–1291. https://doi.org/10.1016/J.PAID.2004.08.010

Costa, P. T., Terracciano, A., & McCrae, R. R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology*, *81*(2), 322–331. https://doi.org/10.1037/0022-3514.81.2.322

Čuljak, Z., & Mlačić, B. (2014). The Big-Five Model of Personality and the Success of High School Students in Physical Education. *Croatian Journal of Education*, *16*(2), 471–490. Retrieved from http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=184604

Dahlin, M. E., & Runeson, B. (2007). Burnout and psychiatric morbidity among medical students entering clinical training: a three year prospective questionnaire and interview-based study. *BMC Medical Education*, *7*(1), 6. https://doi.org/10.1186/1472-6920-7-6

Deary, I. J., Watson, R., & Hogston, R. (2003). A longitudinal cohort study of burnout and attrition in nursing students. *Journal of Advanced Nursing*, *43*(1), 71–81. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12801398

DeNeve, K. M., & Cooper, H. (1998). The happy personality: a meta-analysis of 137 personality traits and subjective well-being. *Psychological Bulletin*, *124*(2), 197–229. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9747186

Diener, E., Napa Scollon, C., & Lucas, R. E. (2003). The evolving concept of subjective well-being: the multifaceted nature of happiness. In *Advances in Cell Aging and Gerontology* (Vol. 15, pp. 187–219). Elsevier. https://doi.org/10.1016/S1566-3124(03)15007-9

Diener, E., & Ryan, K. (2009). Subjective Well-Being: A General Overview. *South African Journal of Psychology*, *39*(4), 391–406. https://doi.org/10.1177/008124630903900402

Doherty, E. M., & Nugent, E. (2011). Personality factors and medical training: a review of the literature. *Medical Education*, *45*(2), 132–140. https://doi.org/10.1111/j.1365-2923.2010.03760.x

Donker, T., van Straten, A., Marks, I., & Cuijpers, P. (2011). Quick and easy self-rating of Generalized Anxiety Disorder: Validity of the Dutch web-based GAD-7, GAD-2 and GAD-SI. *Psychiatry Research*, *188*(1), 58–64. https://doi.org/10.1016/j.psychres.2011.01.016

Dyrbye, L. N., Thomas, M. R., & Shanafelt, T. D. (2006). Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. *Academic Medicine : Journal of the Association of American Medical Colleges*, *81*(4), 354–373. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/16565188

Francisco, A. P., Oliveira, M. A. B. de, Carissimi, A., Fabris, R. C., Ilgenfritz, C. A. V., Souza, C. M. de, … Hidalgo, M. P. L. (2017). Spanish translation of the mood rhythm instrument: a novel approach to mood evaluation. *Clinical & Biomedical Research*, *37*(1), 41–47. Retrieved from http://seer.ufrgs.br/index.php/hcpa/article/view/69877

Furnham, A., & Christoforou, I. (2007). Personality Traits, Emotional Intelligence, and Multiple Happiness. *North American Journal of Psychology*, *9*(3), 439–462. Retrieved from http://eds.b.ebscohost.com/abstract?site=eds&scope=site&jrnl=15277143&AN=27729805&h=ZBeorqm%2FVf1zfbpIqgnK4CtIbfdtRfwU9LXAq7G%2F4CJ5rKsudjc2U20A4j3o25qU%2FE6xBn8q%2FH51aleCgDTMtg%3D%3D&crl=c&resultLocal=ErrCrlNoResults&resultNs=Ehost&crlhashurl=login.aspx

Furnham, A., & Petrides, K. V. (2003). TRAIT EMOTIONAL INTELLIGENCE AND HAPPINESS. *Social Behavior and Personality: An International Journal*, *31*(8), 815–823. https://doi.org/10.2224/sbp.2003.31.8.815

Goldberg, L. R. L., & R., L. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment*, *4*(1), 26–42. https://doi.org/10.1037/1040-3590.4.1.26

Gramstad, T. O., Gjestad, R., & Haver, B. (2013). Personality traits predict job stress, depression and anxiety among junior physicians. *BMC Medical Education*, *13*(1), 150. https://doi.org/10.1186/1472-6920-13-150

Gulliver, A., Griffiths, K. M., & Christensen, H. (2010). Perceived barriers and facilitators to mental health help-seeking in young people: a systematic review. *BMC Psychiatry*, *10*(1), 113. https://doi.org/10.1186/1471-244X-10-113

Harkness, J. A., & Schoua-Glusberg, A. (1998). Questionnaires in Translation. *ZUMA-Nachrichten Spezial*, (1), 87–126. Retrieved from

https://isites.harvard.edu/fs/docs/icb.topic506406.files/znspez3_04_Harkness_Glusberg.pdf

Hojat, M., Glaser, K., Xu, G., Veloski, J. J., & Christian, E. B. (1999). Gender comparisons of medical students' psychosocial profiles. *Medical Education, 33*(5), 342–349. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10336769

Horley, J., & Lavery, J. J. (1995). Subjective well-being and age. *Social Indicators Research, 34*(2), 275–282. https://doi.org/10.1007/BF01079200

Kjeldstadli, K., Tyssen, R., Finset, A., Hem, E., Gude, T., Gronvold, N. T., … Vaglum, P. (2006). Life satisfaction and resilience in medical school – a six-year longitudinal, nationwide and comparative study. *BMC Medical Education, 6*(1), 48. https://doi.org/10.1186/1472-6920-6-48

Kocalevent, R.-D., Hinz, A., & Brähler, E. (2013). Standardization of the depression screener Patient Health Questionnaire (PHQ-9) in the general population. *General Hospital Psychiatry, 35*(5), 551–555. https://doi.org/10.1016/j.genhosppsych.2013.04.006

Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin, 136*(5), 768–821. https://doi.org/10.1037/a0020327

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606–613. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11556941

Kroenke, K., Spitzer, R. L., Williams, J. B. W., & Löwe, B. (2010). The Patient Health Questionnaire Somatic, Anxiety, and Depressive Symptom Scales: a systematic review. *General Hospital Psychiatry, 32*(4), 345–359. https://doi.org/10.1016/j.genhosppsych.2010.03.006

Lievens, F., Coetsier, P., De Fruyt, F., & De Maeseneer, J. (2002). Medical students'

personality characteristics and academic performance: a five-factor model perspective. *Medical Education*, *36*(11), 1050–1056. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12406265

Lo, R. (2002). A longitudinal study of perceived level of stress, coping and self-esteem of undergraduate nursing students: an Australian case study. *Journal of Advanced Nursing*, *39*(2), 119–126. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12100655

Löwe, B., Decker, O., Müller, S., Brähler, E., Schellberg, D., Herzog, W., & Herzberg, P. Y. (2008). Validation and Standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the General Population. *Medical Care*, *46*(3), 266–274. https://doi.org/10.1097/MLR.0b013e318160d093

Löwe, B., Kroenke, K., Herzog, W., & Gräfe, K. (2004). Measuring depression outcome with a brief self-report instrument: sensitivity to change of the Patient Health Questionnaire (PHQ-9). *Journal of Affective Disorders*, *81*(1), 61–66. https://doi.org/10.1016/S0165-0327(03)00198-8

Lyubomirsky, S., & Lepper, H. S. (1999). A Measure of Subjective Happiness: Preliminary Reliability and Construct Validation. *Social Indicators Research*, *46*(2), 137–155. https://doi.org/10.1023/A:1006824100041

McLaughlin, K., Moutray, M., & Muldoon, O. T. (2008). The role of personality and self-efficacy in the selection and retention of successful nursing students: a longitudinal study. *Journal of Advanced Nursing*, *61*(2), 211–221. https://doi.org/10.1111/j.1365-2648.2007.04492.x

Mlačić, B., & Goldberg, L. R. (2007). An Analysis of a Cross-Cultural Personality Inventory: The IPIP Big-Five Factor Markers in Croatia. *Journal of Personality Assessment*, *88*(2), 168–177. https://doi.org/10.1080/00223890701267993

Ozolins, U. (2009). Back translation as a means of giving translators a voice. *The*

International Journal of Translation & Interpreting Research, 1(2), 1–13. https://doi.org/10.12807/T&I.V1I2.38

Pinto-Meza, A., Serrano-Blanco, A., Peñarrubia, M. T., Blanco, E., & Haro, J. M. (2005). Assessing depression in primary care with the PHQ-9: Can it be carried out over the telephone? *Journal of General Internal Medicine*, *20*(8), 738–742. https://doi.org/10.1111/j.1525-1497.2005.0144.x

Por, J., Barriball, L., Fitzpatrick, J., & Roberts, J. (2011). Emotional intelligence: Its relationship to stress, coping, well-being and professional performance in nursing students. *Nurse Education Today*, *31*(8), 855–860. https://doi.org/10.1016/j.nedt.2010.12.023

Steel, P., & Ones, D. S. (2002). Personality and happiness: A national-level analysis. *Journal of Personality and Social Psychology*, *83*(3), 767–784. Retrieved from http://psycnet.apa.org/buy/2002-17813-019

Swinson, R. P. (2006). The GAD-7 scale was accurate for diagnosing generalised anxiety disorder. *Evidence-Based Medicine, 11*(6), 184–184. https://doi.org/10.1136/ebm.11.6.184

Tkach, C., & Lyubomirsky, S. (2006). How Do People Pursue Happiness?: Relating Personality, Happiness-Increasing Strategies, and Well-Being. *Journal of Happiness Studies*, *7*(2), 183–225. https://doi.org/10.1007/s10902-005-4754-1

Tyssen, R., Dolatowski, F. C., Røvik, J. O., Thorkildsen, R. F., Ekeberg, Ø., Hem, E., … Vaglum, P. (2007). Personality traits and types predict medical school stress: a six-year longitudinal and nationwide study. *Medical Education*, *41*(8), 781–787. https://doi.org/10.1111/j.1365-2923.2007.02802.x

Vittersø, J. (2001). Personality traits and subjective well-being. *Personality and Individual Differences*, *31*(6), 903–914. https://doi.org/10.1016/S0191-8869(00)00192-6

Warbah, L., Sathiyaseelan, M., Vijayakumar, C., Vasantharaj, B., Russell, S., & Jacob, K. S. (2007). Psychological distress, personality, and adjustment among nursing students. *Nurse Education Today*, *27*(6), 597–601. https://doi.org/10.1016/j.nedt.2006.09.002

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., … ISPOR Task Force for Translation and Cultural Adaptation. (2005). Principles of Good Practice for the Translation and Cultural Adaptation Process for Patient-Reported Outcomes (PRO) Measures: Report of the ISPOR Task Force for Translation and Cultural Adaptation. *Value in Health*, *8*(2), 94–104. https://doi.org/10.1111/j.1524-4733.2005.04054.x

Table legend

TABLE 1. Correlations (Spearman's rho) of age, GPA, scores of the Subjective Happiness Scale (SHS), the domains of the IPIP Big-5 questionnaire, PHQ-9 (The patient health questionnaire-9) and GAD-7 (Generalized Anxiety Disorder-7) scales. (N=562)

	GPA	PHQ-9	GAD-7	SHS	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Intellect
Age	-0,218**	-0.037*	0.044	0.145*	0.017	-0.081	0.032	0.024	-0.101*
GPA		-0.072	-0.047	-0.003	0.092*	0.033	0.1307*	0.009	0.101*
PHQ-9			0.729**	-0.342**	-0.184**	-0.024	0.226**	-0.568**	0.034
GAD-7				-0.325**	-0.187**	-0.006	-0.139*	-0.604**	0.007
SHS					0.215**	0.030	0.139*	0.384**	0.068
Extraversion						0.239**	0.144*	0.243**	0.308**
Agreeableness							0.271**	0.066	0.353**
Conscientiousness								0.290**	0.219**
Emotional Stability									0.090

*p<0.05, Spearman's rho

**p<0.01, Spearman's rho

TABLE 2. Medians and Interquartile ranges of the students' GPAs, scores of the Subjective Happiness Scale (SHS), the domains of the IPIP Big-5 questionnaire, PHQ-9 (The

patient health questionnaire-9) and GAD-7 (Generalized Anxiety Disorder-7) scales and the gender-related differences (N=562).

Variable	Male Median (IQR)	Female	All students	p-value*
GPA	4 (3.9-4.5)	4 (4-4.37)	4 (3.9-4.4)	0.310
Happiness	18 (16-20)	16 (16-20)	18 (16-20)	0.920
PHQ-9	6 (3-9.5)	6 (4-10)	6 (3-10)	0.249
GAD-7	4 (2-8)	5 (3-8)	5 (3-8)	0.022
Extraversion	34 (30-39)	33 (29-37)	33 (29-38)	0.040
Agreeableness	37 (31.5-40)	39 (35-42.5)	38 (34-42)	<0.001
Conscientiousness	36 (31-41)	37 (32-41)	36 (32-41)	0.377
Emotional Stability	34 (29-39)	32 (28-36)	32 (28-37)	<0.001
Intellect	37 (33-41)	35 (32-40)	36 (32-40)	0.021

*Mann-Whitney Test

TABLE 3. The frequencies and percentages of the categories of depressive and anxiety symptoms according to the GAD-7 (Generalized Anxiety Disorder-7) and PHQ-9 (The patient health questionnaire-9) questionnaires. Groups are divided by gender and by university major - medicine (MD) and nursing (RN). (N=562).

		n(%)				
		Males	Females	MD	RN	Total
GAD-7	Low anxiety	88 (52.4)	157 (42.4)	179 (46)	66 (44.3)	245 (45.5)
	Mild anxiety	58 (34.5)	156 (42.2)	152 (39.1)	62 (41.6)	214 (39.8)
	Moderate anxiety	21 (12.5)	47 (12.7)	49 (12.6)	19 (12.8)	68 (12.6)
	Severe anxiety	1 (0.6)	10 (2.7)	9 (2.3)	2 (1.3)	11 (2)
PHQ-9	Low levels of depressive symptoms	70 (41.4)	133 (35.4)	139 (35.2)	64 (42.7)	203 (37.2)
	Mild depressive symptoms	60 (35.5)	154 (41)	158 (40)	56 (37.3)	214 (39.3)
	Moderate depressive symptoms	30 (17.8)	58 (15.4)	67 (17)	21 (14)	88 (16.1)
	moderately severe depressive symptoms	9 (5.3)	30 (8)	31 (7.8)	8 (5.3)	39 (7.2)
	Severe depressive symptoms	0	1 (0.3)	0	1 (0.7)	1 (0.2)

Figure legend

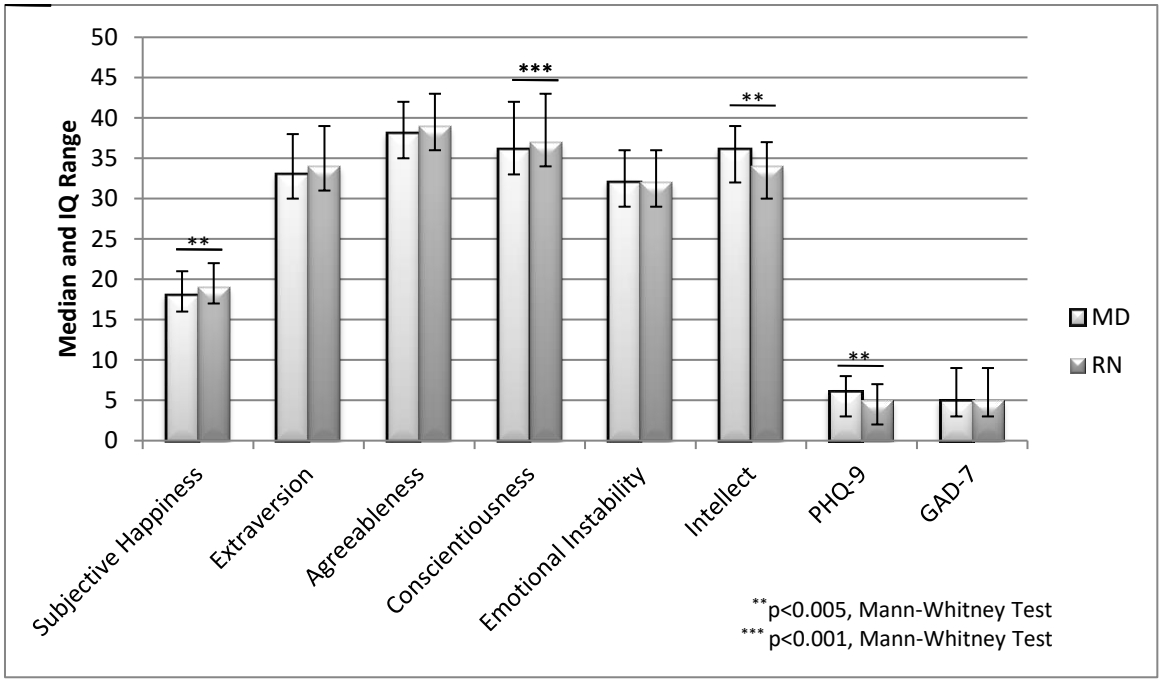

FIGURE 1. Medical (MD) and Nursing (RN) Students' scores on the Subjective Happiness Scale, the domains of the IPIP Big-5 questionnaire, PHQ-9 (The patient health questionnaire-9) and GAD-7 (Generalized Anxiety Disorder-7) scales, and the differences between the groups. (N=562)

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Circadian Typology and Personality Dimensions of Croatian Students of Health-Related University Majors

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Abstract: The aim of this study was to determine the relationship between circadian preferences and personality dimensions among 712 students of three different majors from the Faculty of Medicine, Osijek: medical students (MD), nursing students (RN) and medical laboratory diagnostics students (MLD). For the measurement of personality dimensions, the IPIP50 Big-Five questionnaire was used. The circadian preference of students was assessed using the reduced morningness-eveningness questionnaire (rMEQ). Several significant results were observed and there was a significant difference in circadian preference among the three tested groups, with RN students scoring highest on the morningness scale and MLD students scoring the lowest. RN students scored significantly higher on agreeableness and conscientiousness than the other two groups. On the other hand, MD students scored higher on intellect than the MLD students. MLD students scored the lowest on emotional stability scales. Morning type students had higher conscientiousness and emotional stability scores. These results imply that circadian preference and personality traits are crucial elements of medical professionals' wellbeing. With this paper, we would like to raise awareness about common personality traits and adherence to certain circadian orientations in medical professionals as a motivation to introduce a more flexible view towards strict time and task divisions in everyday practice.

Keywords: morningness-eveningness; chronobiology; medical students; university students; Big-Five

1. Introduction

Students differ in their biological rhythms, such as wake time, bedtime or time at which they feel at their best [1,2]. Circadian rhythms show many physiological processes with the most prominent circadian rhythms in mammals being sleep and waking. Physiological rhythms are also seen in core body temperature, secretion of hormones such as cortisol and melatonin and activity of many organ systems. The suprachiasmatic nucleus (SCN) is the central pacemaker or the master clock in mammals [3]. Circadian preference shows substantial differences in biological and behavioral parameters [1,2]. In the concept of circadian preference, individuals may be classified in one of three chronotypes: morning, neither and evening type [4]. About 60% of the adult population is classified as neither type, while 40% are in one of the two extreme groups [1]. Studies show that most medical students (52.6% to 67.2%) are neither type [5–7], which is similar to the adult population.

For the understanding of the relationships between circadian rhythms and behavior, in the past, research on personality has been conducted using different questionnaires and morningness measures [8,9]. The International Personality Item Pool Five-Factor model (IPIP Big-Five) has five broad dimensions: extraversion, agreeableness, conscientiousness, emotional stability and intellect [10]. The dimensions of the IPIP Big-Five model have proved crucial in predicting achievements in life, especially educational and academic success [11]. Previous studies have reported an association between personality dimensions and a wide range of mental problems. Lower emotional stability is associated with anxiety, depression and other negative emotions [11–16], while higher extroversion protects against depressive symptoms [16,17]. Circadian preference has been considered a potential intervening factor in affective and other minor psychiatric disorders [18] and chronotype has been found to correlate with some personality dimensions [19]. Studies show that evening preference is associated with impulsivity, more depressive symptoms and possible psychiatric diseases [18–21]. In the literature are many inconsistent results regarding the correlation between circadian preference and personality dimensions. Meta-analyses results show that morningness is related to conscientiousness and, in a smaller degree, to agreeableness [19,22–24], while extraversion and intellect are related to eveningness [22,23]. Low emotional stability scores, associated with evening types, might indicate a tendency for frustration, emotional instability and depression [12,16]. Jackson and Gerard proposed that conscientiousness is the personality dimension that best distinguishes diurnal types [25]. The link between circadian rhythm and personality is a potential common neurobiological model because serotonin is implicated in both control of circadian rhythm as well as an individual's psychological state. Serotonergic inputs to the SCN adjust the entrainment of circadian rhythms to light and also regulate activity-induced shifts in the circadian rhythm [26,27] and personality [28].

The majority of the conducted research is based on a single student population, such as medical students or psychology students, and all the studies analyze the influence of personality dimensions on circadian preference or vice versa. No studies compare personality dimensions and morningness-eveningness orientation between physicians, nurses and laboratory assistants. Circadian preferences and personality differences, which could relate to students' future jobs, might be present between students from distinct study programs as early as in student age. Circadian preferences change with age, while personality dimensions are relatively stable throughout time [29]. Different types of people choose different study programs that differ from each other due to workload and schedule. It is considered that medical students have more study materials and less free time. This information raises interest into whether medical students have morning preferences or are more evening-orientated, compared to other study programs, and how medical professionals differ in personality dimensions. Students' lectures are usually held in the morning and this could lead to sleep deprivation. Previous research at our faculty has shown that over 50% of students are depressed [16]. Determining students' circadian preferences might help us assess their schedule, whether it fits their habits or should be changed. Furthermore, assessing personality dimensions between different majors could be useful in the evaluation of which personality traits contribute to the later chronotype and whether those personality traits might contribute to affective disorders. It is well known that neuroticism (e.g., low emotional stability) leads to affective disorders [15,18]. Medical students (MD), nursing students (RN) and medical laboratory diagnostics students (MLD) were analyzed separately because these three groups differ in many respects. We expect MD to be more ambitious and emotionally more stable than other students. RN would be more sensitive and perhaps more extroverted. This difference can be reflected in the circadian preferences and, consequently, in possible affective disorders.

The aim of the study was to investigate the relationship between the students' major and personality dimensions on the one hand and circadian preferences on the other. Furthermore, the aim was to study the relationship between circadian preference and personality dimensions in students of different majors. To the authors' knowledge, rMEQ has not been used in research in Croatia to this point. The further aim was to assess the psychometric reliability of the instrument in the population

of students from biomedical studies. In this case, medical doctors, nursing students and medical laboratory diagnostic students from the Faculty of Medicine, Osijek, Croatia.

2. Participants and Methods

2.1. Participants

A cross-sectional study was conducted from 7 January to 15 June 2016, on 944 students from the Faculty of Medicine Osijek, Croatia. Out of these, 712 students (201 males) completed the survey (the response rate was 75.43%). All participants were anonymous and unpaid volunteers, asked to fill in the questionnaire after lectures in person and all gave their written informed consent before inclusion in the study. All students enrolled in 2015/2016 were involved in the research, which includes students of all study years. Inclusion criteria: medical, nursing and medical laboratory diagnostics students present at class on the day of data collection. There were no specific exclusion criteria. The average age of the participants was 22.93 ± 5.88. Participants were divided into three groups, based on their major: (1) medical students (MD, n = 407 (150 males), age 21.63 ± 2.06 yrs), (2) nursing students (RN, n = 155 (23 males), age 26.79 ± 8.94 yrs), and (3) medical laboratory diagnostics students (MLD, n = 150 (28 males), age 22.53 ± 7.17 yrs). Students were grouped in those three groups to compare whether there is any difference between different healthcare professions concerning personality dimensions and morningness-evenings orientation. The study was approved by the Ethical Committee of the Faculty of Medicine Osijek (Number 2158-61-07-15-77). The present study was conducted according to the Declaration of Helsinki and its amendments.

2.2. Questionnaires

Students were asked to fill in a questionnaire consisting of three parts. In the first part, they were asked about their socio-demographic and academic characteristics.

The second part consisted of the reduced morningness-eveningness questionnaire (rMEQ). The MEQ was developed by Horne and Östberg and is the most widely used morningness measure [4]. Adan and Almirall developed the reduced MEQ (rMEQ) [30]. This scale contains five items, and the correlation between the rMEQ and the MEQ ranges from satisfactory to excellent (0.69–0.90) [1]. The total rMEQ score, obtained by summing the scores of each question, ranges from 4 to 25, with higher rMEQ scores indicating a morningness preference. We used the cut-offs as suggested by Adan and Almirall [30] to divide our sample into three circadian groups (morning types, neither types and evening types). In this study, the questions of the rMEQ were drawn from a Croatian translation of the MEQ [31] previously used in similar research [8].

In the third part, students were questioned about their characteristic traits using the International Personality Item Pool Five-Factor questionnaire (IPIP Big-5). The IPIP was created by Goldberg for the development of advanced measures of personality traits and other individual differences [32]. We measured personality traits with the Croatian version of the questionnaire IPIP Big-Five with 50 items (short version) [33]. Participants were asked to read each of the 50 items and then rate how well they believed it described them on a 5-point rating scale ranging from 1 (very inaccurate) to 5 (very accurate) as in the original instrument [32]. This scale was used for several reasons: there is a scarcity of validated psychological instruments in Croatian when compared to larger countries; this instrument is open access and proved useful in similar research on students [16]; it contains 50 questions which makes it large enough to provide good internal validity, but is short enough to be useful in large cross-sectional studies; it has good psychometrical properties [34]. In the original American sample the Cronbach alpha scores were as follows: extraversion 0.87, agreeableness 0.82, conscientiousness 0.79, emotional stability 0.86, and intellect/imagination 0.84; the validated Croatian instrument had similar Cronbach alpha scores: 0.87, 0.79, 0.81, 0.88, and 0.79 [33].

2.3. Statistical Analyses

Cronbach alpha scores were calculated to assess the reliability of the instruments. The dimension reduction was performed using a principal component analysis (PCA). A Kolmogorov–Smirnov test was used to assess the normality of the data distribution. IPIP Big-Five and rMEQ variables deviated from a normal distribution, but due to the large sample size, it was possible to use parametric tests. Numerical data were described as means and standard deviations (SD). To compare the means of two or more independent groups, a *t*-test and one-way ANOVA tests were used, respectively. Effect sizes were calculated using the formulas suggested by Tomczak and Tomczak [35] and Fritz et al. [36]. Even though the distribution deviated from normal, the large sample size allowed for the use of analyses of covariance (ANCOVA) considering the total score of each dimension of the IPIP Big-Five and rMEQ score as a dependent variables and taking study majors as factor, while age was considered as a covariate to control for possible effects. The partial eta-squared (η_p^2) was obtained as a measure of effect size, and the observed statistical power for significant effects was >0.90. Correlation between variables was determined using the Pearson's rank-order correlation coefficient. $p < 0.05$ was considered statistically significant, and all values were adjusted for multiple testing, according to Bonferroni. The analysis was conducted using SPSS software (ver. 16.0, SPSS Inc., Chicago, IL, USA).

3. Results

3.1. Reliability of IPIP 50 Big Five and rMEQ

The Cronbach alpha for the rMEQ in the total sample was 0.638. Detailed information on corrected item-total correlations, alpha if items deleted and factor loadings of the items of the Croatian rMEQ are presented in Table 1. Inter-item correlations of the items of the Croatian rMEQ are presented in Table 2.

Table 1. Item means and standard deviations, corrected item-total correlations, alpha if items deleted and factor loadings of the items of the Croatian rMEQ (n = 712).

Item	Mean ± SD	Corrected Item-Total Correlations	Alpha If Item Deleted	Factor Loadings
1. Considering only your own "feeling best" rhythm, at what time would you get up if you were entirely free to plan your day?				
	2.87 ± 0.87	0.502	0.557	0.743
2. During the first half-hour after having woken in the morning, how tired do you feel?				
	2.29 ± 0.76	0.357	0.611	0.607
3. At what time in the evening do you feel tired and as a result in need of sleep?				
	2.76 ± 1.46	0.244	0.673	0.388
4. At what time of the day do you think that you reach your "feeling best" peak?				
	2.70 ± 0.79	0.536	0.554	0.755
5. One hears about "morning" and "evening" types of people. Which one of these do you consider yourself to be?				
	2.69 ± 1.83	0.577	0.490	0.816

Table 2. Inter-item correlations of the items of the Croatian rMEQ (n = 712).

Variable	Item 2	Item 3	Item 4	Item 5
Item 1	0.360	0.164	0.397	0.477
Item 2		0.073	0.295	0.338
Item 3			0.182	0.251
Item 4				0.543

Cronbach alphas for the subscales of the IPIP Big-5 were as follows: extraversion 0.82, agreeableness 0.73, conscientiousness 0.71, emotional stability 0.86, intelligence 0.77.

The results from the principal component analysis (PCA) showed a single factor solution of the rMEQ scale, Eigenvalue 2.308, that explained 46.17% of the variance. The Kaiser–Meyer–Olkin (KMO) test showed acceptable sampling adequacy (0.750) with an approximated Chi-Square 641.875. Bartlett's test showed no redundancy ($p < 0.001$, df 10).

3.2. IPIP 50 Big-Five and rMEQ Related Differences between Different Majors

Several significant differences were found between the students of different majors (Table 3). There was a significant age difference between the groups ($p < 0.001$, one-way ANOVA, F (2) = 49.23, $\eta^2 = 0.12$). Nursing students were significantly older than MD students ($p < 0.001$, t-test, t (558) = 10.93, Cohen's d = 1.04), and MLD students ($p < 0.001$, t-test, t (301) = 4.56, Cohen's d = 0.53). MLD students were significantly older than MD students ($p < 0.001$, t-test, t (555) = 2.29, Cohen's d = 0.22).

Table 3. Descriptive statistics of the reduced Morningness-eveningness questionnaire (rMEQ) and the domains of the IPIP 50 Big-Five questionnaire and the differences between the groups (n = 712).

Variable	MD	RN	MLD	All Students	ANOVA *		
	n = 407	n = 155	n = 150				
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F	p-Value	η^2
Age	21.63 ± 2.1	26.79 ± 8.94	22.53 ± 7.17	22.93 ± 5.88	49.23	<0.001	0.12
rMEQ	13.23 ± 4.1	14.47 ± 3.13	12.35 ± 3.89	13.32 ± 3.89	11.84	<0.001	0.03
Extraversion	33.14 ± 6.69	33.62 ± 5.56	32.15 ± 6.52	33.04 ± 6.44	2.12	0.121	0.01
Agreeableness	37.66 ± 6.35	38.68 ± 5.12	36.93 ± 5.72	37.73 ± 5.99	3.32	0.037	0.01
Conscientiousness	35.49 ± 6.75	37.53 ± 5.49	35.24 ± 5.88	35.89 ± 6.37	6.78	0.001	0.02
Emotional Stability	32.16 ± 7.49	32.45 ± 6.06	29.81 ± 6.83	31.73 ± 7.13	7.09	0.001	0.02
Intellect	36.84 ± 5.46	35.27 ± 5.49	35.39 ± 5.28	36.19 ± 5.47	6.77	0.001	0.02

MD–medical students; RN–nursing students; MLD–medical laboratory diagnostics students; SD–standard deviation; * one-way ANOVA df 2, 711.

As it can be seen in Table 3, RN students scored higher than MD students ($p = 0.001$, t-test, t (560) = 3.45, Cohen's d = 0.33), and the MLD students ($p < 0.001$, t-test, t (303) = 5.24, Cohen's d = 0.60) on the rMEQ and the MD students scored higher than the MLD students ($p = 0.023$, t-test, t (555) = 2.28, Cohen's d = 0.22).

MD students scored significantly lower than RN students on the conscientiousness subscale ($p = 0.001$, t-test, t (560) = 3.35, Cohen's d = 0.32) but scored higher on the intellect subscale ($p = 0.002$, t-test, t (560) = 3.05, Cohen's d = 0.29). MD students also scored significantly higher on both the intellect ($p = 0.005$, t-test, t (555) = 2.79, Cohen's d = 0.27) and emotional stability subscales when compared with the MLD students ($p = 0.001$, t-test, t (555) = 3.36, Cohen's d = 0.32). Nursing students scored significantly higher on the extraversion ($p = 0.035$, t-test, t (303) = 2.12, Cohen's d = 0.24), agreeableness ($p = 0.005$, t-test, t (303) = 2.81, Cohen's d = 0.32), conscientiousness ($p = 0.001$, t-test, t (303) = 3.51, Cohen's d = 0.40) and the emotional stability scale ($p < 0.001$, t-test, t (303) = 3.57, Cohen's d = 0.41) than the MLD students (Figure 1).

An ANCOVA showed that nursing students presented higher average scores in agreeableness ($F_{(2706)} = 4.356$; $p = 0.013$; $\eta_p^2 = 0.012$), and conscientiousness ($F_{(2706)} = 7.428$; $p < 0.001$; $\eta_p^2 = 0.021$), while MLD students had the lowest score in emotional stability ($F_{(2706)} = 7.316$; $p < 0.001$; $\eta_p^2 = 0.02$). MD students had the highest score in intellect dimension ($F_{(2706)} = 3.575$; $p = 0.029$; $\eta_p^2 = 0.01$). Post-hoc comparisons between students' major groups for personality dimensions indicated that the RN students had a significantly higher agreeableness score when compared with MLD (2.04, $p = 0.012$). Furthermore, RN students had a significantly higher conscientiousness score when compared with the MD (2.29, $p < 0.001$) and MLD students (2.52, $p = 0.002$). MLD students had a significantly lower emotional stability score when compared with MD (−2.33, $p = 0.002$) and RN students (−2.80, $p = 0.003$). MD students had a significantly higher intellect score compared to MLD (1.31, $p = 0.033$).

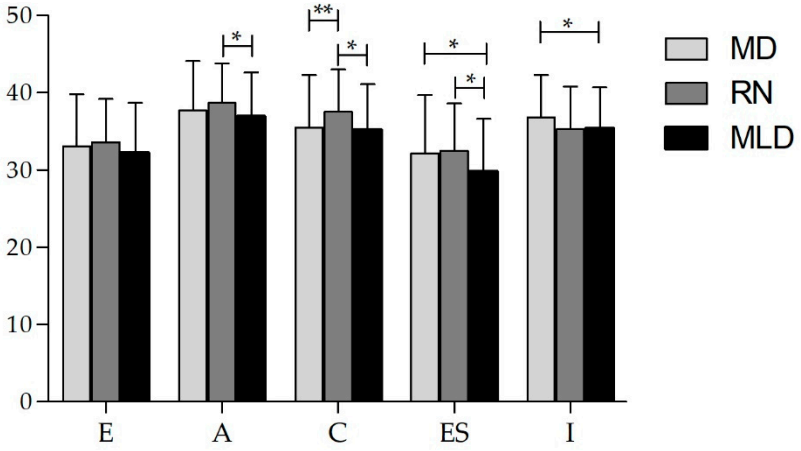

Figure 1. Personality dimensions of IPIP Big-Five (mean ± SD) within different majors (ANCOVA analysis, adjusted for age). E–extraversion; A–agreeableness; C–conscientiousness; ES–emotional stability; I–intellect; MD–medical students; RN–nursing students; MLD–medical laboratory diagnostics students; * $p < 0.05$; ** $p < 0.001$. $n = 712$.

The distribution of students' circadian preferences was 86 in the morning type (12.1%), 406 for neither type (57.2%) and 218 in the evening type (30.7%). Table 4 shows the distribution of circadian preference (rMEQ) and descriptive statistics (mean ± standard deviation) between the different majors. There was a significant difference in circadian preferences ($F_{(2706)} = 7.210$; $p < 0.001$; $\eta_p^2 = 0.02$) between different majors while adjusting for age (ANCOVA). Post-hoc comparison between different majors and circadian preferences indicated that the MLD students had a significantly lower score when compared with MD (−0.96, $p = 0.025$) and RN students (−1.69, $p = 0.001$). There was no difference between MD and RN students (−0.73, $p = 0.176$) on circadian preference.

Table 4. Distribution and descriptive statistics of morningness-eveningness orientation (rMEQ) according to gender and within the different majors ($n = 712$).

Variable	Morning Type		Neither Type		Evening Type	
	n (%)	Mean ± SD	*n* (%)	Mean ± SD	*n* (%)	Mean ± SD
MD ($n = 406$)	48 (11.8)	20.1 ± 3.4	223 (54.9)	14.5 ± 1.1	135 (33.3)	8.9 ± 1.8
RN ($n = 155$)	26 (16.8)	19.6 ± 1.7	104 (67.1)	14.4 ± 1.1	25 (16.1)	10.2 ± 0.9
MLD ($n = 149$)	12 (8.1)	19.4 ± 0.8	79 (53)	14.3 ± 1.2	58 (38.9)	8.4 ± 2.0

MD–medical students; RN–nursing students; MLD–medical laboratory diagnostics students; SD–standard deviation.

Gender-related differences can be seen in Tables S1 and S2 (Supplementary Material). There was no difference between gender and rMEQ (t (710) = 0.30, $p = 0.764$). Men's lower scores in agreeableness were observed in the evening type group, while in the neither type and the morning type groups no significant differences between men and women were observed.

3.3. Relationship of IPIP 50 Big-Five and rMEQ

Correlations between the rMEQ and IPIP Big-Five can be seen in Table 5**.** Circadian preference positively correlated with age (r = 0.178, $p < 0.01$). Further, circadian preference positively correlated with some of the personality dimensions, i.e., conscientiousness (r = 0.232, $p < 0.01$), and emotional stability (r = 0.133, $p < 0.01$), which indicates that more morning-oriented students are more responsible and emotionally stable.

Table 5. Correlations (Pearson's r) of age, reduced morningness-eveningness (rMEQ), and the domains of the IPIP 50 Big-Five questionnaire (n = 712).

Variable	rMEQ	Extraversion	Agreeableness	Conscientiousness	Emotional Stability	Intellect
Age	0.178 *	−0.032	−0.040	0.022	−0.006	−0.179 *
rMEQ		−0.033	0.012	0.232 *	0.133 *	−0.031
Extraversion			0.265 *	0.160 *	0.237 *	0.289 *
Agreeableness				0.317 *	0.012	0.308 *
Conscientiousness					0.280 *	0.224 *
Emotional Stability						0.067

* $p < 0.01$; Pearson's r.

Table 6 shows descriptive statistics of the domains of the IPIP 50 Big-Five questionnaire according to morningness-eveningness orientation.

Table 6. Descriptive statistics (mean ± SD) of the IPIP 50 Big-Five questionnaire domains according to the reduced morningness-eveningness questionnaire (rMEQ).

IPIP 50	rMEQ			ANOVA *		
	Morning Type n = 86	Neither Type n = 406	Evening Type n = 218	F	p-Value	η^2
Extraversion	32.7 ± 7.3	32.9 ± 5.9	33.4 ± 6.9	0.44	0.643	<0.01
Agreeableness	37.7 ± 5.7	37.9 ± 5.5	37.4 ± 6.9	0.67	0.499	<0.01
Conscientiousness	37.4 ± 6.5	36.8 ± 5.8	33.5 ± 6.7	24.39	<0.001	0.06
Emotional Stability	33.4 ± 6.9	32.2 ± 6.9	30.2 ± 7.5	8.31	<0.001	0.02
Intellect	36.0 ± 6.1	35.9 ± 5.2	36.7 ± 5.7	1.42	0.241	<0.01

SD-standard deviation; * one-way ANOVA df 2, 711.

Morningness-eveningness orientation (rMEQ) presented significant differences in the ANCOVA for the dimensions conscientiousness ($F_{(2706)} = 24.573$; $p < 0.0001$; $\eta_p^2 = 0.065$) and emotional stability ($F_{(2706)} = 8.703$; $p < 0.0001$; $\eta_p^2 = 0.024$). Post-hoc comparisons between circadian typology groups indicated that the evening type had a significantly lower conscientiousness score when compared with neither type (−3.42, $p < 0.0001$) and morning type (−4.04, $p < 0.0001$). Also, evening type had a significantly lower emotional stability score when compared with neither type (−2.06, $p = 0.002$) and morning type (−3.29, $p = 0.001$). Higher morningness scores corresponded to higher scores of conscientiousness and emotional stability (Figure 2).

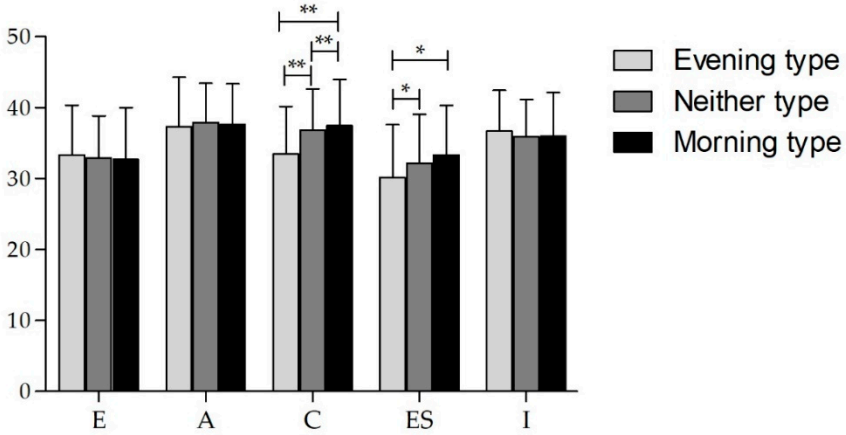

Figure 2. Personality dimensions of IPIP Big-Five (mean ± SD) and rMEQ interaction. E–extraversion; A–agreeableness; C–conscientiousness; ES-emotional stability; I–Intellect; * $p < 0.005$; ** $p < 0.001$. n = 712.

4. Discussion

This study utilized the IPIP 50 Big-Five model and the rMEQ to examine links between personality and individual differences in circadian rhythm among three groups of students, based on their major, as well as the psychometric reliability of the rMEQ and IPIP Big-Five in the population of students from biomedical studies.

The psychometric properties of the Croatian rMEQ in this study sample are modest (Cronbach alpha 0.638). It should be noted, however, that the results are not drastically different from the scales translated into other languages, where the alpha is usually around 0.7 [37], which is decent considering the short length of the scale. One possible reason can be found when observing inter-item correlations and factor loadings. It can be observed that Item 3 correlated the worst with the other items (Table 2) and it had the lowest factor loading (0.388, Table 1). The English formulation of the item is: "At what time in the evening do you feel tired and as a result in need of sleep?" It is possible that biomedical students have a habit of going to bed later than their bodies would normally require, and that the force of habit makes them biased when answering this item. This might indicate that this instrument is not ideal for this population of students, and more studies should be therefore performed in the general population. To the authors' knowledge, no other research has been done in Croatia using the rMEQ. A validation study of the Slovenian MEQ showed that the results are similar to the findings from previous studies. Even with a much smaller number of participants in the Slovenian study, MEQ was useful for measuring morningness-eveningness orientation [38]. Circadian preferences correlated with other psychological constructs in several studies focused on Eysenck's personality dimensions [12,27,39]. The IPIP Big-five is a reliable measure that shows high sensitivity in determining students' personality dimensions, and the internal reliability for the present sample is high (Cronbach's $\alpha = 0.77$).

The distribution between chronotypes is similar to that found in literature [5,6], with 52.7–63% of our students belonging to neither type. However, we found differences between the majors, with RN students having a similar distribution of morning and evening types, and a larger proportion of students adhering to neither type. In contrast, MD and MLD students had one third to two-fifths of students adhering to evening type, compared to about 10% of students adhering to morning types. A possible explanation is that RN students are older than MD and MLD students, so they showed a tendency to move from evening to morning type. Age might have some impact on the morningness level of RN students, since it has been shown that people become more morning-oriented as they age [40]. In our study, RN students were 1.02 standard deviations older than MD students which represents a difference of 5 years. Statistical significance of the correlation between morningness and age means that those who were older scored higher on morningness. RN students were the oldest and had the highest score on morningness in the study, which is similar to the results of Muro et al. [9]. Due to the fact that nurses in Croatia work alternating day and night 12-h shifts, the greater percentage of neither type rhythm might be a favorable predisposition for their future professional working schedule, whereas they could have a greater problem adapting to these alternating shifts if they belonged to one of the extreme circadian groups. For instance, it has been shown that evening-oriented shift nurses have poorer subjective sleep quality, which can cause issues as daytime sleepiness [41], therefore leading to chronic fatigue. Furthermore, since the regular working shifts of physicians are 8-h shifts starting in the morning, this could be a reason for struggle and poorer working performance in their future professional life. This could be also applied to medical laboratory professionals. However, greater eveningness might be favorable for future physicians in the perspective of 24-h shifts, which physicians work several times monthly, where a more morning-oriented person probably might feel too tired to properly deal with medical emergencies with enough mental concentration.

The IPIP Big-Five results showed that MD students scored higher on emotional stability and intellect than the MLD students, so they tended to be calmer and more relaxed compared to MLD students. They do not react with intense emotions and have intellectual and artistic interests [14]. The results showed that MLD students had low extraversion scores, which might be an indicator

of emotional vulnerability to anxiety disorders [42]. When associated with low emotional stability, this might predict obsessive-compulsive traits, an aspect more commonly seen in evening types [12]. In this study, MLD students had the lowest score on extraversion and emotional stability, and were more evening-oriented, so they might be at risk for affective disorders. On the other hand, agreeableness presents self-control regarding disciplined aspirations toward goals and strict adherence to personal principles [43]. A high score on agreeableness is marked by kindness, caring and sympathy [14]. These are traits often desired in nursing professionals and that is in concordance with our results where RN students had the highest scores. Lastly, conscientiousness is a significant predictor of various aspects of work performance [11]. RN students had the highest score on conscientiousness, which implies that they could be more reliable, well-organized, responsible and hard-working [14].

Authors have suggested a link between agreeableness, conscientiousness and morningness. The possible explanation of the connection between personality and morningness may lay in neurochemistry, as serotonin is strongly involved in the modulation of circadian preferences and serotonergic differences influence both circadian preferences and personality [28]. Another possible explanation is that circadian preference and the Big-Five model of personality have a genetic basis [27,28]. Results showed that conscientious students were more morning-oriented. This result is relevant, even though it might be known that conscientious students are probably more likely to spend more time studying. Since biomedical disciplines have a very demanding workload, students are often forced to study at night, which can have detrimental consequences on individuals naturally inclined to go to bed early. The authors' previous research found that almost 30% of MD students showed excessive sleepiness and only 21.7% of students slept 8 h or more at night, which is the amount of sleep recommended to adult individuals by the WHO to recover from physical and psychological fatigue [41,44]. On the other hand, emotionally unstable students were more evening-oriented, which was also found in certain studies [19,20]. It is interesting that MD students were shown to be more stable than RN students, especially since greater morningness was found to correlate to emotional stability and RN students were more morning-oriented compared to MD students. This may also indicate that in the case of MD students, the evening orientation could be due to circadian misalignment. It is possible that MD students tend to be more evening types than their peers, and since their workload is greater, this can also impact their wellbeing. Morningness-eveningness orientation should be considered as a significant risk factor for burnout, as observed in evening types [45]. Furthermore, evening-oriented individuals tend to have more depressive symptoms, as well as cognitive and behavioral problems, experiencing hyperactivity, attention deficit and tending towards impulsivity [21,46]. Circadian preferences are associated with emotional stability and affective disorders, which is particularly evident in medical students [16]. In the present study, it was MLD students who had such results of low emotional stability and evening orientation. In a prior research at our school, more than half of students showed some level of depressive symptoms [16]; we find these results alarming. Sleep deprivation caused in part by early classes and nights spent studying might have a causative role. It is considered that individual differences in serotonergic function are a primary source of stability as a trait [19].

The association of chronotype and personality in a broad social context might help to explain social influences on circadian preference and human personality traits more clearly [47]. The effects of circadian preferences on cognitive function may be small but are worthy of further consideration. Personality characteristics of the evening-type and early-morning-type of people entail different vulnerability to risky and addictive behaviors such as smoking, drugs and alcohol [48]. It is important to mention that age is a variable that significantly influences circadian preferences [19], which is observed in our study.

Our study showed gender differences in personality dimensions, in agreement with other research [11,18,49,50]; female students scored lower than males on the emotional stability and higher on the agreeableness scale. However, gender-related differences were not found in the extraversion and conscientiousness scale, and this is in accordance with the results obtained by Prat and Adan [18]. Personality dimensions are gender-related and could be used to assess risk or protect mental health

based on gender [39]. In the literature, gender analyses of circadian preferences are inconsistent. In this study, no difference between gender and circadian preference was found, as was the case in the study of Prat and Adan [18], even though differences have been found in a study on adolescents [8], in a study with a much larger sample [51] or with the use of meta-analytic procedures [52].

Our study has several limitations. First, we assessed the relationship between university students of different majors and IPIP50 Big-five model and rMEQ. These subjects most likely have different characteristics compared to general population samples, such as particular cultural backgrounds or socio-economic status, as well as some control over their daily schedules. Furthermore, the sample was biased toward women, which is a result from the student body consisting dominantly of female students. Furthermore, the sample was biased toward MD students because they represent the majority of enrolled students. Students were not tested on other variables which might have proven useful, such as sleep quality, sleep duration, average time spent studying, depression, anxiety or perfectionism, and these variables should be assessed in future research.

5. Conclusions

This research contributes to the knowledge about the relationship between circadian preferences and personality among students of health-related university majors. This is especially relevant to Croatia, where little research has been done on the topic of circadian typology. Chronobiology is often an ignored topic by medical professionals. However, working at top performance often comes as a privilege, and many who work in the medical branches cannot afford it. For a vast number of medical professionals, the medical systems, with inflexible shifts and unexpected emergency duty calls, are a constant source of frustration and anxiety, thereby undermining their professional success [21,41]. Just as chronobiology is mostly not acknowledged in the professional life of physicians, medical laboratory professionals and nurses, it also rarely becomes appreciated as a source of potential threat for the mental and metabolic health of patients. The results indicated that MD students are the most imaginative, while RN students were the most caring and responsible students. Further, RN students were the most morning-oriented, while MLD students were more shy and evening-oriented than other groups. According to the present study, MLD students might be at risk of developing affective disorders. These results suggest that circadian preference and personality traits are essential components of the well-being of many medical professionals [53]. With this research, we would like to raise awareness about common personality traits and adherence to certain circadian preferences in medical students to have data for later comparisons and considerations about the timetables for classes, i.e., if most of the students are evening types, classes should be put later in the day, and not in the early morning. Early classes may lead to sleep deprivation and affective disorders, already highly prevalent in this population [16]. Data on the chronotypes of future medical professionals are appealing because they could be compared to those of skilled medical professionals, after they start working shifts, to see if their chronotypes change after they enter the workforce. It is possible to investigate the relationship between personality dimensions among skilled medical professionals to see how it differs from the data obtained in this research on the student population.

Psychometric analysis of the Croatian version of the rMEQ showed mediocre results, and additional tests are warranted to assess its reliability in the general population. Future research should compare the dimensions of personality dimensions and morningness-eveningness orientation in employees who completed these different majors.

Supplementary Materials: The following are available online at http://www.mdpi.com/1660-4601/17/13/4794/s1, Table S1: Distribution and descriptive statistics of morningness-eveningness orientation (rMEQ) according to gender, Table S2: Descriptive statistics of the reduced morningness-eveningness (rMEQ) questionnaire and the domains of the IPIP 50 Big-Five questionnaire and the gender-related differences (n = 712).

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draft preparation, J.M. and I.Š.; writing—review and editing, J.M., I.M.V., I.K., M.H., and I.Š.; visualization, I.Š.; supervision, M.H. All authors have read and agreed to the published version of the manuscript.

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References

1. Adan, A.; Archer, S.N.; Hidalgo, M.P.; Di Milia, L.; Natale, V.; Randler, C. Circadian typology: A comprehensive review. *Chronobiol. Int.* **2012**, *29*, 1153–1175. [CrossRef]
2. Randler, C.; Gomà-i-Freixanet, M.; Muro, A.; Knauber, C.; Adan, A. Do different circadian typology measures modulate their relationship with personality? A test using the Alternative Five Factor Model. *Chronobiol. Int.* **2015**, *32*, 281–288. [CrossRef]
3. Germain, A.; Kupfer, D.J. Circadian rhythm disturbances in depression. *Hum. Psychopharmacol. Clin. Exp.* **2008**, *23*, 571–585. [CrossRef]
4. Horne, J.A.; Ostberg, O. A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *Int. J. Chronobiol.* **1976**, *4*, 97–110. [PubMed]
5. Liaghatdar, M.J.; Ashoorion, V.; Avizhgan, M. Compare the educational achievement of medical students with different circadian rhythms in difficult courses of basic sciences. *Adv. Biomed. Res.* **2016**, *5*, 58. [CrossRef] [PubMed]
6. Raoof, A.M.; Asaad, Y.A.; Al-Hadithi, T.S. Distribution of Chronotypes among a Sample of Iraqi Kurdish Medical Students. *Sultan Qaboos Univ. Med. J.* **2014**, *14*, e356–e360. [PubMed]
7. Andrijevic, I.; Simic, S.; Stanojevic, C.; Golubovic, B.; Milutinovic, D. Sleep quality in relation to sleep hygiene knowledge and practice, chronotype and lifestyle behaviour among healthcare students. *Med. Pregl. Rev.* **2018**, *71*, 17–24. [CrossRef]
8. Milić, J.; Kvolik, A.; Ivković, M.; Babić, A.; Labak, I.; Benšić, M.; Ilakovac, V.; Ništ, M.; Zibar, L.; Heffer, M. Are There Differences in Students' School Success, Biorhythm, and Daytime Sleepiness Depending on Their School Starting Times? *Coll. Antropol.* **2014**, *38*, 889–894.
9. Muro, A.; Gomà-i-Freixanet, M.; Adan, A.; Cladellas, R. Circadian typology, age, and the alternative five-factor personality model in an adult women sample. *Chronobiol. Int.* **2011**, *28*, 690–696. [CrossRef]
10. Goldberg, L.R. The development of markers for the Big-Five factor structure. *Psychol. Assess.* **1992**, *4*, 26–42. [CrossRef]
11. Čuljak, Z.; Mlačić, B. The Big-Five Model of Personality and the Success of High School Students in Physical Education. *Croat. J. Educ.* **2014**, *16*, 471–490.
12. Adan, A.; Lachica, J.; Caci, H.; Natale, V. Circadian typology and temperament and character personality dimensions. *Chronobiol. Int.* **2010**, *27*, 181–193. [CrossRef]
13. Lee, S.J.; Park, S.H.; Cloninger, C.R.; Chae, H. Behavior problems and personality in Korean high school students. *PeerJ* **2018**, *6*, e6106. [CrossRef]
14. Kotrla Topic, M.; Perkovic Kovacevic, M.; Mlacic, B. Relations of the Big-Five personality dimensions to autodestructive behavior in clinical and non-clinical adolescent populations. *Croat. Med. J.* **2012**, *53*, 450–460. [CrossRef] [PubMed]
15. Hampson, S.E. Personality processes: Mechanisms by which personality traits "get outside the skin". *Annu. Rev. Psychol.* **2012**, *63*, 315–339. [CrossRef] [PubMed]
16. Milić, J.; Škrlec, I.; Vranješ, I.M.; Podgornjak, M.; Heffer, M. High levels of depression and anxiety among Croatian medical and nursing students and the correlation between subjective happiness and personality traits. *Int. Rev. Psychiatry* **2019**, *31*, 1–8. [CrossRef]
17. Gramstad, T.O.; Gjestad, R.; Haver, B. Personality traits predict job stress, depression and anxiety among junior physicians. *BMC Med. Educ.* **2013**, *13*, 150. [CrossRef]
18. Prat, G.; Adan, A. Relationships among circadian typology, psychological symptoms, and sensation seeking. *Chronobiol. Int.* **2013**, *30*, 942–949. [CrossRef]
19. Randler, C. Morningness–eveningness, sleep–wake variables and big five personality factors. *Pers. Individ. Differ.* **2008**, *45*, 191–196. [CrossRef]
20. Russo, P.M.; Leone, L.; Penolazzi, B.; Natale, V. Circadian preference and the big five: The role of impulsivity and sensation seeking. *Chronobiol. Int.* **2012**, *29*, 1121–1126. [CrossRef] [PubMed]

21. Selvi, F.F.; Karakaş, S.A.; Boysan, M.; Selvi, Y. Effects of shift work on attention deficit, hyperactivity, and impulsivity, and their relationship with chronotype. *Biol. Rhythm. Res.* **2015**, *46*, 53–61. [CrossRef]
22. Tsaousis, I. Circadian preferences and personality traits: A meta-analysis. *Eur. J. Pers.* **2010**, *24*, 356–373. [CrossRef]
23. Lipnevich, A.A.; Credè, M.; Hahn, E.; Spinath, F.M.; Roberts, R.D.; Preckel, F. How distinctive are morningness and eveningness from the big five factors of personality? A meta-analytic investigation. *J. Pers. Soc. Psychol.* **2017**, *112*, 491–509. [CrossRef] [PubMed]
24. Randler, C.; Schredl, M.; Göritz, A.S. Chronotype, Sleep Behavior, and the Big Five Personality Factors. *SAGE Open* **2017**, *7*, 1–9. [CrossRef]
25. Jackson, L.; Gerard, D. Diurnal types, the "Big Five" personality factors, and other personal characteristics. *J. Soc. Behav. Pers.* **1996**, *11*, 273–283.
26. DeYoung, C.G. Higher-order factors of the Big Five in a multi-informant sample. *J. Pers. Soc. Psychol.* **2006**, *91*, 1138–1151. [CrossRef]
27. DeYoung, C.G.; Hasher, L.; Djikic, M.; Criger, B.; Peterson, J.B. Morning people are stable people: Circadian rhythm and the higher-order factors of the Big Five. *Pers. Individ. Differ.* **2007**, *43*, 267–276. [CrossRef]
28. Randler, C. Evening Types among German University Students Score Higher on Sense of Humor after Controlling for Big Five Personality Factors. *Psychol. Rep.* **2008**, *103*, 361–370. [CrossRef]
29. Bleidorn, W.; Hill, P.L.; Back, M.D.; Denissen, J.J.A.; Hennecke, M.; Hopwood, C.J.; Jokela, M.; Kandler, C.; Lucas, R.E.; Luhmann, M.; et al. The policy relevance of personality traits. *Am. Psychol.* **2019**, *74*, 1056–1067. [CrossRef]
30. Adan, A.; Almirall, H. Horne & Östberg morningness-eveningness questionnaire: A reduced scale. *Pers. Individ. Differ.* **1991**, *12*, 241–253. [CrossRef]
31. Milić, J.; Škrlec, I.; Vranješ, I.M.; Matić, M.; Sertić, D.; Heffer, M. The Croatian Translation of the Horne and Östberg Morningness-Eveningness Questionnaire With a Brief Review of Circadian Typology. *Southeast Eur. Med. J.* **2018**, *2*, 1–11. [CrossRef]
32. Goldberg, L.R. A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In *Personality Psychology in Europe*, 1st ed.; Mervielde, I., Deary, I., De Fruyt, F., Ostendorf, F., Eds.; Tilburg University Press: Tilburg, The Netherlands, 1999; Volume 7, pp. 7–28.
33. Mlačić, B.; Goldberg, L.R. An Analysis of a Cross-Cultural Personality Inventory: The IPIP Big-Five Factor Markers in Croatia. *J. Pers. Assess.* **2007**, *88*, 168–177. [CrossRef]
34. Goldberg, L.R.; Johnson, J.A.; Eber, H.W.; Hogan, R.; Ashton, M.C.; Cloninger, C.R.; Gough, H.G. The international personality item pool and the future of public-domain personality measures. *J. Res. Pers.* **2006**, *40*, 84–96. [CrossRef]
35. Tomczak, M.; Tomczak, E. The need to report effect size estimates revisited. An overview of some recommended measures of effect size. *Trends Sport Sci.* **2014**, *21*, 19–25.
36. Fritz, C.O.; Morris, P.E.; Richler, J.J. Effect size estimates: Current use, calculations, and interpretation. *J. Exp. Psychol. Gen.* **2012**, *141*, 2–18. [CrossRef]
37. Randler, C. German version of the reduced Morningness–Eveningness Questionnaire (rMEQ). *Biol. Rhythm. Res.* **2013**, *44*, 730–736. [CrossRef]
38. Treven Pišljar, N.; Štukovnik, V.; Kocjan, G.Z.; Dolenc-Groselj, L. Validity and reliability of the Slovene version of the Morningness-Eveningness Questionnaire. *Chronobiol. Int.* **2019**, *36*, 1409–1417. [CrossRef]
39. Adan, A.; Natale, V.; Caci, H.; Prat, G. Relationship between circadian typology and functional and dysfunctional impulsivity. *Chronobiol. Int.* **2010**, *27*, 606–619. [CrossRef]
40. Yoon, I.Y.; Kripke, D.F.; Elliott, J.A.; Youngstedt, S.D.; Rex, K.M.; Hauger, R.L. Age-related changes of circadian rhythms and sleep-wake cycles. *J. Am. Geriatr. Soc.* **2003**, *51*, 1085–1091. [CrossRef]
41. Yoo, G.S.; Kim, T.W. The Effect of Morningness-Eveningness on Shift Work Nurses: Sleep Quality, Depressive Symptoms and Occupational Stress. *Sleep Med. Res.* **2017**, *8*, 39–43. [CrossRef]
42. Kotov, R.; Gamez, W.; Schmidt, F.; Watson, D. Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychol. Bull.* **2010**, *136*, 768–821. [CrossRef] [PubMed]
43. Mlačić, B.; Šakić, I. The Development of Croatian Markers for the Big-Five Personality Model. *J. Gen. Soc. Issues* **2008**, *17*, 223–246.

44. Milić, J.; Šijan, I.; Božić, I.; Zibar, L.; Ilakovac, V.; Heffer, M. Habits of medical students and the effect on daytime sleepiness. In Proceedings of the Zagreb International Medical Summit, Zagreb, Croatia, 21–24 November 2013; Liječnički vjesnik: Zagreb, Croatia, 2013; p. 34.
45. Mokros, L.; Koprowicz, J.; Nowakowska-Domagała, K.; Rodak, J.; Pietras, T. Eveningness and its possibility of predicting burnout symptoms among physicians and nurses—Preliminary results. *Curr. Probl. Psychiatry* **2018**, *19*, 23–29. [CrossRef]
46. Hasler, B.P.; Allen, J.J.B.; Sbarra, D.A.; Bootzin, R.R.; Bernert, R.A. Morningness-eveningness and depression: Preliminary evidence for the role of the behavioral activation system and positive affect. *Psychiatry Res.* **2010**, *176*, 166–173. [CrossRef] [PubMed]
47. Vollmer, C.; Randler, C. Circadian preferences and personality values: Morning types prefer social values, evening types prefer individual values. *Pers. Individ. Differ.* **2012**, *52*, 738–743. [CrossRef]
48. Piffer, D.; Ponzi, D.; Sapienza, P.; Zingales, L.; Maestripieri, D. Morningness–eveningness and intelligence among high-achieving US students: Night owls have higher GMAT scores than early morning types in a top-ranked MBA program. *Intelligence* **2014**, *47*, 107–112. [CrossRef]
49. Costa, P.T.; Terracciano, A.; McCrae, R.R. Gender differences in personality traits across cultures: Robust and surprising findings. *J. Pers. Soc. Psychol.* **2001**, *81*, 322–331. [CrossRef] [PubMed]
50. Lynn, R.; Martin, T. Gender Differences in Extraversion, Neuroticism, and Psychoticism in 37 Nations. *J. Soc. Psychol.* **1997**, *137*, 369–373. [CrossRef]
51. Adan, A.; Natale, V. Gender differences in morningness-eveningness preference. *Chronobiol. Int.* **2002**, *19*, 709–720. [CrossRef]
52. Randler, C. Gender differences in morningness–eveningness assessed by self-report questionnaires: A meta-analysis. *Pers. Individ. Differ.* **2007**, *43*, 1667–1675. [CrossRef]
53. Walker, W.H.; Walton, J.C.; DeVries, A.C.; Nelson, R.J. Circadian rhythm disruption and mental health. *Transl. Psychiatry* **2020**, *10*, 1–13. [CrossRef] [PubMed]

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Importance of the big-five in the future medical specialty preference

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Abstract

Background: The most crucial decision in the physician's career after graduation is undoubtedly the choice of specialization. It is conditioned by many factors such as intellectual challenges, clinical experience, economic and social influences. The aim of this study was to determine whether personality traits affect the choice of medical specialty at the University of Osijek, Croatia.

Methods: This cross-sectional study included a total of 407 medical students. To assess the personality traits, the IPIP Big-Five questionnaire was used.

Results: There were no differences in four of the five personality traits of the Big-Five questionnaire when comparing the groups based on their specialty preference: extroversion, agreeableness, conscientiousness, and emotional stability. A significant difference was found for openness to experience (intellect/imagination) trait, where students who preferred psychiatry specialties achieved the highest score, and those who chose public health specialties scored the lowest. We observed no significant effect between gender and specialty preference based on personality traits.

Conclusions: We could not attribute the differences in personality traits to specialty preference. Medical students with higher scores on agreeableness and openness (intellect/imagination) scales were more inclined to psychiatric specialties, and more conscientiousness students preferred the anesthesiology and emergency medicine specialties. Even if variations in personality traits do not exist across different specialties, many other factors influence specialty preference.

Keywords: Big-five, Medical students, Personality, Preference, Specialty

Background

The most crucial decision in the physician's career after graduation is undoubtedly the choice of specialization. It is conditioned by many factors such as intellectual challenges, the possibility of professional progress, the organization of working time, salary level, but primarily the personality of a physician who makes such a decision [1–3]. Other factors which contribute to choosing a specific medical specialty are gender, economic status, clinical experience, family influence, lifestyle [4–6], and intention to work in the city [7]. Factors such as personal interests and controlled lifestyle are more important than traditional motives such as prestige and length of specialization [8]. Students are forced to decide early, usually after less than a year of short exposure to specialties during internships in a clinical setting [2]. They do not have enough experience and insights into the life and work of physicians or any specialist [2].

In European countries, including Croatia, there is a growing interest in specializations with the possibility to control one's lifestyle. This group of specialties includes dermatology, psychiatry, radiology, ophthalmology, otorhinolaryngology, neurology, and pathology. On the other hand, on specific specializations such as anesthesiology, young doctors decide because there is too much interest

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in the specializations that were at the top of their priorities [1, 3].

Gender also influences the choice of medical specialty. It is well known that male students prefer specialties associated with technical and instrumental features such as surgery. While on the other hand, female students will focus on specialties with opportunities for relational aspects and more contact with patients. Gender significantly contributes to motives for specialty preferences [8, 9].

Although many factors influence a physician's career and specialty preference, personality traits are among the most critical determinants [10]. Personality is a common intrinsic factor in determining specialty preference. Personality can be assessed in different ways and with multidimensional approaches [5]. One of the main tools to measure personality is the Big Five inventory, which consists of five personality traits: extraversion, agreeableness, conscientiousness, emotional stability/ neuroticism, and openness to experience (intellect /imagination). Extraversion includes traits such as sociability, activity, and positive emotionality. It relates to an individual's engagement with others and the outside world. Agreeableness is related to the ability of an individual to cooperate with and to sympathize with other people. It includes traits such as altruism, tender-mindedness, trust, and modesty. Conscientiousness refers to the reliability, organization, and dutifulness of an individual. It includes being persistent, organized, and achievement oriented. Neuroticism is characterized by anxiety, anger, and depression, while emotional stability expresses ones' capacity to remain emotionally stable and balanced under stressful circumstances. Variable 'Openness to experience' is often called 'Intellect or imagination' and it refers to the individual's interest in the outside world and new experiences, a curiosity, sensitivity, and openness to a variety of experiences [10–12].

Different studies showed the relationship between personality traits and specialty preference. For example, psychiatrists were characterized by a lower conscientiousness [10] and high levels of openness (intellect/imagination) [5]. Psychiatrists are commonly regarded as being open to experience, especially in comparison to other medical specialties, which is consistent with previous research [5, 10, 11]. Psychiatrists are described as being imaginative, curious, intelligent, insightful, fast learning, and inventive. They thrive in their careers because of those personality traits. Psychiatrists appear to be agreeable but might vary in conscientiousness [10, 11]. In literature, agreeableness was associated with altruism, cooperation, and sympathy [4]. Psychiatrists exhibit traits associated with agreeableness such as being sympathetic, warm, trusting, helpful, cooperative, and altruistic [11]. In the literature, surgeons were characterized by extraversion [13], although different surgical specialties are characterized by different personality traits [5]. For example, students who chose gynecology and obstetrics are characterized as highly conscientious and, thus, can be described as organized, persistent, scrupulous, and achievement oriented. Also, they are less agreeable and, thus, may not be as sympathetic, friendly, or altruistic as the students that chose other specialties [11]. Anesthesiologists tend to be more extraverted and imaginative [11]. Anesthesiologists are less sociable and cooperative, but more organized, persistent, imaginative, and curious, which corresponds to extraversion and conscientiousness [11].

Although the research is consistent and showed the link between personality and academic and clinical performance, the relationship between personality and medical specialty preference is less clear [13]. It is difficult to draw a good and overall conclusion because of the variety of tools used to measure personality [4].

The present study aimed to investigate whether personality traits affect the choice of medical specialty. We hypothesized that there would be differences in personality composition concerning medical specialty preference among Osijek medical students.

Methods

Participants

In this cross-sectional study, we questioned a total of 407 medical students (150 males and 257 females) from the Faculty of Medicine Osijek (response rate of 81.89%). The study was conducted between January and June 2016. Students were asked to fill the questionnaire after lectures in person. The study was approved by the Ethical Committee of the Faculty of Medicine Osijek, and all participants gave written informed consent.

Questionnaire

The students were given a self-administered questionnaire consisting of two parts. The first part included questions about the participants' essential sociodemographic characteristics: age, grade point average (GPA) score, gender, past involvement in a scientific project, and the specialty they wish to pursue after graduation. The list of the specializations was taken from The European Union of Medical Specialists' (UEMS) list and grouped in six fields (Table 1). In the present study, the UEMS list is used to be comparable to research in other European Union countries. The UEMS list does not offer a general practice or family medicine as a specialty. Additionaly, in Croatia it is not necessary to have a family medicine specialty to work as a family medicine physician. It is possible to work as general medicine physician right after obtaining the degree of medical doctor. Due to the similarity of family medicine and internal medicine specialty in Croatia, we could assume

that most students who choose one of the internal medicine specialties might also choose family medicine. Also, in Croatia, family medicine is only a transitional period during which young physicians want to gain work experience before choosing a specialty. School success in Croatia is measured by the GPA score which applies to all levels of education. The official grade scale ranges from 1 to 5 with 1 being a failing grade, two being sufficient, three being good, four being very good, and five being excellent (Table 1).

In the second part, the students were asked to fill in the IPIP-50 Big Five questionnaire. Personality traits were measured with the Croatian short version of the questionnaire IPIP Big-Five with 50 items [14–16] IPIP-50 items are rated on a 5-point Likert-type scale ranging from 1 (very inaccurate) to 5 (very accurate) as in the original instrument [17].

Statistical analysis

To test the normality of the data distribution, the Kolmogorov-Smirnov test was used. All scalar variables significantly deviated from a normal distribution. Numerical data were described with medians and interquartile ranges (IQR). To compare the means of two or more independent groups, Mann-Whitney and Kruskal Wallis tests were used, respectively. Multiple analyses of covariance (MANCOVA) were performed considering the total score of each dimension of the IPIP Big-Five as a dependent variable and taking specialty preference and gender as factors, while age was considered as a covariate to control for possible effects. The partial eta-squared (η_p^2) was obtained as a measure of effect size, and the observed statistical power for significant effects was >0.90. $P < 0.05$ was considered statistically significant. The analysis was conducted using the SPSS software (ver. 16.0, SPSS Inc., Chicago, IL, USA).

Results

We questioned a total of 407 medical students from the Faculty of Medicine Osijek. The median age of the students was 22 (IQR 20–23). Descriptive analysis is presented in Table 2.

Of the male students, 34.7% students have selected surgical specialties, 32.7% preferred internal medicine, 12% students chose public health, 8% selected anesthesiology and emergency medicine, 7.3% students preferred diagnostics specialties, and 5.3% chose psychiatry specialties. For females, 52.9% students chose internal medicine, 21.8% preferred surgical specialties, 8.2% students selected psychiatry, 7.8% chose diagnostics specialties, 5.4% students preferred anesthesiology and emergency medicine, and 3.9% chose public health specialties.

Table 3 presents specialty preferences between groups of younger and older students.

Tables 4 and 5 present the frequencies of the students choosing a specific medical specialty, and a specialty from a specific specialty group, respectively, as well as their GPA. Since none of the students chose allergology as a preferred specialty, that specialty was excluded from Table 4.

There was a significant difference in the preference both for a specific specialty group (Pearson Chi-Square = 25.579, df = 5, $P < 0.001$) and the individual specialties (Pearson Chi-Square = 79.965, df = 39, $P < 0.001$) between the gender.

Table 1 The list of medical specialties grouped into six groups

SURGERY	Surgery	PUBLIC HEALTH	Public Health Medicine
	Thoracic Surgery		Occupational Medicine
	Cardiothoracic Surgery	PSYCHIATRY	Psychiatry
	Vascular Surgery		Child and Adolescent Psychiatry and Psychotherapy
	Plastic, Reconstructive and Aesthetic Surgery		
	Neurosurgery	ANAESTHESIOLOGY AND EMERGENCY MEDICINE	Anesthesiology
	Oro-Maxillo-Facial Surgery		Emergency Medicine
	Pediatric Surgery	INTERNAL MEDICINE	Internal Medicine
	Orthopedics		Gastroenterology
	Gynecology and Obstetrics		Cardiology
	Urology		Endocrinology
	Ophthalmology		Nephrology
	Otorhinolaryngology		Pneumology
DIAGNOSTICS	Pathology		Rheumatology
	Laboratory Medicine / Medical Biopathology		Allergology
	Medical Microbiology		Geriatrics
	Radiology		Infectious Diseases
	Nuclear Medicine		Pediatrics
	Clinical Neurophysiology		Clinical Genetics
			Physical Medicine and Rehabilitation
			Radiotherapy
			Dermatology and Venereology
			Neurology

Table 2 Descriptive analysis of the sample ($N = 407$)

	n	(%)
Gender		
Male	150	36.9
Female	257	63.1
Academic Year		
First	70	17.2
Second	84	20.6
Third	73	17.9
Fourth	5	16.0
Fifth	59	14.5
Sixth	56	13.8
Science project		
Yes	338	16.5
No	67	83.3

There was a significant difference in the individual specialty preference depending on the GPA (Pearson Chi-Square = 2046.630, df = 1716, $P < 0.001$), but the difference was not observed when the specialties were merged into groups (Pearson Chi-Square = 213.525, df = 220, $P = 0.610$).

There were no significant differences in the specialty preference, depending on whether or not the students were involved with scientific research during their studies (Pearson Chi-Square = 64.45, df = 78, $P = 0.865$).

There were no differences in four of the five domains of the Big-Five questionnaire when comparing the groups based on their group specialty preference: extroversion (Kruskal-Wallis Test, $P = 0.489$), agreeableness (Kruskal-Wallis Test, $P = 0.239$), conscientiousness (Kruskal-Wallis Test, $P = 0.367$) and emotional stability (Kruskal-Wallis Test, $P = 0.245$). A significant difference was found for openness (intellect/imagination) (Kruskal-Wallis Test, $p = 0.002$). The medians and IQ-ranges of the openness (intellect/imagination) domain of the IPIP Big-Five questionnaire were as follows - surgery: 37.0 (34.0–41.0), internal medicine: 36.0 (33.0–41.0), public health: 33.5 (30.0–37.0), psychiatry: 39.0 (35–45), anesthesiology and emergency medicine: 37 (33.75–41) and diagnostics: 37 (33–40).

Females presented higher average scores in agreeableness ($F_{(1,394)} = 11.17$; $P = 0.001$; $\eta_p^2 = 0.028$), while males scored higher in emotional stability ($F_{(1,394)} = 7.17$; $P = 0.008$; $\eta_p^2 = 0.018$). Post-hoc comparisons between gender and personality traits indicated that the male students had a significantly lower agreeableness score when compared with the female students (−2.93, $P = 0.001$). Male students had a significantly higher emotional stability score when compared with female students (2.84, $P = 0.008$).

The median scores and the gender-related differences of the different domains of the IPIP Big-Five questionnaire and the students' GPA are presented in Table 6.

Specialty preference showed significant differences in the MANCOVA for the trait openness (intellect/imagination) ($F_{(5,394)} = 3.78$; $P = 0.002$; $\eta_p^2 = 0.046$), where the psychiatry specialty achieved the highest score, and the public health specialty preference the lowest (Table 7). Post-hoc comparisons between specialty preference indicated that the students who choose public health as a specialty had a significantly lower openness (intellect/imagination) score when compared with psychiatry choice (−6.29, $P = 0.001$), surgery (−4.69, $P = 0.003$), internal medicine (−4.06, $P = 0.011$), and diagnostics (− 4.49, $P = 0.021$). We have not observed a significant effect between gender and specialty preference based on personality traits.

Discussion

The highest percentages of the students (45.5%) preferred internal medicine as a postgraduate specialty, and the lowest percentages (6.4%) preferred anesthesiology and emergency medicine. The highest level of interest was seen for internal medicine specialties. Among the subspecialties, pediatrics and neurology were the most popular, followed by endocrinology, dermatology,

Table 3 Specialty preferences between groups of younger (academic years 1–3) and older students (academic years 4–6)

	n (%)					
Specialty group	Years 1–3		Years 4–6		Together	
Surgery	58	(25.6)	50	(27.8)	108	(26.5)
Internal medicine	100	(44.1)	85	(47.2)	185	(45.5)
Public health	21	(9.3)	7	(3.9)	28	(6.9)
Psychiatry	16	(7.0)	13	(7.2)	29	(7.1)
Anesthesiology and emergency medicine	16	(7.0)	10	(5.6)	26	(6.4)
Diagnostics	16	(7.0)	15	(8.3)	31	(7.6)

Table 4 Relationship between specialty preference and gender

Specialty	*n* (%)						Median GPA
	Male (*n* = 150)		Female (*n* = 257)		Together (*n* = 407)		
Anesthesiology	11	(7.3)	14	(5.4)	25	(6.1)	4.2
Cardiology	6	(4.0)	9	(3.5)	15	(3.7)	4.0
Cardiothoracic Surgery	4	(2.7)	6	(2.3)	10	(2.5)	4.0
Child and Adolescent Psychiatry and Psychotherapy	1	(0.7)	3	(1.2)	4	(1.0)	4.0
Clinical Genetics	0	(0)	4	(1.6)	4	(1.0)	**4.5**
Clinical Neurophysiology	0	(0)	1	(0.4)	1	(0.2)	–
Dermatology and Venereology	0	(0)	15	(5.8)	15	(3.7)	4.0
Emergency Medicine	1	(0.7)	0	(0)	1	(0.2)	–
Endocrinology	4	(2.7)	14	(5.4)	18	(4.4)	4.4
Gastroenterology	1	(0.7)	2	(0.8)	3	(0.7)	4.0
Geriatrics	1	(0.7)	1	(0.4)	2	(0.5)	–
Gynecology and Obstetrics	2	(1.3)	11	(4.3)	13	(3.2)	4.0
Infectious Diseases	3	(2.0)	4	(1.6)	7	(1.7)	4.1
Internal Medicine	0	(0)	1	(0.4)	1	(0.2)	–
Laboratory Medicine/Medical Biopathology	1	(0.7)	1	(0.4)	2	(0.5)	**4.8**
Medical Microbiology	0	(0)	1	(0.4)	1	(0.2)	–
Nephrology	2	(1.3)	9	(3.5)	11	(2.7)	4.2
Neurology	**12**	(8.0)	13	(5.1)	25	(6.1)	4.0
Neurosurgery	11	(7.3)	7	(2.7)	18	(4.4)	4.4
Nuclear Medicine	0	(0)	3	(1.2)	3	(0.7)	4.0
Occupational Medicine	11	(7.3)	5	(1.9)	16	(3.9)	4.0
Ophthalmology	0	(0)	6	(2.3)	6	(1.5)	4.0
Oro-Maxillo-Facial Surgery	2	(1.3)	4	(1.6)	6	(1.5)	4.2
Orthopedics	9	(6.0)	3	(1.2)	12	(2.9)	3.9
Otorhinolaryngology	1	(0.7)	3	(1.2)	4	(1.0)	**4.5**
Pediatric Surgery	2	(1.3)	2	(0.8)	4	(1.0)	4.4
Pediatrics	**12**	(8.0)	**18**	(7.0)	30	(7.4)	4.0
Pathology	5	(3.3)	**36**	(14.0)	41	(10.1)	4.0
Physical Medicine and Rehabilitation	2	(1.3)	7	(2.7)	9	(2.2)	4.0
Plastic, Reconstructive and Aesthetic Surgery	3	(2.0)	6	(2.3)	9	(2.2)	4.2
Pneumology	0	(0)	3	(1.2)	3	(0.7)	4.4
Psychiatry	7	(4.7)	**18**	(7.0)	25	(6.1)	4.0
Public Health Medicine	7	(4.7)	5	(1.9)	12	(2.9)	3.9
Radiology	8	(5.3)	7	(2.7)	15	(3.7)	4.0
Radiotherapy	0	(0)	1	(0.4)	1	(0.2)	–
Rheumatology	0	(0)	1	(0.4)	1	(0.2)	–
Surgery	10	(6.7)	3	(1.2)	13	(3.2)	4.0
Thoracic Surgery	1	(0.7)	0	(0)	1	(0.2)	–
Urology	3	(2.0)	4	(1.6)	7	(1.7)	4.0
Vascular Surgery	7	(4.7)	6	(2.3)	13	(3.2)	4.0

Table 5 Relationship between specialty preference, gender and GPA

	n (%)						Median (IQ Range)
Specialty group	Male		Female		Together		GPA
Surgery	52	(34.7)	56	(21.8)	108	(26.5)	4.0 (4.0–4.5)
Internal medicine	49	(32.7)	136	(52.9)	185	(45.5)	4.0 (4.0–4.5)
Public health	18	(12.0)	10	(3.9)	28	(6.9)	4.0 (3.5–4.0)
Psychiatry	8	(5.3)	21	(8.2)	29	(7.1)	4.0 (3.76–4.01)
Anesthesiology and emergency medicine	12	(8.0)	14	(5.4)	26	(6.4)	4.2 (4.0–4.4)
Diagnostics	11	(7.3)	20	(7.8)	31	(7.6)	4.0 (4.0–4.5)

venereology, and cardiology. The research conducted in 2007 at the School of Medicine in Zagreb showed that the interest of students for certain specialties in Croatia had not changed much. The three most popular specialties in 2007 were internal medicine, pediatrics, and surgery [18]. Other studies conducted around the world showed that most of the students prefer internal medicine as a specialty, while the least favorite are specialties in diagnosis and psychiatry [8, 19]. Student specialty preferences may change over the course of their medical education. However, in our study there was no expected difference between students at the beginning and at the end of study regarding their specialty preferences in five groups of medical specialties (surgery, internal medicine, psychiatry, anesthesiology and emergency medicine, diagnostics). However, students at the beginning of their study showed higher interest for public health specialties, which is not in line with other studies where surgery and internal medicine are the most wanted specialties among 1st year medical students [20, 21].

New research has shown that essential factors in the specialty preference are not the same for each specialty. These differences might vary depending on the environment and even on culture. For example, in the UK, female students were less likely to choose surgical specialties [22], while in Germany, there has been a slight increase in the number of female surgeons in recent years [19]. In contrast, amongst Swedish students, there was a significant difference between females and males in the gynecology and obstetrics specialty preference [7]. In India, the male students were mostly interested in internal medicine or surgery, while females preferred gynecology and obstetrics. For females in the present study, subspecialties of internal medicine held the highest level of interest, whereas, for males, surgical subspecialties held the same place, which was expected. Females were significantly more likely than males to have an interest in pathology, endocrinology, gynecology and obstetrics, nephrology, ophthalmology, and psychiatry. Females were less likely than males to be interested in surgery, orthopedics, and occupational medicine subspecialties. There was no significant gender difference in interest in geriatrics, laboratory medicine, and radiology. Boyle and coworkers obtained similar results among medical students in New Zealand [7]. A study conducted in Switzerland showed that gender had the most significant influence on specialty preference, followed by personality traits [23].

Students who were interested in anesthesiology and emergency medicine reported the best academic performance (i.e., GPA), while those who were interested in public health reported the poorest academic performance. The crucial thing to say is that the specialty preference in Croatia is not related to income because there is no significant difference in the income across specialties, contrary to that observed in a US study [3].

There were no significant differences among specialties for extraversion, agreeableness, conscientiousness,

Table 6 Relationship between personality, GPA and gender

	Male	Female	Together	
Variable	Median (IQR)			*P* value[a]
Extraversion	33 (30–39)	33 (28–37.5)	33 (29–38)	0.104
Agreeableness	36 (31–40)	39 (35–43)	38 (34–42)	**< 0.001**
Conscientiousness	35 (31–40.25)	36 (31–40)	36 (31–40)	0.832
Emotional stability	34 (28.75–37.5)	31 (27–36)	32 (27–37)	**< 0.001**
Intellect/imagination	37 (33–41)	36 (33–41)	36 (33–41)	0.458
GPA	4 (3.9–4.5)	4 (4–4.4)	4 (4–4.45)	0.753

[a]Mann-Whitney Test

Table 7 Relationship between specialty preference and personality

	Specialty group						MANCOVA		
IPIP 50	S	IM	PH	P	AEM	D	F	η_p^2	*P*
Extraversion	34 (29–39)	33 (29–37)	33 (30–36)	33 (26–40)	33 (28–38)	35 (30–40)	0.752	0.009	0.585
Agreeableness	37 (33–41)	38 (34–42)	37 (33–41)	40 (37–43)	38 (34–42)	39 (36–42)	1.541	0.019	0.176
Conscientiousness	36 (21–41)	36 (32–40)	34 (29–39)	36 (32–40)	38 (32–44)	37 (32–42)	0.383	0.005	0.860
Emotional stability	33 (28–38)	31 (37–36)	32 (26–38)	32 (24–40)	32 (27–37)	33 (29–37)	0.913	0.011	0.472
Intellect/ imagination	37 (34–41)	36 (33–41)	34 (30–37)	39 (35–45)	37 (34–41)	38 (33–40)	3.779	0.046	**0.002**

Variables are defined with the median and Interquartile ranges. *S* Surgery, *IM* Internal medicine, *PH* Public health, *P* Psychiatry, *AEM* Anesthesiology and emergency medicine, *D* Diagnostics, *F* Test statistic, η_p^2 partial eta-squared, df = 5

and emotional stability traits, but there were for the openness (intellect/imagination) trait. Occupational satisfaction and personal interest are important motivating factors in specialty preferences among students who score higher at the openness (intellect/imagination) scale [4]. Openness to experience (intellect/imagination) is the most commonly reported in psychiatrists and medical students with a preference for psychiatry as a future specialty preference [24]. Openness (intellect/imagination) is associated with academic ability and divergent thinking. It is more useful in clinical education and the applied settings of medicine than in academic achievement during medical education [10]. The openness facilitates acceptance, flexibility, and adequate adaptation to situational changes [10]. Persons who score higher on openness (intellect/imagination) are more open-minded and people-oriented. They might be more intellectually curious and experience fewer obstacles to or fear of experiencing close contact with patients [24]. Of the five personality traits, openness (intellect/imagination) is the most consistent trait associated with a specialty preference, as shown in a study by Mullola et al. [10].

Females scored significantly higher than males on agreeableness but significantly lower than males on emotional stability. Agreeableness presents self-control regarding disciplined aspirations toward goals and strict adherence to personal principles [25]. In the present study, male students tend to be better at controlling their emotions, while female students tend to be more kind, helpful and sensitive toward others (Table 6). However, students pursuing diagnostics specialties scored higher on extraversion and lower on emotional stability. There is some inconsistency with other studies where females score higher on extraversion, conscientiousness, and emotional stability traits, but lower on openness (intellect/imagination) compared to males [10, 26]. The study of Mullola and coworkers found no gender differences in agreeableness [10], but Lydon and coworkers found that females scored significantly higher than males on agreeableness [13]. Our results also suggest that gender-related personality might be an essential individual-level factor in career counseling and specialty supervision during and after medical education to improve the ability of physicians to do their best.

In the present study, medical students who preferred psychiatry as a specialty showed the highest score on agreeableness and openness (intellect/imagination) traits. Although psychiatrists scored higher on extraversion in other studies [10, 11], here we found that students who choose psychiatry specialties had lower extraversion score together with students who choose internal medicine, public health, and anesthesiology and emergency medicine specialties. That trait described them as reserved, shy, silent, and retiring.

In the present study, the highest emotional stability was associated with preference in internal medicine. Many other studies found that preference in internal medicine is associated with high conscientiousness and high agreeableness [5, 10, 11]. According to our findings, we could tell that student who preferred internal medicine specialties were generally more stable, calm, and content. Previous research showed that internists are less extroverted because they are inclined to focus on the inner world of ideas rather than the community relationship.

Students who chose anesthesiology and emergency medicine showed more conscientiousness because they were highly self-reliant. Anesthesiologists had the highest conscientiousness levels, so they tend to be more organized, responsible, precise, and practical. All the traits mentioned above are essential features for anesthesiologists. Although, some studies claim that anesthesiologists are team players and open to experience [1, 13], which corresponds to high extraversion and high openness (intellect/imagination) personality traits, respectively. Being imaginative suggests that anesthesiologists could be described in the same way as surgeons concerning their imagination, curiosity, and the need for diversity.

We found that the preference for specializing in surgery is associated with high emotional stability and the lowest agreeableness. Other studies found that higher conscientiousness was associated with specializing in surgery [10] because surgeons tend to be organized, careful, and persistent. Higher emotional stability and

lower agreeableness, was also associated with specializing in surgery [10]. Mainly, surgeons have been described as extraverted and outgoing [5, 10, 11]. Surgeons have a higher tendency to be demanding, dominant, and tough-minded, which refers to their lower agreeableness, and is consistent with previous research [5, 10].

Students who preferred specializations in public health scored the lowest on agreeableness, conscientiousness, and openness to experience (intellect/imagination) traits. Taken in general, these findings might suggest that public health residents tend to be more unfriendly, cruel, careless, irresponsible, shallow, and simple when compared to other specialists.

Medical students who choose diagnostic specialties scored the highest on extraversion and lowest on emotional stability. They are characterized by being more talkative, energetic, outgoing, sociable, but also anxious, fearful, and emotional [13], even though we must observe that pathologists tended to be introverted and less sociable [11]. The finding that the extroverts preferred diagnostic specialties is fascinating and requires further attention in future research.

From all of the above, we can see that the relationship between personality and medical specialty preference is not very clear and univocal.

Limitations of the study

We questioned students from all six years of study, younger students presumably having little knowledge about the different specialties and what they entail. It is known that the specialty preferences may vary significantly from the beginning to the end of medical school. The specialties were grouped to the authors' best ability, after consulting the literature and medical doctors from different fields. However, it was challenging to make a small number of groups without pooling in specialties that different personality groups would choose. Also, we have to take into consideration that participants will want to manage how they appear when responding to self-report questionnaires. Although the UEMS list was used so the research could be compared with studies in other European Union countries, in further studies it would be better to include family medicine as a specialty preference to gain more accurate data for Croatia.

Conclusion

Personality traits might be helpful in medical career counseling during and after medical education to help students choose the specialty that best suits their personalities. This study showed that there were no significant differences in personality traits between medical specialty groups, except for differences in openness (intellect/imagination) among different specialty preferences. Even if variations in personality traits do not exist across different specialties, many other factors influence on specialty preference. However, we believe that our study supplements some new knowledge about the mechanism of specialty preference among medical students. Despite the limitations, the present study might be of help to medical students, professors, and medical educators in the process of selecting a specialty. Additional research with a more significant number of students will be needed to assess the more precise factors associated with the specialty preference. Our results present the influence of personality traits in Croatian settings. The present study explores the factors involved in the choice of specialty. In future studies, it would be interesting to define the most relevant personality traits necessary in each specialty.

Abbreviations

GPA: Grade point average GPA; IQR: Interquartile ranges; MANCOVA: Multiple analyses of covariance; UEMS: The European Union of Medical Specialists'

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Authors' contributions

Conception and design: JM, IŠ. Acquisition of data: VP, IMV. Analysis and interpretation of data: JM, JJ, MH. Drafting the manuscript: IŠ, IMV, VP. Revising the manuscript critically for important intellectual content: JJ, JM, MH. All authors have given final approval of the version to be published and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Availability of data and materials

The authors have full control of all primary data and if you agree to allow the journal to review their data if requested.

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee (Faculty of Medicine Osijek, No. 2158-61-07-15-77) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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References

1. Dolenc E, Mirčić M, Marketin A, Popović J, Žgela K, Grubišić Čabo B, et al. Interest in choosing residency in anesthesiology among sixth-year medical students at the School of Medicine, University of Zagreb. Acta medica Croat. 2018;72:5–10.
2. Schafer S, Shore W, Hearst N. Is medical school the right place to choose a specialty? JAMA. 2001;285:2782. https://doi.org/10.1001/jama.285.21.2782-JMS0606-4-1.
3. Dorsey ER, Jarjoura D, Rutecki GW. Influence of controllable lifestyle on recent trends in specialty choice by US medical students. JAMA. 2003;290:1173. https://doi.org/10.1001/jama.290.9.1173.
4. Kwon OY, Park SY. Specialty choice preference of medical students according to personality traits by five-factor model. KJME. 2015;28:95–102. https://doi.org/10.3946/kjme.2016.14.
5. Bexelius TS, Olsson C, Järnbert-Pettersson H, Parmskog M, Ponzer S, Dahlin M. Association between personality traits and future choice of specialisation among Swedish doctors: a cross-sectional study. Postgrad Med J. 2016;92:441–6. https://doi.org/10.1136/postgradmedj-2015-133478.
6. Pianosi K, Bethune C, Hurley KF. Medical student career choice: a qualitative study of fourth-year medical students at Memorial University, Newfoundland. CMAJ Open. 2016;4:E147–52. https://doi.org/10.9778/cmajo.20150103.
7. Boyle V, Shulruf B, Poole P. Influence of gender and other factors on medical student specialty interest. N Z Med J. 2014;127:78–87.
8. AbouZaid L, Nabil N, Al-Fadil S, Alatmi A, Saeed A. Career choice and its influencing factors: perception of senior medical students. J Contemp Med Edu. 2014;2:168–73. https://doi.org/10.5455/jcme.20140911043239.
9. Heiligers PJM. Gender differences in medical students' motives and career choice. BMC Med Educ. 2012;12:82. https://doi.org/10.1186/1472-6920-12-82.
10. Mullola S, Hakulinen C, Presseau J, Gimeno Ruiz de Porras D, Jokela M, Hintsa T, et al. Personality traits and career choices among physicians in Finland: employment sector, clinical patient contact, specialty and change of specialty. BMC Med Educ. 2018;18:52. https://doi.org/10.1186/s12909-018-1155-9.
11. Borges NJ, Savickas ML, Hassan MQ. Personality and medical specialty choice: a literature review and integration. J Career Assess. 2002;10:362–80. https://doi.org/10.1177/10672702010003006.
12. John OP, Robins RW, Pervin LA. Handbook of personality: theory and research. 3rd ed. New York: The Guilford Press; 2008. p. 160–79.
13. Lydon S, O'Connor P, Mcveigh T, Offiah C, Byrne D, Offiah G. Medical speciality choice: does personality matter? Ir Med J. 2015;108:75–8.
14. Mlačić B, Goldberg LR. An analysis of a cross-cultural personality inventory: the IPIP big-five factor markers in Croatia. J Pers Assess. 2007;88:168–77. https://doi.org/10.1080/00223890701267993.
15. Čuljak Z, Mlačić B. The big-five model of personality and the success of high school students in physical education. Croat J Educ. 2014;16:471–90.
16. Goldberg LR. The development of markers for the big-five factor structure. Psychol Assess. 1992;4:26–42. https://doi.org/10.1037/1040-3590.4.1.26.
17. Goldberg L. A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In: Mervielde I, Deary I, De Fruyt F, Ostendorf F, editors. Personality psychology in Europe. 1st ed. Tilburg: Tilburg University Press; 1999. p. 7–28.
18. Polašek O, Kolčić I, Čikeš N. Specialty preferences among final-year medical students at Zagreb University medical school. Liječnički Vjesn. 2007;129:118–23.
19. Grasreiner D, Dahmen U, Settmacher U. Specialty preferences and influencing factors: a repeated cross-sectional survey of first- to sixth-year medical students in Jena, Germany. BMC Med Educ. 2018;18:103. https://doi.org/10.1186/s12909-018-1200-8.
20. Vo A, McLean L, McInnes MDF. Medical specialty preferences in early medical school training in Canada. Int J Med Educ. 2017;8:400–7. https://doi.org/10.5116/ijme.59f4.3c15.
21. Kaliyadan F, Amin T, Qureshi H, Al Wadani F. Specialty preferences of 1 st year medical students in a Saudi medical school – factors affecting these choices and the influence of gender. Avicenna J Med. 2015;5:134. https://doi.org/10.4103/2231-0770.165120.
22. Hill E, Vaughan S. The only girl in the room: how paradigmatic trajectories deter female students from surgical careers. Med Educ. 2013;47:547–56. https://doi.org/10.1111/medu.12134.
23. Buddeberg-Fischer B, Klaghofer R, Abel T, Buddeberg C. Swiss residents' speciality choices – impact of gender, personality traits, career motivation and life goals. BMC Health Serv Res. 2006;6:137. https://doi.org/10.1186/1472-6963-6-137.
24. Fino E, Agostini A, Mazzetti M, Colonnello V, Caponera E, Russo PM. There is a limit to your openness: mental illness stigma mediates effects of individual traits on preference for psychiatry specialty. Front Psychiatry. 2019;10:775. https://doi.org/10.3389/fpsyt.2019.00775.
25. Mlačić B, Šakić I. The development of Croatian markers for the big-five personality model. J Gen Soc issues. 2008;17:223–46.
26. Hojat M, Zuckerman M. Personality and specialty interest in medical students. Med Teach. 2008;30:400–6. https://doi.org/10.1080/01421590802043835.

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Tendencies towards emigration and their association with introversion and ethnocentrism among final-year medical students from Osijek, Croatia: a cross-sectional study

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Abstract

Background The migration of healthcare workers is attracting growing attention worldwide. Attitudes towards emigration develop over the years, and it is possible that, in addition to social factors, they are influenced by the characteristics of a person's personality and the sense of belonging to the social environment. This study aimed to determine the tendencies of final-year medical students' from Osijek, Croatia, towards emigration after graduation and after specialization, as well as their specialty preferences and to investigate whether introversion and ethnocentrism have an impact on attitudes toward leaving the country in search of employment elsewhere.

Methods A cross-sectional study was conducted among final-year (6th year) medical students from Osijek, Croatia, in two consecutive academic years – 2014/2015 and 2015/2016. Students completed a questionnaire about sociodemographic characteristics, academic and scientific performance, preferences about their future medical career, the medical specialty of choice, emigration tendencies after graduation and specialization, ethnocentrism and introversion.

Results There were 124 students who participated in the study (response rate: 96%). A quarter of participants agreed that they are likely or very likely to emigrate after graduation (25.0%) or after specialization (23.39%). Variables associated with the intention to emigrate were specialty preferences (students that prefer endocrinology and psychiatry had the highest emigration tendencies), academic year in which the participants were included (students included in 2014/2015 were more prone to emigrate after specialization, $p = 0.060$), prior involvement in scientific projects (students with experience in scientific projects expressed higher tendencies to emigrate after graduation, $p = 0.023$), and ethnocentrism (higher ethnocentrism was associated with a lower tendency towards emigration after specialization, Spearman's rho = -0.191).

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Conclusion Our finding that a quarter of final-year medical students from the Faculty of Medicine Osijek were considering emigrating from Croatia in search of employment elsewhere after graduation or specialization is not as high as in previous Croatian studies or studies conducted in other European countries. Even though these data may be encouraging, considering the lack of physicians in Croatia, interventions are needed to prevent permanent emigration to protect the future functioning of the Croatian health system. Furthermore, our study did not find significant associations between levels of introversion and ethnocentrism and tendency to emigrate from Croatia. It seems that the phenomenon covering the emigration of students is more complex and influenced by many other factors which were not included in our study.

Keywords Emigration, Medical students, Ethnocentrism, Introversion, Medical specialty

Background

The migration of healthcare workers is attracting growing attention worldwide [1]. Trained healthcare professionals, which are in demand worldwide, migrate looking for better standards of living and quality of life, financially more rewarding jobs, access to advanced technology and more stable political conditions. People tend to migrate from developing to developed countries, which can devastate health systems in developing countries [2]. The World Health Organization (WHO) recognizes such migration as a cause of the uneven distribution of the global health workforce, which may lead to even greater inequalities in healthcare availability [3].

Recent trends in the international migration of physicians show that the United States of America (USA) is their main destination country, followed by the United Kingdom and Germany [4]. Since Croatia joined the European Union (EU) in June 2013, many medical professionals have emigrated from Croatia to more developed countries, with more physicians emigrating each year. Most Croatian physicians migrated to Germany, Slovenia, the United Kingdom (UK), Ireland and Switzerland [5]. Studies have shown that about 140 physicians leave Croatia annually [6], making Croatia one of the three EU countries from which most physicians emigrate [5].

Furthermore, a study among Croatian students from 2014 indicated that as many as 35% of students wanted to emigrate after Croatia joined the EU, expressing readiness to work and live abroad permanently. Most of the surveyed students wanted to move to Germany (40%), the USA and Canada (17%), and the UK (11%) [7].

In a study conducted among medical students in Croatia, the most common reasons for wanting emigration were higher earnings, secure work, better health system organization, more opportunities for career advancement, and greater respect for medical personnel in society [8].

One study has shown that healthcare workers who reported a tendency to emigrate were mostly men, young, not married, and more educated [9], while the other revealed a correlation between the tendency to permanently work out of their country and being abroad before for a study purpose or having a relative or friend abroad [10]. In addition, another study found a negative correlation between interest in leaving their county for work and wanting to pursue a surgical career [11].

Attitudes towards emigration develop over the years, and it is possible that, in addition to social factors, they are influenced by the characteristics of a person's personality and the sense of belonging to the social environment. Ethnocentrism can be used as a measure of a feeling of belonging to the social environment. The term ethnocentrism was first introduced by Sumner in 1906, defining it as an understanding of the world in which an individual puts their group at the center of everything while evaluating all other groups in relation to it [12].

Ethnocentrism is defined within the framework of two terms: "ingroup" - a social group in which an individual feels like a member of it, and "outgroup" - the rest of the social environment with which the individual cannot identify [13]. Ethnocentric behavior is based on specific ties within the group, such as language, accent, physical features, and religion, and has a highly developed territorial component [14]. Since, to the authors' knowledge, this concept was not previously analyzed in the context of migration, and since it intuitively seems to lead in the direction of a lower tendency to migrate, we decided to analyze the impact of ethnocentrism on the tendency to migrate.

Another potential variable that can play a role in the decision on the choice of future profession, as well as the place of residence, is the introversion of the respondent. The first concept of introversion and extraversion was introduced by Jung in 1921, characterizing them as two main personality types [15]. He described introversion as an orientation towards inner experience and a tendency towards introspective cognitive activity. In later conceptualization attempts, introverts were described as persons preoccupied with inner ideas and feelings [16] and prone to social withdrawal [17]. Eysenck describes introverts as calm, serious, passive and pessimistic people, who have few close friends, plan ahead, are not irritable and value ethical principles [18]. Previous research has shown that extraversion is positively associated with the tendency to migrate since extraverted persons have an

easier time making interpersonal connections in a new environment [19].

Since brain drain can profoundly affect the region, we also aimed to assess academic success by self-reported grade point average (GPA), previous involvement in scientific research, whether the students failed a year of study and its relation to the tendency to emigrate. Previous research showed no association between academic success and the tendency to migrate [8].

Since involvement in scientific research often implies international cooperation and having contacts in other countries [20], we hypothesized that the students who participated in scientific research would have a higher tendency for emigration.

Studies regarding emigration tendencies are highly relevant for Croatia because of its very high emigration flows. Emigration has particularly intensified after Croatia joined the EU. Analysis of immigration data from the national statistical offices of the core EU countries indicated that 230 thousand people left Croatia between 2013 and 2016 [21]. Eastern Croatia, whose largest city is Osijek, is an economically less developed region in Croatia and one of the Croatian regions with a ratio of migrants to a domestic population close to or above 1% [21]. Thus, this region warrants further emigration-related studies.

This study aimed to determine the tendencies of final-year medical students' from Osijek, Croatia, towards emigration after graduation and after specialization, as well as their specialty preferences and to investigate whether introversion and ethnocentrism have an impact on attitudes toward permanently leaving the country in search of employment elsewhere after graduation and after specialization.

Methods

Study design

This was a cross-sectional study.

Participants

The study included two generations of final-year (6th year) medical students from the Faculty of Medicine Osijek. The study was conducted during two consecutive academic years, 2014/2015 and 2015/2016, and each was conducted during the last months of the academic year, May and June 2015 and 2016.

Ethics

The study was approved by the Ethics Committee of the Faculty of Medicine Osijek, and all participants gave written informed consent. All methods were carried out in accordance with relevant guidelines and regulations.

Questionnaire

The students were given a self-administered anonymous paper-based questionnaire consisting of two parts. Full text of the questionnaire can be found in Supplementary file 1. The first part included eight questions about the participants' sociodemographic characteristics: age, sex, year of study, self-reported GPA (in Croatia, the GPAs are on a scale 1.00–5.00, where grade 1 is a fail, and grades 2–5 are passing grades), whether they failed a year of study, whether they participated in scientific research, preferences about their future career in medicine and their medical specialty of choice.

The second part of the questionnaire included questions about emigration tendencies after graduation and specialization (questions 9 and 10) and validated scales for determining levels of ethnocentrism (questions 11–32) and introversion (questions 33–50). Questions about emigration tendencies were formulated as positive sentences ("I am very likely to emigrate after graduation." and "I am very likely to emigrate after specialization.") after which the participants rated their level of agreement to statements on a 5-point Likert scale as follows: "Strongly Disagree" "Disagree", "Neither Disagree nor Agree", "Agree" and "Strongly Agree".

McCroskey introversion scale by McCroskey and Richmond was used to determine the participants' personality types [22]. On 18 items, participants rated their level of agreement to statements on a 5-point Likert scale, where "Strongly Disagree" "Disagree", "Neither Disagree nor Agree", "Agree" and "Strongly Agree" represent the options that were coded 1 through 5, respectively. Questionnaire results were calculated by the accumulation score's formula that should be in the range of 12 to 60. On that account, scores 12–24 represent highly extraverted; scores 25–35 are categorized as moderate extraversion, 37–48 as moderate introversion and 49–60 are classified as high introversion. Example items from the scale are „Do you like to have many social engagements?" and „Do you usually take the initiative in making new friends?".

Ethnocentrism was assessed using the Revised Ethnocentrism Scale [23]. Respondents needed to note the degree to which they agree or disagree with each item using the following fivepoint scale: Strongly Disagree=1; Disagree=1; Neutral=3; Agree=4; Strongly Agree=5. Questions 15, 18 and 20 were reverse-scored, and questions 14, 17, 23, 26, 27, 28 and 30 were dropped, as suggested by the author of the original instrument [23]. Based on the 15 measurement items, the score range was 15 to 75, with a mid-point of 45. The higher the score is, the higher the ethnocentrism is. Example items from the scale are „Most other cultures are backward compared to my culture." and „Most people would be happier if they lived like people in my culture.".

Table 1 Academic characteristics of included students (N = 124)

		n (%)
Failed a year		
	Yes	24 (19)
	No	100 (81)
Participated in a scientific project		
	Yes	39 (31)
	No	85 (69)
Area of medical interest		
	Basic medical sciences	2 (2)
	Clinical medicine	117 (94)
	Public health	5 (4)

Statistical analysis

The distribution normality of numerical variables was tested by Kolmogorov-Smirnov and Shapiro-Wilks test. Non-parametrical tests were used due to the non-normal distribution of all scalar variables. Numerical data were presented as medians and interquartile ranges (IQR), or as means and standard deviations (SD). Categoric variables were presented by relative and absolute frequencies. Mann-Whitney U-test was used to assess the differences between the two groups of students based on the academic year in which the participants were included (2014/2015 and 2015/2016). Chi-square test was used to assess the difference among ratios between independent samples, whereas Spearman's ρ was used to assess correlations among variables. Data analysis was performed using an IBM SPSS Statistics version 16.0 for Windows. P-values less than 0.05 were considered statistically significant.

Raw data

Raw data collected within the study are provided in Supplementary file 2.

Results

A total of 124 final-year medical students were included in the study, of which 34 (27%) were men. In the 2014/2015 academic year, 60 students were enrolled for the final year and in the 2015/2016 academic year, 69 students were enrolled for the final year, so the response rate was 96%. Of the total number of participants, 61 (49%) were tested in the 2014/2015 academic year, and 63 (51%) in the 2015/2016 academic year. The mean age of the participants was 24.14 ± 1.074 (range 23–30).

Most students indicated they would prefer a career in clinical medicine (94%) (Table 1). The most popular specializations were Pediatrics and Internal medicine (11% each), followed by Otorhinolaryngology, Surgery, and Anesthesiology (7% each). The mean GPA was 4.13 (0.379).

The tendency toward emigration after graduation was expressed by 31 (25%) students, while 29 (24%) of them indicated they would emigrate after specialization (Table 2). In our sample, students that prefer endocrinology and psychiatry as their specialty had the highest median scores on the questions pertaining to emigration tendency (Table 3).

Table 2 Tendencies towards emigration of final-year medical students and the differences between the two tested generations (N = 124)

	n (%)			
	All students	**2014/2015 academic year**	**2015/2016 academic year**	**Chi Square (p value)**
I am very likely to emigrate after graduation.				
Strongly Disagree	24 (19)	7 (11)	17 (27)	8.028 (0.091)
Disagree	27 (22)	14 (23)	13 (21)	
Neutral	42 (34)	23 (38)	19 (30)	
Agree	19 (15)	8 (13)	11 (17)	
Strongly Agree	12 (10)	9 (15)	3 (5)	
I am very likely to emigrate after specialization.				
Strongly Disagree	18 (14)	5 (8)	13 (20)	13.238 (0.010)
Disagree	33 (27)	16 (26)	17 (27)	
Neutral	44 (35)	19 (31)	25 (40)	
Agree	17 (14)	10 (17)	7 (11)	
Strongly Agree	12 (10)	11 (18)	1 (2)	

The mean score (SD) for ethnocentrism was 32.58 (6.129), and the median score (IQR) of the introversion scale was 41 (36–44). Higher ethnocentrism was associated with a lower tendency towards emigration after specialization (Table 4).

No differences were observed in the tendency to emigrate after graduation (Mann Whitney test, z=-0.029, p=0.977) or specialization (Mann Whitney test, z=-0.305, p=0.760) between students who did and did not fail a study year.

Significant differences between generations were observed regarding the tendencies to emigrate after specialization (Mann Whitney test, z=-2.773, p=0.006); students enrolled for the final study year in the 2014/2015 academic year were more prone to emigrate. Medians and IQRs of the two groups were 3 [2–4] vs. 3 [2, 3], respectively. No differences were observed in the tendency to emigrate after graduation (Mann Whitney test, z=-1.882, p=0.060) between the two generations.

No sex-related differences in the tendency to emigrate were observed, either after graduation (Mann Whitney test, z=-1.165, p=0.244), or after specialization (Mann Whitney test, z=-0.607, p=0.544).

Students that participated in scientific projects during their medical education expressed a higher tendency towards emigrating after graduation than students who

Table 3 Specialty preferences and median scores of the questions pertaining to emigration

	n	(%)	Median (IQR)	
Specialty			**Emigration after graduation**	**Emigration after specialization**
Anesthesiology	9	(7.4)	3 (1.5–4.5)	3 (1.5-4)
Cardiology	5	(4.1)	3 (1.5-4)	2 (1.5-4)
Cardiothoracic Surgery	3	(2.5)	3 (2)	3 (2)
Child and Adolescent Psychiatry and Psychotherapy	1	(0.8)	3	3
Clinical Genetics	1	(0.8)	5	5
Dermatology and Venereology	2	(1.6)	2.5 (2)	2.5 (2)
Endocrinology	2	(1.6)	4 (3)	4 (3)
Gastroenterology	4	(3.3)	2.5 (1.25–4.5)	2.5 (1.25–4.5)
Gynecology and Obstetrics	3	(2.5)	2 (1)	2 (1)
Infectious Diseases	2	(1.6)	3 (2)	3 (2)
Internal Medicine	14	(11.5)	3 (1.75-4)	3 (2-4.25)
Medical Microbiology	1	(0.8)	3	4
Nephrology	3	(2.5)	3 (1)	3 (2)
Neurology	7	(5.7)	3 (2–4)	3 (2–3)
Neurosurgery	1	(0.8)	3	3
Occupational Medicine	3	(2.5)	3 (1)	3 (1)
Ophthalmology	6	(4.9)	3 (2.75–4.25)	3 (2.75–4.25)
Oro-Maxillo-Facial Surgery	2	(1.6)	1.5 (1)	2 (2)
Orthopedics	3	(2.5)	2 (1)	2 (1)
Otorhinolaryngology	9	(7.4)	2 (1–3)	2 (1–3)
Pediatrics	14	(11.5)	2 (1–4)	3 (1–3)
Pathology	1	(0.8)	1	1
Physical Medicine and Rehabilitation	2	(1.6)	2.5 (2)	2.5 (2)
Plastic, Reconstructive and Aesthetic Surgery	1	(0.8)	3	3
Pneumology	1	(0.8)	3	3
Psychiatry	5	(4.1)	4 (2-4.5)	4 (2.5–4.5)
Public Health Medicine	4	(3.3)	3 (1.5–3.75)	3.5 (2.25-4)
Radiology	4	(3.3)	2.25 (3-4.5)	2.25 (3-4.5)
Surgery	9	(7.4)	3 (2-4.5)	3 (1.5-3)

Acronym: IQR = interquartile range

did not participate in scientific projects (Mann Whitney test, z=-2.268, p=0.023), medians and IQRs 3 [2–4] and 3 (1.5-3), respectively. No differences were observed in the tendency to emigrate after specialization regarding participation in scientific projects (Mann Whitney test, z=-1.244, p=0.213).

Discussion

In our study, a quarter of final-year medical students from the Faculty of Medicine Osijek, Croatia, agreed that they are very likely to emigrate after graduation or after specialization. Variables associated with the tendency to emigrate were prior involvement in scientific projects, GPA and ethnocentrism, and differences in the median tendency to migrate were observed between students of different specialty preference.

Table 4 Correlations between the GPA, Introversion and Ethnocentrism scores and the inclination towards emigration after graduation (Graduation) and after specialization (Specialization) (N = 124)

	Graduation	Specialization	Introversion	Ethnocentrism
GPA	0.007	-0.037	0.004	0.070
Graduation		0.686**	0.108	-0.135
Specialization			0.061	-0.191*
Introversion				0.161

*p < 0.05, Spearman's rho

**p < 0.01, Spearman's rho

The percentage of students who considered leaving the country in search of employment abroad in our study differs from a study conducted in 2013, which included final-year medical students from all four medical schools in Croatia (in Zagreb, Rijeka, Split, and Osijek). Among 260 participants included in the 2013 study, 90 (35%) indicated the tendency to emigrate [7]. Moreover, the percentage of students from our study who expressed a wish to seek employment abroad is not as high as in other European countries. For example, 62.1% of Polish students indicated having a plan to seek employment abroad after graduation [1].

Regarding the standards of care, it is noteworthy that in Croatia, these standards are generally lower compared to EU averages. Croatia had 344 physicians per 100 000 inhabitants in 2018. Since the EU average is 382 physicians per 100 000 inhabitants, Croatian numbers are below the EU average. Also, the number of general practitioners per 100 000 inhabitants (57 in 2019) in Croatia was below the EU average (78 in 2013) and physicians in Croatia are needed particularly in primary care [24].

Given that Croatia already lacks physicians, with the number of physicians below the EU average, the percentage of students with a tendency to emigrate should be perceived as worrisome. This is particularly alarming considering the projection of the Croatian Medical Chamber stating that Croatia will lose a third of its physicians due to emigration and retirement by 2025 [6] as well as increasing needs for healthcare services due to extended life expectancy. Thus, raising awareness of the importance of attracting healthcare workers to stay in the homeland is crucial.

Furthermore, our findings suggest that students who participated in scientific projects during their medical education had a stronger tendency to emigrate after graduation. We could not compare these results with others since we did not find such data in the literature. We can speculate that participation in scientific projects during medical education is associated with higher motivation and ambition for collaborating with foreign colleagues to improve scientific accomplishments.

We found no significant association between levels of introversion and tendency to emigrate. To the best of our knowledge, this is the first study that investigated the link between introversion and tendency to emigrate after graduation or specialization among medical students. However, we found a study that investigated the association between personality traits and migration intentions among university students in Germany [19]. Our findings are not in accordance with that study since they found a positive association between migration and extraversion, implying a negative correlation between introversion and migration intentions [19].

Likewise, a significant association between levels of ethnocentrism and a tendency toward emigration was not observed. To our best knowledge, this is also the first study to investigate the association between ethnocentrism and the tendency to emigrate.

In the larger context, it has to be mentioned that the migration of medical personnel also derives some benefits to countries they leave behind, particularly in the case of temporary migration. In more advanced settings, physicians can acquire new skills, gain more experience and improve their research skills.

At the same time, retaining enough physicians for healthcare systems to function is very important. This is why the WHO Global Code of Practice on the International Recruitment of Health Personnel in May 2010 called for more ethical hiring of health workers to evade active recruitment in countries that already cope with an insufficient number of health care professionals [25].

Furthermore, countries that have invested in the education of young health professionals experience a loss of financial resources when these people leave the country since highly educated personnel are one of the most expensive resources in any country. However, these countries are not at a loss only because of the investment in the health workers, but also due to the possible contribution of those workers to the health system [2]. For instance, the total cost of educating one physician from primary school to university in Kenya is US$ 65,997; and for every physician who emigrates, a country suffers a loss of about US$ 517,931 worth of investment [26]. We were not able to find in the literature any comparable studies that were conducted in Croatia.

It is important to highlight that our study was conducted at a very specific time point in the geopolitical EU history – shortly after Croatia joined the EU in June 2013. Thus, our data provide insight into the emigration tendencies of medical students in a region that is economically disadvantaged and highly affected by population outflow, early after EU accession [21]. As such, our data will serve as a benchmark for future studies that can compare future data with ours.

Also, it should be highlighted that ethnocentrism is a concept rarely analyzed. While, this was limiting in the sense that making comparisons with other research was difficult, this is also an advantage of our study, as our findings contribute to a research field that was insufficiently explored.

Limitations of the study

It could be considered that with 124 students included, our study had a relatively small sample size. However, we had a response rate of 96%, thus adequately representing the population of medical students in Eastern Croatia. The Faculty of Medicine Osijek is the only Medical School in Eastern Croatia. For this region, the results about the tendencies for emigration are crucial, as Eastern Croatia is one of the areas of Croatia that is experiencing the highest levels of emigration.

Second, we compared two generations of students that are only one year apart from each other. This minimal age difference makes generational comparisons challenging to interpret. We included two consecutive generations to increase the sample size because the school in which we conducted the study is fairly small and enrolls a limited number of students per year. However, despite the minimal age differences, we also wanted to compare the two generations and see if the minimal age difference affects the tendency to migrate, hypothesizing that the younger generation would be more prone to migration. It is known that young people make up a part of the population that is most likely to emigrate [27]. Since we found significant differences between the two consecutive generations, we believe that these results could be interesting to the readers, and useful for fostering further research. We were unable to find comparable studies in the literature to compare our results with those from other authors, but our study could motivate other researchers to explore how quickly intergenerational tendencies towards emigration change and why. We have added this now to the manuscript.

Third, the student population was predominantly women, with only 27% men participants. However, this should not be considered a limitation of the study because this is representative of the trend of so-called feminization of medicine, as the majority of students enrolled and graduated from medical studies in Croatia

are women [28]. Moreover, other variables should have been taken into account, such as Big-5, marital status, financial status, fluency in foreign languages, or previous student mobility.

The survey was conducted in 2015 and 2016. However, the results are relevant for the number of reasons. Firstly, the data presented are novel as we were unable to find a single other study that has explored ethnocentrism among medical students in Croatia. Furthermore, we were unable to find other studies in the literature that have investigated the link between introversion and tendency to emigrate after graduation or specialization among medical students. Also, we were unable to find a single other study in the literature that has investigated the association between ethnocentrism and the tendency to emigrate. Secondly, it has been posited that all research should be published [29]. Research is the advancement of knowledge and ideally, all research findings should be publicly available. Knowledge gained via research is a common good. Publication of research results is one of the prerequisites for verifying results and improving and increasing knowledge [29]. Thirdly, the topic that we have explored is an important topic for individual countries and health systems. It has been highlighted in the literature that the migration of medical professionals as a result of the expansion of the European Union is cause for concern, but that there is a significant lack of information available about this phenomenon [30]. Our study fills part of this gap. Fourthly, our results will serve as a benchmark to show the status of the tendency to emigrate shortly after joining the EU. Newer research can take these results as a point of comparison, especially after Croatia joined the Schengen Area in January 2023 and after the widespread protests of physicians related to their wages and work conditions that were organized in March 2023 in Croatia.

Conclusion

This study showed that almost one-fourth of final-year medical students from the Faculty of Medicine Osijek were considering emigrating from Croatia in search of employment elsewhere after graduation or specialization. These results are not as high as they were in previous Croatian studies or studies conducted in other European countries. Even though these data may be encouraging, considering the lack of physicians in Croatia, interventions are needed to prevent permanent emigration to protect the future functioning of the Croatian health system.

Furthermore, our study did not find significant associations between levels of introversion and tendency to emigrate from Croatia, but we did find a significant negative association between the levels of ethnocentrism and willingness to migrate after specialization. It seems that the phenomenon covering the emigration of students is more complex and influenced by many other factors which were not included in our study.

Further studies are needed to explore more factors associated with the migration tendencies of medical personnel. In future studies, it would be interesting to investigate what other personality traits (internal factors), such as other dimensions of the Big-5, marital and financial status, or patriotism, influence the decision to emigrate after graduation or specialization, as well as external factors such as public policies and strategies.

Acronyms

EU European Union.
GPA Grade point average.
IQR Interquartile ranges.
SD Standard deviation.
UK United Kingdom.
USA United States of America.
WHO World Health Organization.

Abbreviations

EU	European Union
GPA	Grade point average
IQR	Interquartile ranges
SD	Standard deviation
UK	United Kingdom
USA	United States of America
WHO	World Health Organization

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

Author contributions

Study design: JM, MM, IMV; Data collection, analysis, and interpretation: JM, JJ, MĆ, MM, LP; Writing of the manuscript and revising the manuscript for intellectual content: JM, ZVĆ, JJ, MČ, LP, IMV, MM; Final approval of the manuscript: JM, ZVĆ, JJ, MČ, LP, IMV, MM.

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Data Availability

Raw data collected and analyzed within this study are publicly available in Supplementary file 2.

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the Faculty of Medicine Osijek, and all participants gave written informed consent. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

None. The authors declare they have no competing interests.

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References

1. Krayewski-Siuda K, Szromek A, Romaniuk P, Gericke CA, Szpak A, Kaczmarek K. Emigration preferences and plans among medical students in Poland. Hum Resour Health. 2012;10:8. https://doi.org/10.1186/1478-4491-10-8.
2. Dodani S, LaPorte RE. Brain drain from developing countries: how can brain drain be converted into wisdom gain? J R Soc Med. 2005;98(11):487–91. https://doi.org/10.1258/jrsm.98.11.487.
3. Hagopian A, Thompson MJ, Fordyce M, Johnson KE, Hart G. The migration of physicians from sub-saharan Africa to the United States of America: measures of the african brain drain. Hum Resour Health. 2004(17):2. https://doi.org/10.1186/1478-4491-2-17.
4. OECD. Recent Trends in International Migration of doctors, nurses and medical students. Paris: OECD Publishing; 2019. https://doi.org/10.1787/5571ef48-en.
5. Gruber E, Sarajlic Vukovic I, Musovic M, Moravek D, Starcevic B, Martic Biocina S, Knez R. Migration of croatian physicians in the global context. Med Flumin. 2020;56(2):88–96. https://doi.org/10.21860/medflum2020_237296.
6. Jurić T. Medical Brain Drain from Southeastern Europe: using Digital Demography to Forecast Health worker emigration. JMIRx Med. 2021;2(4):e30831. https://doi.org/10.2196/30831.
7. Kolčić I, Čikeš M, Boban K, Bućan J, Likić R, Ćurić G, Đogaš Z, Polašek O. Emigration-related attitudes of the final year medical students in Croatia: a cross-sectional study at the dawn of the EU accession. Cro Med J. 2014;55(5):452–8. https://doi.org/10.3325/cmj.2014.55.452.
8. Kolcić I, Polasek O, Mihalj H, Gombac E, Kraljević V, Kraljević I, Krakar G. Research involvement, specialty choice, and emigration preferences of final year medical students in croatia. Croat Med J. 2005;46(1):88–95.
9. Ferreira PL, Raposo V, Tavares AI, Correia T. Drivers for emigration among healthcare professionals: testing an analytical model in a primary healthcare setting. Health Policy. 2020;24(7):751–7. https://doi.org/10.1016/j.healthpol.2020.04.009.
10. Santric-Milicevic MM, Terzic-Supic ZJ, Matejic BR, Vasic V, Ricketts IIITC. First-and fifth-year medical students' intention for emigration and practice abroad: a case study of Serbia. Health Policy. 2014;118(2):173–83. https://doi.org/10.1016/j.healthpol.2014.09.018.
11. Akl EA, Maroun N, Major S, Afif C, Abdo A, Choucair J, Sakr M, Li CK, Grant BJ, Schünemann HJ. Post-graduation migration intentions of students of lebanese medical schools: a survey study. BMC Public Health. 2008;8:191. https://doi.org/10.1186/1471-2458-8-191.
12. Neuliep JW, Hintz SM, McCroskey JC. The influence of Ethnocentrism in Organizational Contexts: perceptions of interviewee and managerial attractiveness, credibility, and effectiveness. Commun Q. 2005;53(1):41–56. https://doi.org/10.1080/0146337050005595.
13. Lantz G, Loeb S. Country of Origin and Ethnocentrism: an analysis of canadian and american preferences using Social Identity Theory. Adv Consum Res. 1996;23:374–8.
14. Hammond RA, Axelrod R. The evolution of Ethnocentrism. J Confl Res. 2006;50(6):926–36. https://doi.org/10.1177/0022002706293470.
15. Jung CG. Psychological types. San Diego, CA: Harcourt; 1921.
16. Cattell R. Description and measurment of personality. New York: World Book Company; 1969.
17. Good C. Dictionary of education. New York: McGraw-Hill Book Company; 1959.
18. Eysenck H, Eysenck S. Manual of the Eysenck personality questionnaire revised. San Diego, CA: EdITS; 1994.
19. Fouarge D, Özer MN, Seegers P. Personality traits, migration intentions, and cultural distance. Pap Reg Sci. 2019;98(6):2425–54. https://doi.org/10.1111/pirs.12468.
20. Puljak L, Vari SG. Significance of research networking for enhancing collaboration and research productivity. Croat Med J. 2014;55(3):181–3.
21. Draženović I, Kunovac M, Pripužić D. Dynamics and determinants of emigration: the case of Croatia and the experience of new EU member states. Public Sect Econ. 2018;14(424):415–47.
22. McCroskey JC, Richmond VP. Willingness to communicate: differing cultural. 1990;56(1):72–7. https://doi.org/10.1080/10417949009372817.
23. Neuliep JW, McCroskey JC. The development of a U.S. and generalized ethnocentrism scale. Commun Res Rep. 1997;14(4):385–98. https://doi.org/10.1080/08824099709388682.
24. Džakula A, Vočanec D, Banadinović M, Vajagić M, Lončarek K, Lukačević Lovrenčić I, Radin D, Rechel B. Croatia: Health system review. Health Syst Transit. 2021;23(2:):1–146.
25. Taylor A, Dhillon I, The, WHO Global Code of Practice on the International Recruitment of Health Personnel.: The Evolution of Global Health Diplomacy. 2011. https://scholarship.law.georgetown.edu/cgi/viewcontent.cgi?article=1733&context=facpub. Accessed 15 Jan 2022.
26. Kirigia JM, Gbary AR, Muthuri LK, Nyoni J, Seddoh A. The cost of health professionals' brain drain in Kenya. BMC Health Serv Res. 2006;6:89. https://doi.org/10.1186/1472-6963-6-89.
27. Remeikienė R, Gasparėnienė L. Assessment of the impact of emigration on the origin economy. Bus Theory Pract. 2019;20:187–95.
28. Puljak L, Kojundzic SL, Sapunar D. Gender and academic medicine: a good pipeline of women graduates is not advancing. Teach Learn Med. 2008;20(3):273–8.
29. Hammerstrøm KT, Nylenna M. Alle forskningsresultater bør publiseres [All research results should be published]. Tidsskr nor Laegeforen. 2011;131(23):2337–8.
30. García-Pérez MA, Amaya C, Otero A. Physicians' migration in Europe: an overview of the current situation. BMC Health Serv Res. 2007;7:201.

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RESEARCH

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Levels of depression, anxiety and subjective happiness among health sciences students in Croatia: a multi-centric cross-sectional study

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Abstract

Background Previous studies have shown that symptoms of depression and anxiety were highly prevalent among health sciences students. This may lead to other professional and personal difficulties and a decrease in individuals' well-being. This study aimed to analyze levels of depression, anxiety and subjective happiness among health sciences students in Croatia.

Methods We conducted a cross-sectional study in 10 higher education institutions in Croatia during March 2023. Eligible participants were health sciences students. Participants filled out an online survey consisting of sociodemographic questions and validated scales for determining the levels of depression (9-question Patient Health Questionnaire, PHQ-9), anxiety (General Anxiety Disorder 7-item scale, GAD-7), and happiness (Subjective Happiness Scale, SHS).

Results Of 7460 invited students, 2137 students participated in the study (29% response rate). There were 41.4% of students that exhibited at least mild depressive symptoms, with 8% of students exhibiting moderately severe symptoms and 1.8% severe depressive symptoms. Mild anxiety was found in 36.8%, moderate anxiety in 23.9% and severe anxiety in 15.8% of students. The median SHS score was 19 (15.25–22).

Women students had significantly higher levels of depression ($p < 0.001$) and anxiety ($p < 0.001$) than their men peers. Students in earlier study years showed higher levels of depression, anxiety and lower levels of subjective happiness compared to those in later study years. Students with lower self-assessed financial status had higher levels of depression ($p < 0.001$) and anxiety ($p < 0.001$). Students that failed an academic year had higher levels of depression ($p < 0.001$), but lower levels of anxiety ($p = 0.005$).

Conclusion In this study, we have shown that health sciences students exhibit high levels of depression and anxiety, at rates exceeding those in the general population reported in other studies. Our results may help educational institutions to put greater effort into the battle against mental health stigma, foster acceptance of mental health issues and encourage students to seek help when needed. Adequate mental health services are needed at universities to promote timely diagnosis and treatment of mental health problems.

Keywords Mental health, University students, Depression, Anxiety, Nursing, Healthcare

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Background

It is well documented that university students show high levels of mental distress, which is even more pronounced among health sciences students. Health sciences are often considered to be academically, psychologically, and emotionally challenging [1–4]. In our previous study conducted in 2016, we found that 60.2% of medical and health sciences students showed increased levels of depression [5]. Most research on the topic of student mental health was done on medical students. It is considered that the frequencies of mental health issues in other health sciences students are comparable to that of medical students. We have also previously shown that the levels of depressive symptoms among nursing students were comparable to those of medical students, albeit the difference was statistically significant (64.8% vs 57.3%) [5]. In the literature, the prevalence of depressive symptoms in university students varies between 8.6% and 71% [1, 3, 6–8].

Anxiety disorders are the most common psychiatric conditions in university students [9]. Medical students report symptoms of anxiety with a global prevalence rate of 33.8%, ranging between 7.7% and 65.5%, showing that a third of medical students exhibit problems with anxiety, which is much more prevalent than in the general population where it is estimated at 3–25%, depending on the instrument and study protocol [10, 11]. The prevalence of anxiety in medical students is not significantly different from that of other university students [10]. Our previous study among medical and health sciences students found high anxiety levels in 54.5% of the students, with no significant differences between medical and nursing students [5].

The prevalence of mental health issues in the population of health sciences students is alarming. These issues may lead to more severe psychiatric conditions, poor academic performance, use of harmful substances, stress-related academic dishonesty, and reduced empathy which is vital for healthcare workers [8]. Symptoms of anxiety and depression are known detrimental factors of well-being.

Subjective happiness is one of the measures of a person's well-being [12]. It can serve as an indicator of a person's ability to cope with difficulties one can face. A positive outlook on life can help healthcare workers in their relationships with patients. Individuals with higher levels of happiness are shown to live longer; exhibiting happy feelings while at the workplace can make employees more productive, which is particularly important for persons working in the medical field [13].

Since our study from 2016, several changes occurred that might have led to additional increases in the levels of mental distress. Most significantly, the COVID-19 pandemic was shown to be a significant factor leading to mental health issues in the student population. Studies from 2020 have shown a higher prevalence of moderate and severe self-reported depressive and anxious symptoms in the general public and in the student populations caused by the COVID-19 pandemic [14]. A meta-analysis of the prevalence of mental health problems in the population of nursing students during the COVID-19 pandemic showed a prevalence of depression at 52%, fear at 41%, anxiety at 32%, and stress at 30% [15].

The aim of this multi-centric study was to assess the levels of depression, anxiety and subjective happiness among health sciences students in Croatia.

Methods

Study design

This was a multi-centric cross-sectional study.

Reporting

The study is reported in line with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) [16].

Participants

The study included health sciences students from 10 higher education institutions in Croatia providing health sciences studies. The following institutions participated in the study: Catholic University of Croatia, Juraj Dobrila University of Pula, Libertas International University, University of Applied Health Sciences, Polytechnic of Bjelovar, University North, University of Dubrovnik, University of Rijeka, University of Split, and University of Zadar. All health sciences students were eligible, including nursing, dental hygiene, physiotherapy, medical laboratory diagnostics, midwifery, radiological technology, occupational therapy, and sanitary engineering.

Students were asked via their official school email addresses to complete the survey hosted on SurveyMonkey. Participation was voluntary, and no incentives were offered to the students. First, information about the study was sent in a separate document with a link to the survey. The survey invitation with information about the study can be found in Supplementary file 1. Before starting the survey, participants were asked to confirm that they were giving their consent to participate in the study. Two reminders were sent, spaced one week apart, after the first email invitation. The first invitation was sent on March 6, 2023, followed by the first reminder on March 18, 2023, and the second reminder on March 20, 2023. The survey was closed on April 23, 2023. Direct identifiers of the participants were not collected.

Ethics

The study protocol was approved by the Ethics Committees of all participating institutions. All participants gave their written informed consent in the online interface before starting the online survey. All methods were carried out in accordance with relevant guidelines and regulations.

Survey

The students were given an online self-administered anonymous survey in Croatian language. The full text of the survey in the English language can be found in Supplementary file 2. The survey consisted of two parts. The first part included 14 questions about the participants' sociodemographic characteristics: age, sex, university, type of study, whether they are studying full-time or part-time, school year, whether they are employed, whether they live in a rural or urban setting, the number of habitants in their place of residence, the financial status of their family and the monthly income of their family, their self-reported grade point average (GPA), whether they participated in a scientific project, and whether they failed a year in university. The second part of the survey included validated scales for determining the levels of depression, anxiety, and subjective happiness.

The Patient Health Questionnaire (PHQ-9) is a validated psychological instrument that has shown good specificity and sensitivity for detecting depressive disorders [17]. It consists of nine items that are answered on a Likert scale and correspond to one of the DSM-IV Diagnostic Criterion for symptoms of major depressive disorder [18–21]. The total score ranges from 0 to 27. Cut-off points were suggested at 5, 10, 15 and 20, corresponding to mild, moderate, moderately severe and severe levels of depressive symptoms [17]. When determining the prevalence of depressive symptoms, we used the cut-off point of 5, thus encompassing all participants with at least mild depression.

The Generalized Anxiety Disorder – 7 (GAD-7) is a validated 7-item self-report psychological instrument developed to diagnose generalized anxiety disorder. It has shown good sensitivity and specificity as a screening tool for panic disorder, social anxiety and PTSD [17]. Its seven items are answered on a Likert scale [22, 23]. The total score ranges from 0 to 21, with proposed cut-off points set at ≥ 5, ≥ 10, and ≥ 15 representing mild, moderate, and severe anxiety symptom levels, respectively [24]. When determining the prevalence of anxiety symptoms, we used the cut-off point of 5, thus encompassing all participants with at least mild anxiety.

The Subjective Happiness Scale (SHS) is a survey consisting of 4 items, and it aims to assess the respondents' subjective happiness. Respondents are asked to characterize themselves using total ratings and ratings relative to others and to assess to what extent the characterizations of happy and unhappy individuals describe them personally. Each item is scored on a 7-point Likert scale. The possible score range is 4 to 28, with higher scores indicating a higher level of subjective happiness [25].

We used official Croatian versions of the PHQ-9 and GAD-7 since all the participants spoke Croatian. We used the Croatian translation of the Subjective Happiness Scale that our team prepared previously and used in a similar study [5]. Items were not randomized or alternated, nor was adaptive questioning applied. All the items were shown on a single page. The participants could correct their answers before sending the completed survey. Unique site visitors were not counted. The authors tested the online survey on desktop and mobile phones to ensure technical functionality before the data collection. We did not use any methods to prevent duplicate entries potentially. No surveys were submitted with an atypical timestamp.

Statistical analysis

All surveys were included in the study, regardless of their completeness. We reported the completion rate as the number of surveys filled out and submitted divided by the number of surveys started by respondents. The distribution normality of scalar variables was tested by Kolmogorov–Smirnov and Shapiro-Wilks tests. Non-parametrical tests were used due to the non-normal distribution of all scalar variables. Numerical data were presented as medians and interquartile ranges (IQR), or as means and standard deviations. Categorical variables were presented by relative and absolute frequencies. Mann–Whitney U-test was used to assess the differences between the two groups. Cronbach's Alpha was used to assess the internal consistency of the psychological instruments. The chi-square test was used to assess the differences in ratios between independent samples, and Spearman's ρ was used to assess correlations among variables. The effect of multiple variables was assessed by a Stepwise Multiple Linear Regression Analysis. Data analysis was performed using an IBM SPSS Statistics version 16.0 for Windows. *P*-values less than 0.05 were considered statistically significant.

Raw data

Raw data collected within the study, without indirect identifiers of the participants, are published on Open Science Framework (link: https://osf.io/ms2u4/).

Results

Participants' characteristics

Of the 7460 invited students, 2137 students participated in the study (29% response rate). The completion rate of the survey was 97%. Response rates across institutions ranged from 16 to 65%. Response rates per institutions and number of students in different study courses accross specialty per institution are available in Supplementary file 3. One week after the first invitation, the response rate was 14% ($N=1022$); one week after the first reminder, the response rate was 23% ($N=1679$), finally reaching 29% after the second reminder by the time the survey was closed for further responses.

The sociodemographic characteristics of the participants are presented in Table 1. The majority of participants (86.3%) were women. The participants' median age was 22 years (IQR 20–26). Most participants studied nursing. More than half were employed full-time. Most were employed in healthcare, lived in an urban area and had a monthly income of 1001–2000 €. Few students had ever failed a study year. Less than 20% participated in a scientific project (Table 1).

Levels of depression, anxiety and subjective happiness among health sciences students

All scalar variables showed a deviation from normal distribution as tested by the Kolmogorov–Smirnov test. Cronbach's Alpha test showed satisfactory internal consistency of the instruments used in the study, with PHQ-9 having an alpha of 0.905, GAD-7 of 0.905 and SHS of 0.807. Suicidal or auto-destructive ideations were present in 414 (19.4%) of students.

The median scores were as follows: PHQ-9 8 (4–13), GAD-7 7 (4–12), SHS 19 (15.25–22), and GPA 4 (4–4). There were no significant differences in GPA between the sexes ($p=0.064$).

Differences in PHQ-9, GAD-7 and SHS scores are presented in Table 2. Significant differences in the levels of depression were found based on sex ($p<0.001$), whether the students worked part-time or full-time ($p=0.007$), year of study ($p<0.001$), employment ($p<0.001$), self-assessed financial status ($p<0.001$), average monthly income ($p<0.001$), failing a year in college ($p<0.001$). Significant differences in the anxiety levels were found based on sex ($p<0.001$), year of study ($p<0.001$), employment ($p<0.001$), self-assessed financial status ($p<0.001$), average monthly income ($p=0.010$), failing a year in college ($p=0.005$). Significant differences in the subjective happiness scores were found based on whether the students worked part-time or full-time ($p=0.019$), year of study ($p<0.001$), employment ($p<0.001$), self-assessed financial status ($p<0.001$), average monthly income ($p<0.001$), failing a year in college ($p<0.001$).

There was a strong positive correlation between depression and anxiety (rho = 0.826, $p<0.001$), and those variables had a strong negative correlation with subjective happiness (depression: rho = -0.600, $p<0.001$; anxiety, rho = -0.556, $p<0.001$). Age negatively correlated with depression (-0.145, $p<0.001$) and anxiety (rho = -0.091, $p<0.001$) and positively with subjective happiness (rho = 0.083, $p<0.001$).

Since the scores of the PHQ-9 and GAD-7 surveys can be divided into categories based on predefined cut points, the frequencies of those categories are presented in Table 3. Men had higher frequencies of low and mild anxiety, while women had higher frequencies of moderate and severe anxiety ($p<0.001$). Men had higher frequencies of low depressive symptoms, while women had higher frequencies of mild, moderate, moderately severe and severe depressive symptoms ($p=0.003$).

Stepwise Multiple Linear Regression Analysis determined how different variables affected the PHQ-9, GAD-7 and SHS scores. Variables that were offered to the models were as follows: gender, age, type of study, GPA, year of study, full-time or part-time student, employees yes/no, residence, self-assessed financial status, average monthly income, failing a year in college yes/no, previous research project yes/no.

All variables offered to the models for PHQ-9, GAD-7 and SHS were included in the final models. Gender, monthly income and failing a year were the most significant predictors for all the tested variables.

The model for PHQ-9 explained 8.4% of the variance, determined as an adjusted R squared (R^2) with a standard error of 6.28. The ANOVA test results suggest satisfactory explanatory power, F = 16.17, df = 12, $p<0.001$ (Table 4).

The model for GAD-7 explained 5.8% of the variance, determined as an adjusted R squared (R^2) with a standard error of 5.24. The ANOVA test results suggest satisfactory explanatory power, F = 10.82, df = 12, $p<0.001$ (Table 4).

The model for SHS explained 6.8% of the variance, determined as an adjusted R squared (R^2) with a standard error of 4.7. The ANOVA test results suggest satisfactory explanatory power, F = 12.46, df = 12, $p<0.001$ (Table 4).

Discussion

Our analysis of the levels of depression, anxiety and subjective happiness in students of health sciences students in Croatia showed concerning results. There were 41.4% of students that exhibited at least mild depressive symptoms, with 8% of students exhibiting moderately severe symptoms, and 1.8% severe depressive symptoms. Mild

Table 1 Sociodemographic characteristics of the tested population (*N* = 2137)

		n **(%)**
Sex	Men	237 (12.8)
	Women	1845 (86.3)
	Decline to answer	19 (0.9)
Institution of study	Catholic University of Croatia	187 (8.7)
	Libertas International University	130 (6.1)
	Juraj Dobrila University of Pula	193 (9.0)
	University North	194 (9.1)
	University of Applied Health Sciences	542 (25.4)
	University of Dubrovnik	47 (2.2)
	University of Rijeka	291 (13.6)
	University of Split	260 (12.2)
	University of Zadar	153 (7.2)
	Polytechnic of Bjelovar	140 (6.5)
Type of study	Nursing	1479 (69.2)
	Clinical nutritionism	3 (0.1)
	Dental hygiene	1 (0.0)
	Physiotherapy	332 (15.5)
	Medical laboratory diagnostics	74 (3.5)
	Midwifery	44 (2.1)
	Radiological technology	101 (4.7)
	Occupational therapy	33 (1.5)
	Sanitary engineering	68 (3.2)
	Did not specify	3 (0.1)
Full-time or part-time student	Full-time	1123 (52.5)
	Part-time	1014 (47.4)
Year of study	1	198 (9.3)
	2	527 (24.6)
	3	203 (9.5)
	4	594 (27.8)
	5	615 (28.8)
Employment	Employed in the medical field	821 (38.4)
	Employed outside the medical field	424 (19.8)
	Unemployed	892 (41.7)
Residence	Urban	1451 (67.9)
	Rural	686 (32.1)
Size of residence	< 10000	879 (41.1)
	10001–50000	545 (25.5)
	50001–100000	226 (10.6)
	100001–200000	136 (6.4)
	> 200000	351 (16.4)
Self-assessed financial status	1 – very low	16 (0.7)
	2	105 (4.9)
	3	1007 (47.1)
	4	826 (38.7)
	5—excellent	183 (8.6)
Average monthly income	< 1000 €	193 (9.0)
	1001–2000 €	905 (42.3)
	2001–3000 €	636 (29.7)
	> 3000 €	403 (18.8)
Failing a year in college	Yes	156 (7.3)
	No	1981 (92.7)
Doing a scientific project	Yes	404 (18.9)
	No	1733 (81.1)

anxiety was found in 36.8%, moderate anxiety in 23.9% and severe anxiety in 15.8% of students.

Women students had significantly higher levels of depression and anxiety than their men peers. Suicidal or auto-destructive ideations were present in 19.4% of students. Students in earlier years of the study showed higher levels of anxiety, depression and lower levels of subjective happiness. Students with lower self-assessed financial status had higher levels of anxiety and depression. Students that failed an academic year had higher levels of depression but lower levels of anxiety.

In our previous study conducted in 2016, we assessed the same variables in medical and nursing students [5]. We found that the anxiety levels in the current study were markedly higher than in our previous study. Among nursing students, we previously found that 55.7% exhibited at least mild anxiety levels, compared to 76.4% in this study. On the contrary, the levels of depression were lower in the current research; 57.3% of students exhibited at least mild depressive symptoms in our previous research, compared to the current 41.4% [5]. However, the results are not completely comparable since, in the current study, we included other health science university studies and multiple institutions from different parts of Croatia. Thus, the sample was more diverse in the current study.

Pursuing higher education can feel overwhelming for many students, marking a period of first independence from their parents, often accompanied by financial burdens, dealing with long study hours and pressure from family members [26]. Indeed, we found that low self-assessed financial status was associated with higher levels of depression and anxiety in our study. Kumar et al. found that higher financial status was associated with higher levels of happiness in nursing students [27].

Many students have to work part-time or full-time to ease the financial burden of university life, with the share of students working reaching up to 85% in certain

Table 2 Medians and interquartile ranges (IQR) of the scores of the PHQ-9 (The patient health questionnaire-9), GAD-7 (Generalized Anxiety Disorder-7), and Subjective Happiness Scale (SHS) scales depending on the different variables and the difference between those groups. For small groups, the 75th percentile, or both the 25th and the 75th percentile could not be calculated ($N=2138$ participants)

		PHQ-9		GAD-7		SSH	
		median (IQR)	***p***	**median (IQR)**	***p***	**median (IQR)**	***p***
Sex	Men	3 (7–10.5)	< 0.001	3 (6–9)	< 0.001	20 (16–23)	0.069
	Women	8 (4–14)		8 (4–12)		19 (15–22)	
Type of study	Nursing	8 (4–13)	0.222	7 (4–12)	0.072	19 (16–22)	0.156
	Clinical nutritionism	12 (1)		8 (5)		14 (13)	
	Dental hygiene	18		14		25	
	Physiotherapy	7.5 (3.25–13)		7 (3–11)		19 (15–23)	
	Medical laboratory diagnostics	9 (5–15.25)		10 (4.75–14.25)		17 (15–21)	
	Midwifery	9.5 (4.25–12.75)		10 (5–14.75)		19 (16.75–24)	
	Radiological technology	8 (3.5–14)		7 (4–12)		18 (14–22)	
	Occupational therapy	8 (6–13)		8 (3.5–12.5)		20 (15.25–24)	
	Sanitary engineering	9 (6–15)		8.5 (5–12)		17 (14–21)	
Full-time or part-time student	Full-time	8 (4–14)	0.007	8 (4–13)	0.061	19 (15–22)	0.019
	Part-time	8 (4–13)		7 (4–12)		19 (16–22)	
Year of study	1	9 (5–14)	< 0.001	8 (4–12)	< 0.001	14 (12–23)	< 0.001
	2	9 (4–14)		8 (4–13)		19 (15–22)	
	3	8 (4–14)		9 (5–13)		18 (15–22)	
	4	6 (3–11)		6 (3–10)		20 (17–24)	
	5	6 (3–11)		6 (4–9)		20 (17–23)	
Employment	In the medical field	7 (4–12)	< 0.001	7 (4–11)	< 0.001	20 (17–22)	< 0.001
	Outside the medical field	9 (5–16)		8.5 (5–13)		18 (14–22)	
	Unemployed	8 (4–14)		8 (4–12)		19 (15–22)	
Residence	Urban	8 (4–13)	0.888	7 (4–12)	0.793	19 (16–22)	0.083
	Rural	8 (4–14)		7 (4–12)		19 (15–22)	
Size of residence	< 10000	8 (4–14)		7 (4–12)		19 (15–22)	
	10001–50000	9 (4–13)	0.650	8 (4–12)	0.628	19 (16–22)	0.178
	50001–100000	8 (4–13)		7 (4–11.25)		19 (16–23)	
	100001–200000	7 (3–13.75)		7 (3–12)		19 (15–22.25)	
	> 200000	8 (4–13)		8 (4–13)		20 (15–22)	
Self-assessed financial status	1	15 (4.25–23.75)	< 0.001	8.5 (3–14.75)	< 0.001	15.5 (13.75–22.25)	< 0.001
	2	12 (6–18.75)		11 (6–15)		16.5 (13–20)	
	3	9 (5–14)		8 (5–12)		18 (15–22)	
	4	7 (3–13)		7 (4–11.25)		20 (16–23)	
	5	6 (3–11)		6 (3–12)		21 (17–24)	
Average monthly income	< 1000€	9 (6–16)	< 0.001	9 (5–14)	0.010	18 (15–22)	< 0.001
	1001–2000€	9 (4–14)		8 (5–12)		18 (15–22)	
	2001–3000€	7 (4–13)		7 (4–12)		19 (16–23)	
	> 3000€	7 (3–13)		7 (4–12)		20 (17–23)	
Failing a year in college	Yes	11 (5–16)		7 (4–12)		17 (14–21)	
	No	8 (4–13)	< 0.001	9.5 (5–14)	0.005	19 (16–22)	< 0.001
Doing a scientific project	Yes	8 (4–14)		8 (5–13)	0.105	19 (15–22)	
	No	8 (4–13)	0.184	7 (4–12)		19 (16–22)	0.783

Table 3 The frequencies and percentages of the categories of depressive and anxiety symptoms according to the GAD-7 (Generalized Anxiety Disorder-7) and PHQ-9 (The patient health questionnaire-9) scales and the sex-related differences ($N = 2138$)

		n (%)			*P* (Chi square)
		Men	Women	Total	< 0.001
GAD-7	Low anxiety	81 (32.5)	398 (22.4)	484 (23.6)	
	Mild anxiety	103 (41.4)	646 (36.3)	752 (36.8)	
	Moderate anxiety	41 (16.5)	445 (25.0)	488 (23.9)	
	Severe anxiety	24 (9.6)	291 (16.3)	324 (15.8)	
PHQ-9	Low levels of depressive symptoms	189 (69.2)	1056 (57.2)	1253 (58.6)	0.003
	Mild depressive symptoms	42 (15.4)	383 (20.8)	427 (20.0)	
	Moderate depressive symptoms	26 (9.5)	216 (11.7)	246 (11.5)	
	Moderately severe depressive symptoms	15 (5.5)	152 (8.2)	172 (8.0)	
	Severe depressive symptoms	1 (0.4)	38 (2.1)	39 (1.8)	

Note: 19 participants declined to specify their gender and were excluded from the analysis. Due to missing data in certain items of the GAD-7, the scores could not be calculated for 90 participants

Table 4 The unstandardized coefficient betas of the variables included in the stepwise multiple linear regression analysis

	PHQ-9		GAD-7		SHS	
	Beta	Standard Error	Beta	Standard Error	Beta	Standard Error
Gender	2.042***	0.411	2.065***	0.343	-0.613*	0.310
Age	-0.138***	0.025	-0.092***	0.021	0.067***	0.019
Type of study	0.051	0.065	-,023	0.055	-0.069	0.049
GPA	-0.889**	0.286	-0.491*	0.239	0.556*	0.217
Year of study	-0.347**	0.130	-0.246*	0.108	-0.113	0.099
Full-time or part-time student	-0.288	0.379	-0.277	0.316	0.248	0.286
Employed	-0.176	0.224	-0.072	0.187	-0.288	0.170
Residence	-0.332	0.296	-0.149	0.248	-0.178	0.224
Financial status	-0.079	0.174	-0.027	0.145	0.214	0.131
Monthly income	-1.452***	0.207	-0.887***	0.173	1.177***	0.157
Failing a year in college	2.041***	0.536	1.189**	0.448	-1.200**	0.405
Previous research project	0.834*	0.356	0.776**	0.297	-0.040	0.270

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

countries [28, 29]. It has been shown that working students have more prevalent physical and mental problems due to the increased workload, sleep deprivation and lack of social contact with loved ones [29]. In our study, students that worked showed higher levels of depression and anxiety and lower levels of subjective happiness compared to students that did not work. When comparing these variables based on the type of employment, it can be seen that between the groups of students working in the medical field, outside the medical field, and those who are unemployed, students working in the medical field showed the lowest levels of depression and anxiety, and those who were employed outside the medical field, the highest. These results may imply that having a job in the medical field may give the students a sense of stability and competence, which may lead to better mental health.

Higher levels of depression and anxiety in students of lower years of study might be associated with balancing new duties, but the curriculum obligations must also be taken into account in future research. Bachelor studies are often considered to be more difficult than Master's studies in Croatia, and the analysis of whether this is a factor in students' levels of depression and anxiety should be expanded upon in the future since several studies found that school was the main stressor for students [8, 30]. Medical and health sciences are often considered more demanding than other types of studies due to difficult courses but also because of the clinical work, which is

often emotionally and physically demanding. Medical students have shown higher levels of depression and burnout than other university types of studies, and most research on the topic of mental health of university students was done on this population. Studies have shown that medical students often exhibit symptoms of burnout, with prevalence as high as 70—95% [8, 31–33]. The prevalence of depression in this population is 10–15% higher than in the general population [30].

In our study, we found that students that failed a year in college had higher levels of depression and anxiety. However, it is difficult to suggest, based on our data, the direction in which these variables are associated, i.e., whether the initially decreased mental health leads to problems with studying or whether the stress related to school responsibilities leads to decreased mental health. The most plausible answer is that there is an interplay between the variables that eventually form a vicious circle.

Even though the levels of depression are higher in medical students than in other health sciences students, the results are comparable, and there are no significant differences in anxiety levels between medical students and other health science students [5, 10]. A study in Turkey found that nursing students had a borderline to high prevalence of mental health problems compared to other university types of studies and the general population [34]. Other studies found that nursing and public health students were less likely to have mental health problems than other university majors [35]. In the current study, we found a prevalence of at least mild depressive symptoms of 41.4%, which is similar to previous studies [1, 3, 5–8, 36].

Research has shown that 6–26% of students are diagnosed with a mental health issue [1, 7, 8, 30]. Studies have shown that anxiety is more prevalent than depression, which is in line with our results [30]. Women students are usually more affected [37–40], even though a recent meta-analysis found no gender-related differences in anxiety in the medical student population [10]. In our research, we also found significantly higher levels of anxiety in women students. It is important to note that most mental health problems occur in early adulthood, with the onset of 75% of mental health problems occurring by the age of 25, which coincides with the age of pursuing higher education [2]. Still, only a third of them seek treatment [8, 41]. This shows that the stigma of mental health issues still exists, even among health sciences students [42]. Stigma is considered the most important obstacle to seeking professional help [2].

It has been shown that untreated mental health issues may progress into more complex psychiatric disorders, school dropout, addiction, and other auto-destructive behaviors [43]. However, things might be changing as more students seek help at a rate exceeding enrolment increases [43]. Not requesting help may lead to other negative outcomes, such as school dropout, suicidal ideation and burnout [41]. It is known that medical professionals have high rates of suicide [26, 32]. Medical students show rates of suicidal ideations of 7.4 -24.2%, which are higher than those in the general university student population which are at a rate of 6.7% [3, 9, 41, 43]. Even though we did not ask our participants about their suicidal ideations, we asked them about their self-destructive and suicidal ideations (Item 9 from the PHQ-9 scale: "*Thoughts that you would be better off dead, or of hurting yourself*"), and we found a rate of 19.4% which is comparable to prior results about suicidal ideations.

Studies on nursing students showed that during the COVID-19 pandemic, they showed higher levels of anxiety or depression [15, 36, 38, 44–47]. Previous research has also shown that in pandemic outbreaks, nurses are more likely to experience worse mental health than doctors, which might be related to the increased time nurses spend in contact with patients when compared to physicians [44]. The COVID-19 pandemic has put a unique strain on students. In Croatia, following the onset of the COVID-19 pandemic, students were abruptly switched to online-only education, and not all students had a positive attitude towards that switch [48].

Meda et al. conducted a study on Italian students and reported higher levels of depression during the COVID-19 pandemic, with those students who previously showed no problems with mental health having a more pronounced increase in their levels of depression [49]. However, the same research has shown that after the lockdown, the prevalence of psychiatric issues returned to levels before the lockdown [49].

Our study was conducted during March–April 2023 when most measures against COVID-19 were abolished, except in the clinical setting. Our results are in line with those of Meda et al., as the levels of depression and anxiety are comparable to those of similar research done before the COVID-19 pandemic [5, 49].

Studies have shown that higher mental well-being is positively associated with empathy [40]. Empathy is one of the most important traits for workers in healthcare. In this study, we assessed subjective happiness as a measure of well-being [12]. Previous studies have shown that nursing students show higher levels of subjective happiness when compared to medical students [5]. It is known that happier individuals tend to live longer, are more productive at the workforce and contribute to making society a better place through socially cooperative roles such as voluntary work [13]. Previous, albeit limited, research has shown low-to-moderate happiness levels in the nursing student population [27].

High levels of mental health problems in the population of students of health sciences present a reason for concern as it may damage professional performance, decrease empathy, ethical conduct and professionalism, and it may lead to personal consequences such as substance abuse, broken relationships, and suicidal ideation [1, 50].

Limitations of the study

Our study has several limitations. It was an online survey that guaranteed confidentiality and the students were free to decide whether they wished to participate. Due to our response rate (29%), it is possible that the students who exhibit mental problems were overrepresented and more motivated to participate in the study due to self-selection bias [51]. Since we used the cut-off points for mild anxiety and depression, the prevalence we found could represent an overestimation. Our study may provide a baseline for monitoring students' mental health in the future. Even though we aimed to use a limited set of instruments to have a better completion rate, a broader set of instruments would give us a better picture of the possible underlying causes of the problems, and a qualitative study of these findings would be beneficial. Variables that would be useful to assess in future research are the levels of burnout, empathy, stress and personality and whether the students are diagnosed with a mental condition and are seeking professional help. Due to the nature of the study, our findings do not represent the official diagnoses of participants. Also, we would like to emphasize that even though there were more women among participants, this is representative of the demographics of health sciences students.

Conclusion

This study shows that health science students exhibit high levels of depression and anxiety at rates exceeding those in the general population reported in other studies. Since the well-being of medical professionals is essential for their professional work, adequate care must be given to these individuals to prevent further progression of mental illness.

Our results may help educational institutions to put greater effort into the battle against mental health stigma, foster acceptance of mental health issues and encourage students to seek help when needed. Adequate mental health services are needed at universities to promote timely diagnosis and treatment of mental health problems.

Abbreviations

PHQ-9	Patient Health Questionnaire 9
GAD-7	General Anxiety Disorder 7
SHS	Subjective Happiness Scale
GPA	Grade point average
IQR	Inter-quartile range

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12888-024-05498-5.

Additional file 1: Supplementary file 1. Invitation and information for participants.

Additional file 2: Supplementary file 2. Survey used in the research.

Additional file 3: Supplementary file 3. Response rates per institutions and number of students in different study courses accross specialty per institution.

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Authors' contributions

Study design: JMi, LP Data collection, analysis, and interpretation: JMi, NS, DM, SZ, MČ, KI, MM, JMe, ZP, MN, SČ, AR, LP Writing of the manuscript and revising the manuscript for intellectual content: JMi, NS, DM, SZ, MČ, KI, MM, JMe, ZP, MN, SČ, AR, LP Final approval of the manuscript: JMi, NS, DM, SZ, MČ, KI, MM, JMe, ZP, MN, SČ, AR, LP.

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Availability of data and materials

Raw data collected and analyzed within this study are published on Open Science Framework (link: https://osf.io/ms2u4/), except for the indirect identifiers of the participants.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Ethics Committees of all institutions participating in the study. All participants gave their written informed consent in the online interface prior to starting the online survey. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Almeida T, Kadhum M, Farrell SM, Ventriglio A, Molodynski A. A descriptive study of mental health and wellbeing among medical students in Portugal. Int Rev Psychiatry. 2019;31(7–8):574–8.

2. Brown JSL. Student mental health: some answers and more questions. J Ment Health. 2018;27(3):193–6.
3. Slavin SJ. Medical student mental health: culture, environment, and the need for change. JAMA. 2016;316(21):2195–6.
4. Torales J, Kadhum M, Zárate G, Barrios I, González I, Farrell SM, et al. Well-being and mental health among medical students in Paraguay. Int Rev Psychiatry. 2019;31(7–8):598–602.
5. Milić J, Škrlec I, MilićVranješ I, Podgornjak M, Heffer M. High levels of depression and anxiety among Croatian medical and nursing students and the correlation between subjective happiness and personality traits. Int Rev Psychiatry. 2019;31(7–8):653–60.
6. Hamasha AAH, Kareem YM, Alghamdi MS, Algarni MS, Alahedib KS, Alharbi FA. Risk indicators of depression among medical, dental, nursing, pharmacology, and other medical science students in Saudi Arabia. Int Rev Psychiatry. 2019;31(7–8):646–52.
7. Volpe U, Ventriglio A, Bellomo A, Kadhum M, Lewis T, Molodynski A, et al. Mental health and wellbeing among Italian medical students: a descriptive study. Int Rev Psychiatry Abingdon Engl. 2019;31(7–8):569–73.
8. Wilkes C, Lewis T, Brager N, Bulloch A, MacMaster F, Paget M, et al. Wellbeing and mental health amongst medical students in Canada. Int Rev Psychiatry Abingdon Engl. 2019;31(7–8):584–7.
9. Pedrelli P, Nyer M, Yeung A, Zulauf C, Wilens T. College students: mental health problems and treatment considerations. Acad Psychiatry. 2015;39(5):503–11.
10 Tian-Ci Quek T, Wai-San Tam W, Tran BX, Zhang M, Zhang Z, Su-Hui Ho C, et al. The global prevalence of anxiety among medical students: a meta-analysis. Int J Environ Res Public Health. 2019;16(15):2735.
11. Son C, Hegde S, Smith A, Wang X, Sasangohar F. Effects of COVID-19 on college students' mental health in the United States: interview survey study. J Med Internet Res. 2020;22(9):e21279.
12. Ruiz-Aranda D, Extremera N, Pineda-Galán C. Emotional intelligence, life satisfaction and subjective happiness in female student health professionals: the mediating effect of perceived stress. J Psychiatr Ment Health Nurs. 2014;21(2):106–13.
13. Jang HJ. Comparative study of health promoting lifestyle and subjective happiness on nursing students and non-nursing students. Adv Sci Technol Lett. 2016;21(128):78–82.
14. Grubic N, Badovinac S, Johri AM. Student mental health in the midst of the COVID-19 pandemic: a call for further research and immediate solutions. Int J Soc Psychiatry. 2020;66(5):517–8.
15. Mulyadi M, Tonapa SI, Luneto S, Lin WT, Lee BO. Prevalence of mental health problems and sleep disturbances in nursing students during the COVID-19 pandemic: a systematic review and meta-analysis. Nurse Educ Pract. 2021;57:103228.
16. Eysenbach G. Improving the quality of web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J Med Internet Res. 2004;6(3):e34.
17. Kroenke K, Spitzer RL, Williams JBW, Löwe B. The patient health questionnaire somatic, anxiety, and depressive symptom scales: a systematic review. Gen Hosp Psychiatry. 2010;32(4):345–59.
18. Löwe B, Kroenke K, Herzog W, Gräfe K. Measuring depression outcome with a brief self-report instrument: sensitivity to change of the Patient Health Questionnaire (PHQ-9). J Affect Disord. 2004;81(1):61–6.
19. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med. 2001;16(9):606–13.
20. Pinto-Meza A, Serrano-Blanco A, Peñarrubia MT, Blanco E, Haro JM. Assessing depression in primary care with the PHQ-9: can it be carried out over the telephone? J Gen Intern Med. 2005;20(8):738–42.
21. Kocalevent RD, Hinz A, Brähler E. Standardization of the depression screener Patient Health Questionnaire (PHQ-9) in the general population. Gen Hosp Psychiatry. 2013;35(5):551–5.
22. Donker T, van Straten A, Marks I, Cuijpers P. Quick and easy self-rating of generalized anxiety disorder: validity of the Dutch web-based GAD-7, GAD-2 and GAD-SI. Psychiatry Res. 2011;188(1):58–64.
23. Swinson RP. The GAD-7 scale was accurate for diagnosing generalised anxiety disorder. Evid Based Med. 2006;11(6):184–184.
24. Löwe B, Decker O, Müller S, Brähler E, Schellberg D, Herzog W, et al. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. Med Care. 2008;46(3):266–74.
25. Lyubomirsky S, Lepper HS. A measure of subjective happiness: preliminary reliability and construct validation. Soc Indic Res. 1999;46(2):137–55.
26. Molodynski A, Ventriglio A, Bhugra D. A crisis brewing for the healthcare system and a crisis already happening for our students. Int Rev Psychiatry Abingdon Engl. 2019;31(7–8):545–7.
27. Kumar TKA, Khakha DC, Joshi P, Das S, Manu KJ. Happiness and its determinants among nursing students. Ind Psychiatry J. 2022;31(2):293–8.
28. Häkkinen I. Working while enrolled in a university: does it pay? Labour Econ. 2006;13(2):167–89.
29. Verulava T, Jorbenadze R. The impact of part-time employment on students' health. Malta Med J. 2022;34(1):50–7.
30. Castaldelli-Maia JM, Lewis T, Marques Dos Santos N, Picon F, Kadhum M, Farrell SM, et al. Stressors, psychological distress, and mental health problems amongst Brazilian medical students. Int Rev Psychiatry Abingdon Engl. 2019;31(7–8):603–7.
31. Farrell SM, Kar A, Valsraj K, Mukherjee S, Kunheri B, Molodynski A, et al. Wellbeing and burnout in medical students in India; a large scale survey. Int Rev Psychiatry. 2019;31(7–8):555–62.
32. Molodynski A, Lewis T, Kadhum M, Farrell SM, LemtiriChelieh M, Falcão De Almeida T, et al. Cultural variations in wellbeing, burnout and substance use amongst medical students in twelve countries. Int Rev Psychiatry. 2021;33(1–2):37–42.
33. Erschens R, Keifenheim KE, Herrmann-Werner A, Loda T, Schwille-Kiuntke J, Bugaj TJ, et al. Professional burnout among medical students: systematic literature review and meta-analysis. Med Teach. 2019;41(2):172–83.
34. Karaca A, Yildirim N, Cangur S, Acikgoz F, Akkus D. Relationship between mental health of nursing students and coping, self-esteem and social support. Nurse Educ Today. 2019;76:44–50.
35. Lipson SK, Zhou S, Wagner B, Beck K, Eisenberg D. Major differences: variations in undergraduate and graduate student mental health and treatment utilization across academic disciplines. J Coll Stud Psychother. 2016;30(1):23–41.
36. Škrlec I, Talapko J, Pustijanac E, Meštrović T. Depression, anxiety, stress and physical activity in health-related university students during COVID-19. Med Sci Forum. 2021;4(1):43.
37. Ramón-Arbués E, Gea-Caballero V, Granada-López JM, Juárez-Vela R, Pellicer-García B, Antón-Solanas I. The prevalence of depression, anxiety and stress and their associated factors in college students. Int J Environ Res Public Health. 2020;17(19):7001.
38. Talapko J, Perić I, Vulić P, Pustijanac E, Jukić M, Bekić S, et al. Mental health and physical activity in health-related university students during the COVID-19 pandemic. Healthcare. 2021;9(7):801.
39. Ghodasara SL, Davidson MA, Reich MS, Savoie CV, Rodgers SM. Assessing student mental health at the Vanderbilt University School of Medicine. Acad Med J Assoc Am Med Coll. 2011;86(1):116–21.
40. Pacheco JP, Giacomin HT, Tam WW, Ribeiro TB, Arab C, Bezerra IM, et al. Mental health problems among medical students in Brazil: a systematic review and meta-analysis. Braz J Psychiatry. 2017;39(4):369–78.
41. MacLean L, Booza J, Balon R. The impact of medical school on student mental health. Acad Psychiatry J Am Assoc Dir Psychiatr Resid Train Assoc Acad Psychiatry. 2016;40(1):89–91.
42. Bhugra D, Sauerteig SO, Bland D, Lloyd-Kendall A, Wijesuriya J, Singh G, et al. A descriptive study of mental health and wellbeing of doctors and medical students in the UK. Int Rev Psychiatry Abingdon Engl. 2019;31(7–8):563–8.
43. Duffy A, Saunders KEA, Malhi GS, Patten S, Cipriani A, McNevin SH, et al. Mental health care for university students: a way forward? Lancet Psychiatry. 2019;6(11):885–7.
44. Xu Q, Li D, Dong Y, Wu Y, Cao H, Zhang F, et al. The relationship between personality traits and clinical decision-making, anxiety and stress among intern nursing students during COVID-19: a cross-sectional study. Psychol Res Behav Manag. 2023;31(16):57–69.
45. Savitsky B, Findling Y, Ereli A, Hendel T. Anxiety and coping strategies among nursing students during the covid-19 pandemic. Nurse Educ Pract. 2020;46:102809.
46. Nahar Z, Sohan MD, Supti KF, Hossain MDJ, Shahriar M, Bhuiyan MA, et al. Prevalence and associated risk factors for mental health problems among female university students during COVID-19 pandemic: a cross-sectional study findings from Dhaka, Bangladesh. Heliyon. 2022;8(10):e10890.
47. Patelarou A, Mechili EA, Galanis P, Zografakis-Sfakianakis M, Konstantinidis T, Saliaj A, et al. Nursing students, mental health status during COVID-19 quarantine: evidence from three European countries. J Ment Health Abingdon Engl. 2021;30(2):164–9.

48. Puljak L, Čivljak M, Haramina A, Mališa S, Čavić D, Klinec D, et al. Attitudes and concerns of undergraduate university health sciences students in Croatia regarding complete switch to e-learning during COVID-19 pandemic: a survey. BMC Med Educ. 2020;20(1):416.
49. Meda N, Pardini S, Slongo I, Bodini L, Zordan MA, Rigobello P, et al. Students' mental health problems before, during, and after COVID-19 lockdown in Italy. J Psychiatr Res. 2021;134:69–77.
50. Dyrbye LN, Shanafelt TD. Commentary: medical student distress: a call to action. Acad Med. 2011;86(7):801.
51. Elston DM. Participation bias, self-selection bias, and response bias. J Am Acad Dermatol. 2021;S0190–9622(21):01129–34.

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