



# Dispositional Mindfulness Reduces Burnout and Promotes Flourishing in Medical Students: a Two-Wave Latent Change Score Model

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## Abstract

**Objectives** Many studies document the high prevalence of burnout among medical students. This syndrome may lead to depression, suicidal ideation, and increased academic dropout. However, there is a scarcity of evidence-based interventions to prevent it. The aim of this longitudinal study was to identify factors that may reduce students' burnout and foster their well-being, and upon which effective interventions can be developed.

**Methods** A total of 1,117 medical students from eight Chilean universities were asked to complete a set of validated scales in 2015 and 2 years later, in 2017. The measures included distress, burnout, positive mental health, academic engagement, and dispositional mindfulness. Using logistic regressions and a two-wave latent change score model, the predictive power of these variables on burnout and flourishing (an optimal state of mental health) was studied, as well as their covariance across time.

**Results** In total, 639 (57.2%) students answered the questionnaires in T1 and T2; 54.4% reported burnout in T1 and 56.2% in T2. Levels of dispositional mindfulness (the ability to pay attention to one's sensations, thoughts, and emotions in everyday life) predicted lower probabilities of burning out at 2 years, whereas having experienced burnout in T1 doubled these odds. Dispositional mindfulness, academic engagement, and flourishing at T1 predicted greater odds of flourishing 2 years later, while depression decreased these odds.

**Conclusions** Dispositional mindfulness was the most powerful predictive factor of students' burnout and flourishing. As dispositional mindfulness can be nurtured through practice, incorporating mindfulness training into undergraduate medical programs may help reduce burnout and promote students' well-being as health professionals.

**Keywords** Student · Medical · Burnout · Well-being · Mindfulness · Prediction · Latent change score model

Clinical training is a sensitive period when medical students learn in real—and often stressful—clinical contexts. This period tests students' proactivity, resilience, and social skills (Hurst et al., 2013; Lin & Lin, 2016; Zúñiga et al., 2015). Regrettably, many students feel overwhelmed and develop burnout (Erschens et al., 2018; Fonseca-Molina et al., 2018), a syndrome characterized by emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment (Maslach & Jackson, 1981). The prevalence and harmful consequences of burnout has been well documented among medical students from English-speaking countries

(Erschens et al., 2018; Hope & Henderson, 2014; IsHak et al., 2013; Medeiros, 2018), where it has been associated with a higher incidence of depression, suicidal ideation, and deterioration of professionalism (Dyrbye et al., 2014; Maslach & Leiter, 2016; West et al., 2009, 2011). For example, a large multi-institutional study with USA medical students (Dyrbye et al., 2010a, b) showed that one out of every two medical students may be affected by burnout during their medical education.

Several correlational studies indicate that burnout is related to personal and job-related factors. The former includes motivation, optimism, perfectionism, and social support networks; the latter, disproportionate job demands and a lack of resources (Epstein & Privitera, 2016). However, in order to establish causal relationships between

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putative factors and burnout development, longitudinal studies are needed. In a systematic review based on reports published in the 11 years between 2007 and 2017 (Erschens et al., 2018), only one study out of 58 presented longitudinal data. This study showed that American medical students were less likely to recover from burnout if they experienced more stress, were unemployed, belonged to a minority, or perceived that their education was not a priority for the faculty (Dyrbye et al., 2010a, b).

High burnout prevalence has also been reported in Latin-American medical professionals and students (Erschens et al., 2018); however, less is known on possible causes and consequences. In this region, unlike the USA and Europe, most medical schools have 7-year Flexnerian-type study programs. These curricular differences may have an impact on students' responses to stress. Therefore, there is a need to study the factors that influence burnout and flourishing odds of Latin-American students.

Few studies have addressed the positive aspects of medical students' psychosocial functioning; one of such studies reported that 50% of American medical students had a healthy mental state (Dyrbye et al., 2009). This state, referred to as *flourishing*, was associated with less suicidal ideation, fewer thoughts of dropping out of school, and less unprofessional behavior. As in the case of burnout, longitudinal studies are also needed to identify possible causes of students' flourishing.

The objective of this study was to identify the psychological factors that influence Chilean medical students' likelihood of burning out or flourishing during their clinical training. The variables were classified into two groups for the sake of clarity. "Negative" variables included stress, depression, emotional exhaustion, and depersonalization. "Positive" variables included personal accomplishment, general well-being, academic engagement, and dispositional mindfulness (DM). The rationale for including DM in this study stems from the evidence that interventions based on the cultivation of mindfulness (MBIs) promote well-being in health professionals and medical students (Daya & Hearn, 2018; Quaglia et al., 2016; Scheepers et al., 2020). The following hypotheses were examined in this study: Hypothesis 1: Higher levels of "negative" variables or presenting burnout at the onset of clinical training (T1) predict higher chances of being burned out and lower chances of flourishing 2 years later (T2); Hypothesis 2: Higher levels of "positive" variables or presenting a flourishing mental state at T1 predict lower chances of being burned out and higher chances of flourishing at T2; and Hypothesis 3: The change of a given variable's score between T1 and T2 correlates directly with the changes in variables of the same valence and correlates inversely with those of the opposite valence.

## Methods

### Participants

We invited all medical students of the 2011 and 2012 incoming cohorts (enrolled in years 4 and 5 of 7-year programs) of eight medical schools ( $N = 1,340$ ) to take part in the study. Of them, 83.3% ( $N = 1,117$ ) answered the survey in 2015. Two years later, in 2017, 639 (57.2%) of these students answered the survey again. There were no significant differences in terms of demographic characteristics (age, sex, and cohort) or any of the measures' scores between the students who answered only in T1 and those who answered at both time points. We chose this period of their studies based on evidence that students of health professions experience high levels of stress during clinical formation (Houpy et al., 2017; van Dijk et al., 2017).

### Procedures

A non-experimental, two-wave prospective cohort study followed medical students attending eight Chilean universities for 2 years, from the beginning of their clinical training until their graduation. The study programs at the participating schools consist of a 7-year, Flexnerian-type curriculum. Basic sciences are taught during the first 3 years. Years 4 and 5 mark the beginning of clinical training, and years 6 and 7 correspond to fully supervised practice in hospital and ambulatory settings.

Students completed a set of standardized measures of stress, depression, emotional exhaustion, depersonalization, dispositional mindfulness, personal accomplishment, general well-being, and academic engagement. A member of the research team and a faculty member of the respective medical school supervised the application of printed questionnaires on-site during regular curricular time. Participation was voluntary, and participants signed an informed consent form.

### Measures

The variables were measured with validated Spanish translations of the following self-reported questionnaires. We assessed reliability of the scores at each time point using ordinal  $\alpha$  based on polychoric correlations (Zumbo et al., 2007) within a repeated-measures confirmatory factor analysis.

Depression and stress levels were measured with the DASS-21, a 21-item scale scored with a 4-point

Likert-type scale (Daza et al., 2002). Stress scores presented  $\alpha = 0.89$  at T1 ( $\alpha_{t1}$ ) and  $\alpha = 0.91$  at T2 ( $\alpha_{t2}$ ); depression scores presented  $\alpha_{t1} = 0.94$  and  $\alpha_{t2} = 0.94$ .

Burnout was measured with the Maslach Burnout Inventory questionnaire (MBI-HSS; Gil-Monte & Peiró, 1999) developed by Maslach and Jackson (Maslach et al., 1997; Maslach & Jackson, 1981). The scale has 22 items on a 7-point Likert-type scale with 3 subscales: emotional exhaustion (EE,  $\alpha_{t1} = 0.85$ ,  $\alpha_{t2} = 0.85$ ), depersonalization (DP,  $\alpha_{t1} = 0.75$ ,  $\alpha_{t2} = 0.72$ ), and personal accomplishment (PA,  $\alpha_{t1} = 0.80$ ,  $\alpha_{t2} = 0.80$ ). To assign the burnout condition, we used cut-off points determined by cluster analysis of the population of the study (manuscript in preparation). The burnout condition was defined as EE  $\geq 36$  points or DP  $\geq 11$  points.

Positive mental health was evaluated with the Mental Health Continuum Short-Form (MHC-SF; Echeverría et al., 2017), a 14-item, 6-point Likert-type scale assessing emotional, social, and psychological well-being. The results were expressed as a general well-being score ( $\alpha_{t1} = 0.93$ ,  $\alpha_{t2} = 0.94$ ), or as states of mental health (languishing, moderate, or flourishing) calculated according to the algorithm proposed by the author (Keyes, 2009).

Academic engagement was measured with the Utrecht Work Engagement Scale (UWES; Parra & Pérez, 2010), a 17-item, 7-point Likert-type scale, featuring 3 subdimensions: absorption, dedication, and vigor. In this study, we used the general score for academic engagement ( $\alpha_{t1} = 0.94$ ,  $\alpha_{t2} = 0.94$ ).

Dispositional mindfulness—the capacity to attend to one's sensations, thoughts, and emotions in daily life—was measured with the Mindful Attention Awareness Scale (MAAS; Soler et al., 2012), a 14-item, 6-point Likert-type scale developed by Brown and Ryan (Brown & Ryan, 2003) with an averaged general score ( $\alpha_{t1} = 0.90$ ,  $\alpha_{t2} = 0.92$ ).

## Data Analyses

### Multilevel Regression with Random Intercept by School

We performed a multilevel logistic regression with a random intercept by university to determine the likelihood that medical students were burned out or flourishing in T2 based on their sex and cohort, their burnout and flourishing status, and the levels of the “negative” and “positive” variables. We conserved the random intercept only for the burnout model since its variance was not significant for *flourishing*, and it led to singularities in the computations (i.e., the model did not have enough information to inform reliably about variance in the random intercept).

### Two-Wave Latent Change Score Model (2 W-LCSM)

We used the 2 W-LCSM to simultaneously analyze the following: (1) the latent change scores themselves (i.e., changes between T1 and T2); (2) leading variables (i.e., those variables whose initial values predicted changes in the remaining variables); (3) correlated latent change scores (i.e., the convergence or divergence of changes); and (4) covariance of the variables at T1. For this analysis, we used the continuous scores of burnout's dimensions (depersonalization and emotional exhaustion). Similarly, we used the MHC-SF's general well-being score.

To control for the inflated probability of type I errors (false positives) due to multiplicity, we used Benjamini and Hochberg (1995) false discovery rate correction on the  $p$ -values of the 2 W-LCSM estimates as recommended by Cribbie (2007) for SEM analyses.

### Missing Data

For the multilevel regression, we performed multiple imputation by chained equations (MICE; van Buuren & Groothuis-Oudshoorn, 2011). Then, we merged the multiply imputed data into a single data point using the means or modes of the imputed values (Burns et al., 2011). For the 2 W-LCSM, we used full information maximum likelihood.

### Software

We used R 4.1.1 (R Core Team, 2021) with specialized packages: the *MICE* package 3.6.0 (van Buuren & Groothuis-Oudshoorn, 2011) for imputation, the *lme4* package 1.1–27.1 (Bates et al., 2015) for the multilevel regression, and the *lavaan* package 0.6–9 (Rosseel, 2012) for the 2 W-LCSM.

## Results

In total, 639 students from the incoming cohorts of 2011 and 2012 completed the surveys at both measurement times. The participants' characteristics and their tests' scores are summarized in Table 1. To assess attrition bias, the profile of students who completed the surveys at both time points was compared with that of students who only completed them at T1. There were no significant differences ( $p > 0.05$ ) between the two groups in terms of demographic characteristics (age, sex, and cohort) or any of the variables' scores.

### Chances of Burnout and Flourishing at T2 Based on T1 Scores

In total, 54.4% of students were classified as burnt-out in 2015 and 56.2% in 2017 (Table 1). As displayed in detail

**Table 1** Participants' characteristics and average observed scores

Variable	Percentage or mean (SD)		
	Participants' characteristics		
Age	22.3 ( $\pm$ 1.2)		
Gender			
Men	363 (57%)		
Women	276 (43%)		
Cohort			
2011 (5th year at T1)	318 (50%)		
2012 (4th year at T1)	321 (50%)		
	Measures		
	T1	T2	Difference
DASS-21			
Stress	15.75 (10.1)	13.96 (10.3)	– 1.79*
Depression	7.50 (8.1)	7.40 (8.4)	– 0.10
MBI			
Burnout	54.40%	56.20%	1.8%
Emotional exhaustion	31.15 (9.1)	31.44 (9.6)	0.29
Depersonalization	8.87 (5.9)	9.33 (5.7)	0.46**
Personal accomplishment	36.26 (6.5)	35.18 (6.8)	– 1.08***
MHC-SF			
Flourishing	50.50%	51.00%	0.5%
General well-being	46.79 (12.5)	46.98 (13.0)	0.19
UWES			
Academic engagement	73.78 (15.5)	70.39 (17.6)	– 3.39***
MAAS			
Dispositional mindfulness	4.12 (0.9)	3.96 (1.1)	– 0.16***

Notes.  $N=639$ .  $SD$ , standard deviation in parentheses. T1-T2 interval, 2 years. The statistical significance of these scores is detailed in Table 2, sub-Table 1, with the 2 W-LCS analysis. \* $p < .05$ ; \*\* $p < .01$ , \*\*\* $p < .001$

in the 2 W-LCS analysis, there were statistically significant ( $p < 0.05$ ) decrements in stress, personal accomplishment, academic engagement, and dispositional mindfulness, while depersonalization increased.

The probability of being in a state of burnout or in a flourishing state at the end of medical training as a function of students' psychological state 2 years earlier is illustrated in Figs. 1 and 2, respectively.

For the continuous variables, the OR represents the ratio of odds between individuals located one standard deviation (SD) above the mean on the respective scale and those scoring one SD below it. We scaled the inputs dividing by two SDs, as recommended by Gelman (2008), to balance the comparison between the effect sizes of binary and continuous outcomes.

Only two of the measured variables showed significant predictive effects on burnout: the state of burnout and the level of dispositional mindfulness (Fig. 1). All other values being equal, students who experienced burnout at T1 had a 94% greater chance ( $OR = 1.94$ ,  $p < 0.001$ ) of suffering burnout at T2. For individuals scoring one SD above the mean in dispositional mindfulness, the odds of burning out

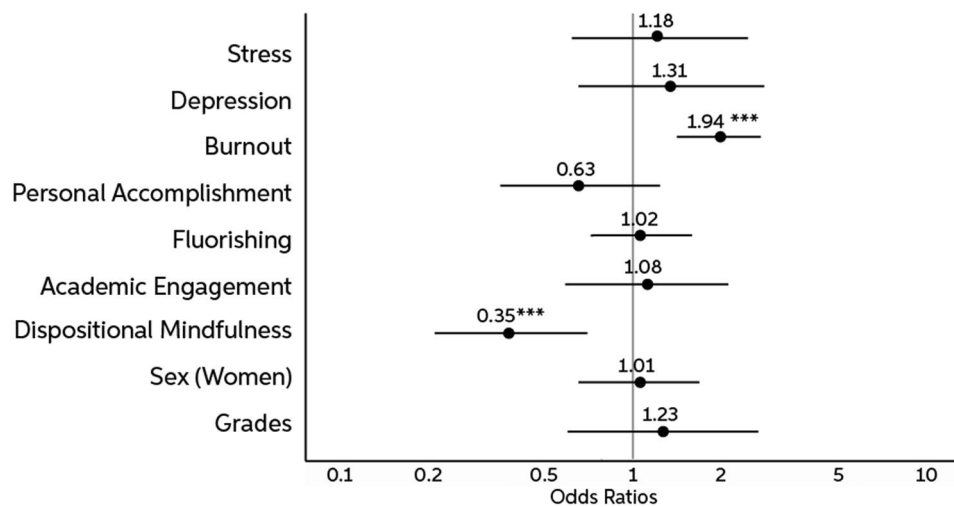
at T2 decreased by 65% ( $OR = 0.35$ ,  $p < 0.001$ ) compared to students scoring one SD below it (Fig. 1).

All other values being equal, flourishing students at T1 were twice as likely to flourish at T2 ( $OR = 2.07$ ,  $p < 0.001$ ; Table 2). The chances of flourishing were also better for students with higher levels of academic engagement ( $OR = 2.14$ ,  $p < 0.01$ ) and dispositional mindfulness ( $OR = 2.02$ ,  $p < 0.001$ ). In contrast, the likelihood of flourishing decreased by 64% ( $OR = 0.36$ ,  $p < 0.001$ ) for students with high depression scores.

Neither academic grades or sex, nor scores in stress or personal accomplishment, had a significant bearing on the odds of burning out or flourishing at T2. Burnout and flourishing showed no reciprocal predictive effects (Fig. 2).

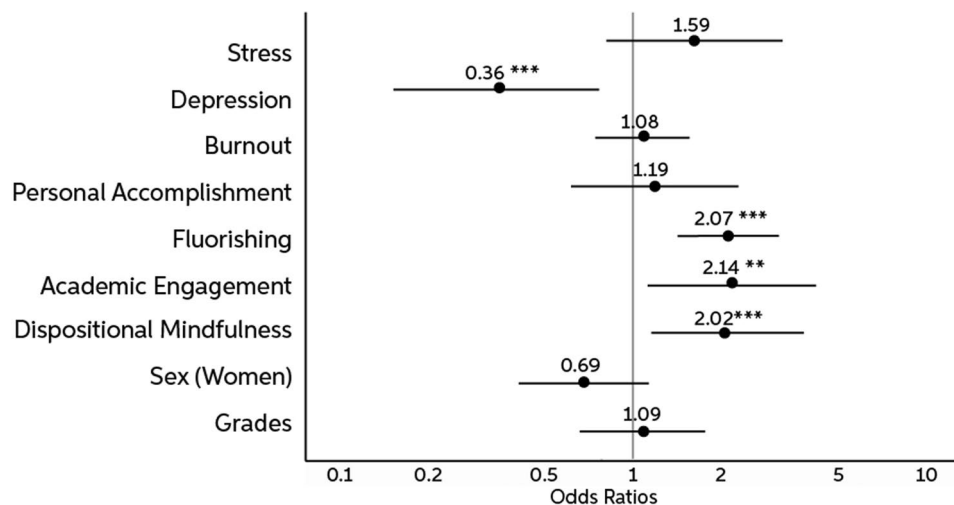
## Raw Univariate Change

Students' mean scores for depersonalization increased from T1 to T2. Stress, personal accomplishment, academic engagement, and dispositional mindfulness decreased—although the standardized change in stress was very small ( $-0.07$ ). Depression, emotional exhaustion, and general



**Fig. 1** Odds ratios (ORs) (plus 95% confidence interval) of preclinical medical students being *burnt-out* at the end of clinical training, as a function of their test results, sex, and grades at T1 (i.e., 2 years earlier). OR for continuous variables compare students one SD above the mean against students one SD below the mean. Being in a state of

burnout and the level of dispositional mindfulness were the only variables that significantly anticipated different chances of being burnt-out at T2. The point estimates indicate that burnout almost doubled the chances while high DM reduced them by 65%. \*\*\* $p < 0.001$



**Fig. 2** ORs (plus 95% confidence interval) of preclinical medical students for *flourishing* at the end of clinical training, as a function of their test results and grades at T1 (i.e., 2 years earlier). ORs for continuous variables compare students one SD above the mean against students one SD below the mean. Depression was the only variable whose value at T1 significantly anticipated decreased chances of

flourishing at T2 with the point estimate indicating that those students with high depression at T1 presented 64% less chances of flourishing at T2. Being in a state of flourishing or showing high academic engagement or dispositional mindfulness significantly increased the chances of flourishing at T2 with point estimates indicating over two times the chances. \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

well-being showed no statistically significant ( $p > 0.05$ ) variations (Table 2, first sub-table: Change scores).

### Leading Variables

Dispositional mindfulness had a significant leading effect ( $p < 0.05$ ) on five of the eight studied variables (Table 2, second sub-table). It predicted decrements in three “negative”

variables (stress, emotional exhaustion, and depersonalization) and increments in two “positive” variables (personal accomplishment and general well-being). General well-being predicted increases in personal accomplishment and decreased depression (Table 2). Conversely, higher depression scores at T1 predicted decreases in general well-being and increases in emotional exhaustion. Academic engagement predicted increases in personal accomplishment

**Table 2** LCSM regression and correlation coefficients

	S	D	EE	DP	PA	GW	AE	DM
Standardized latent change scores								
	-.07* (.02)	.00 (.02)	.04 (.02)	<b>.08** (.02)</b>	-.12*** (.02)	.03 (.01)	-.20*** (.02)	-.16*** (.02)
Change scores regressed over T1 values								
S	-.65*** (.04)	-.03 (.05)	.02 (.05)	-.04 (.05)	.03 (.05)	.08 (.05)	.07 (.05)	-.03 (.05)
D	.02 (.05)	-.63*** (.05)	<b>.14* (.05)</b>	-.04 (.06)	-.06 (.05)	-.16* (.06)	-.03 (.06)	.03 (.06)
EE	.05 (.04)	.07 (.04)	-.56*** (.04)	-.02 (.05)	-.04 (.04)	-.05 (.05)	-.02 (.05)	.00 (.05)
DP	.05 (.04)	.06 (.05)	-.03 (.04)	-.60*** (.03)	-.03 (.04)	-.03 (.04)	-.04 (.04)	.00 (.05)
PA	.07 (.05)	.11 (.06)	-.05 (.05)	-.16* (.05)	-.72*** (.04)	-.07 (.05)	-.01 (.05)	.05 (.06)
GW	-.09 (.05)	-.19** (.05)	.11 (.05)	-.01 (.05)	<b>.17** (.05)</b>	-.53*** (.05)	.12 (.06)	.05 (.06)
AE	.03 (.04)	.01 (.04)	-.02 (.04)	.06 (.04)	<b>.11* (.04)</b>	.05 (.05)	-.45*** (.05)	-.07 (.05)
DM	-.13* (.04)	-.06 (.04)	-.15** (.04)	-.16** (.04)	<b>.12* (.04)</b>	<b>.13* (.04)</b>	.10 (.04)	-.34*** (.04)
Change scores correlation								
Depr	.68*** (.02)							
EE	.46*** (.03)	.39*** (.03)						
Depers	.19*** (.04)	.24*** (.04)	.39*** (.03)					
PA	-.17*** (.04)	-.29*** (.04)	-.17*** (.04)	-.23*** (.04)				
GW	-.35*** (.04)	-.49*** (.03)	-.32*** (.04)	-.26*** (.04)	.43*** (.04)			
AE	-.20*** (.04)	-.32*** (.04)	-.31*** (.04)	-.20*** (.04)	.40*** (.04)	.50*** (.03)		
DM	-.34*** (.04)	-.35*** (.04)	-.38*** (.03)	-.37*** (.04)	.19*** (.04)	.24*** (.04)	.26*** (.04)	

Notes. \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ . Standardized coefficients with standard errors in parenthesis. *S*, stress; *D*, depression; *EE*, emotional exhaustion; *DP*, depersonalization; *PA*, personal accomplishment; *GW*, general well-being; *AE*, academic engagement; *DM*, dispositional mindfulness. **Bold**: statistically significant estimates for changes between T1 and T2 and leading effects

while personal accomplishment led to decreases in depersonalization.

### Correlated Changes

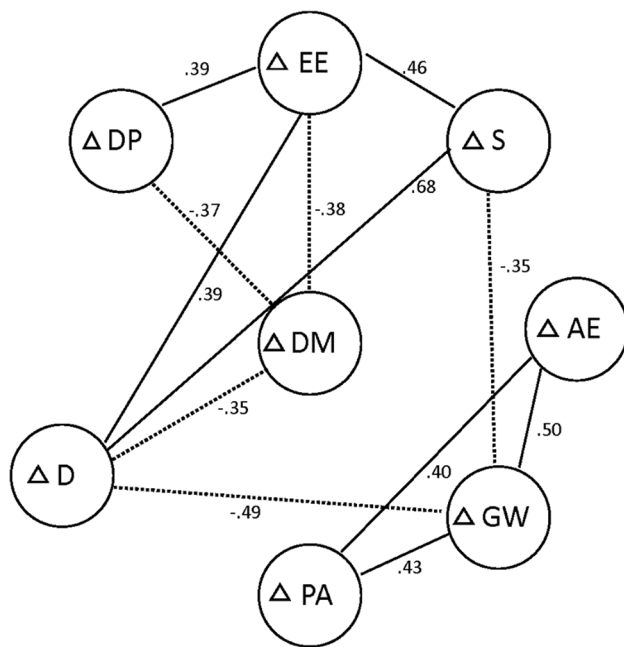
The third sub-table of Table 2 details all change scores' correlations. For clarity, we illustrated the strongest associations ( $\geq 0.35$ ) in Fig. 3. Variations in dispositional mindfulness were inversely related to fluctuations in emotional exhaustion, depersonalization, and depression. Increments in emotional exhaustion were inversely associated with changes in dispositional mindfulness and directly tied to increments in stress, depression, and depersonalization. Increments in general well-being correlated strongly with increased personal accomplishment and academic engagement, and decreased depression.

### Discussion

Although the prevalence and harmful consequences of burnout among medical students have been well documented (Erschens et al., 2018; IsHak et al., 2013; Medeiros, 2018), there is insufficient knowledge regarding the factors that protect students against burnout (Epstein & Privitera, 2016), particularly in Latin-American countries.

Similarly, not much is known about the factors that help them reach an optimal—or flourishing—state of psychological and social functioning during clinical training.

In this multi-institutional two-wave study, the predictive power of several psychological variables on Chilean medical students' burnout and flourishing across 2 years of clinical training was studied. Burnout and flourishing prevalence found in this study were similar to those reported in American students (Dyrbye, 2010a; Dyrbye et al., 2012). The percentage of burnt-out and flourishing students remained unchanged after 2 years and there were small but significant decreases in perceived stress (− 11.4%), personal accomplishment (− 2.97%), academic engagement (− 4.59%), and dispositional mindfulness (− 3.88%), while depersonalization increased (+ 5.1%). These results are compatible with the documented decrease in empathy and motivation, and the increased exhaustion of medical students as they progress through their studies (Dyrbye et al., 2014). The reduction in perceived stress, although very small, is somewhat surprising and might relate to the senior students' acquired experience in dealing with stressors associated to clinical environments. The drop in dispositional mindfulness and increase in depersonalization both point to a reduced ability to be present, an attitude consistent with the use of negative coping strategies (van Dijk et al., 2017).



**Fig. 3** Correlation between latent change scores across the 2-year interval. The coefficients indicate the intensity of association of variations across time between the variables under study—the model does not assume direction of causality. Only correlations over .35 have been included in the figure; Table 2 presents all correlation coefficients. Solid lines indicate positive correlations, dotted lines negative correlations. All coefficients were significant at  $p < .001$ . EE, emotional exhaustion; S, stress; AE, academic engagement; GW, general well-being; PA, personal accomplishment; D, depression; DM, dispositional mindfulness; DP, depersonalization

The quantitative data presented here showed that the single most powerful predictor of students' well-being at 2 years was their initial level of dispositional mindfulness, the capacity to attend to the sensations, thoughts, and emotions that arise in everyday life (Brown & Ryan, 2003). Dispositional mindfulness was the only protective factor for medical students' burnout and one of the three promoters of flourishing. In addition, in follow-up surveys 2 years later, higher baseline levels of dispositional mindfulness predicted changes in five of the remaining seven measures: reductions in stress, emotional exhaustion, and depersonalization, and increases in personal accomplishment and general well-being.

Present results are consistent with a cross-sectional study that analyzed the relationship between the different facets of dispositional mindfulness with psychological distress and positive mental health in Dutch clerkship medical students (van Dijk et al., 2017). The strongest predictors of psychological distress were the “acting with awareness” (negative predictor) and “worrying” (positive predictor) facets of mindfulness. On the other hand, the strongest predictors of positive mental health were

“problem avoidance” (negative predictor) and “emotional irresponsibility” (negative predictor).

What is the relationship between students' capacity to attend to their own experiences in the present moment (i.e., mindful awareness) and the ability to better navigate the challenges of medical school (i.e., with less psychological distress and more well-being and confidence)? The body of research on dispositional mindfulness and stress appraisal suggests that the way in which attention is brought to bear on one's experiences may be important to the adaptive regulation of emotions and well-being. For example, college students higher in mindfulness displayed lower emotional reactivity to aversive experiences (Beshai et al., 2020), lower rates of reaction to threatening emotional stimuli, greater emotional acceptance and awareness, and improved recovery following a stressful situation (Brown et al., 2007; Pearson et al., 2015). Furthermore, dispositional mindfulness longitudinally predicted more benign appraisals of stressors and higher use of adaptive coping strategies (Weinstein et al., 2009).

The predictive characteristics of MAAS observed in this study are consistent with a large body of evidence showing that the cultivation of mindfulness through educational programs such as mindfulness-based stress reduction or mindful practice has positive effects on health professionals' well-being, empathy, and the quality of care they give (Daya & Hearn, 2018; Quaglia et al., 2016; Shiralkar et al., 2013). Despite the methodological heterogeneity of these reports in terms of design, training contents, formats, and educational setting, a systematic review of the recently published literature concluded that doctors exposed to mindfulness-based interventions reported lower levels of negative well-being (burnout, stress, and anxiety) and higher levels of positive well-being (empowerment, dedication, and satisfaction) (Scheepers et al., 2020).

Few studies have investigated the relationship between dispositional mindfulness and subsequent burnout (Braun et al., 2017; Ender et al., 2018). Present results demonstrate the protective effect of dispositional mindfulness and thus provide a rationale for the implementation of mindfulness-based interventions for health professionals. Importantly, dispositional mindfulness can be increased through regular mindfulness practice (Hölzel et al., 2011; Kiken et al., 2015; Quaglia et al., 2016).

Some studies have reported a negative association between burnout and flourishing (Dyrbye et al., 2012; Vetter et al., 2018). The present results, however, suggest that burnout and flourishing behave as different constructs rather than opposite ends of the same one. First, burnout and flourishing did not predict each other, and second, a set of variables (i.e., academic engagement, personal accomplishment, and depression) that influenced one state (flourishing) fail to predict the other (burnout).

The disjunction between flourishing and burnout seen in this study resonates with Keyes's proposal that mental health and mental illness are two different dimensions of mental health, rather than opposite ends of the same continuum (Westerhof & Keyes, 2010). According to his model, being generally well in life—i.e., flourishing—does not necessarily lower the likelihood of having mental health problems such as burnout.

While most results were consistent with the formulated hypotheses, there were some exceptions. For example, students' levels of stress and depression did not influence their odds of burnout as hypothesized. This suggests that burnout is not the simple result of high perceptions of stress or the hallmark of mental health frailty. According to the World Health Organization, rather than being merely a product of high stress levels, burnout arises from a lack of appropriate coping mechanisms to handle chronic stress (WHO, 2019).

This study had several strengths. First, its longitudinal design afforded us the opportunity to examine temporal antecedents as well as correlated changes, and thus helped us to differentiate between relevant predictors and confounding relations. Second, the relatively large sample of medical students enrolled in eight medical schools located in different geographic areas of Chile provided us with a relatively panoramic view of Chilean medical students. Third, the use of established psychometric instruments allowed comparisons between this prospective cohort, the general population, and other samples of medical students from around the world. Finally, the inclusion of several relevant variables and the use of two different modelling techniques with convergent results made present results more robust.

## Limitations and Future Research

We measured mindfulness with MAAS, a widely used scale with an established psychometric profile that, according to these authors, measures present-centered attention-awareness in everyday experience (Brown & Ryan, 2003). However, some authors have expressed concerns as to whether the MAAS actually measures mindfulness (Grossman, 2011; e.g., Van Dam et al., 2010). One of MAAS disadvantages is its uni-dimensionality which implies that the use of this scale only allows investigation of mechanisms involving this very specific aspect of mindfulness. Psychometric studies indicate that mindfulness is a multidimensional construct with five distinct facets: observing, describing, acting with awareness, nonreacting, and nonjudging (Baer et al., 2006). Therefore, for a comprehensive examination of mindfulness' role as a protective factor in burnout development, future studies should be done using multidimensional scales, such as the Five-Facet Mindfulness Scale (Baer et al., 2006).

There was high student dropout between the two measurements (42.8%). However, this does not necessarily

jeopardize the study's generalizability since no significant differences were found between dropout students and those who remained in the study with regard to the sociodemographic variables or the scores of any of the variables measured. Second, the possibility of making inferences about the temporal tendencies of burnout and flourishing other than linear ones is limited by the use of only two waves.

The present study focused on psychological factors on medical students' burnout and flourishing. We chose these variables because some of them have been associated to students' distress and well-being in other countries, but it was not known if these findings were generalizable to Latin-American students. Second, because variables such as stress, well-being, and mindfulness might be modified through specific training, therefore laying the foundations for development of future educational interventions to prevent students' burnout and promote well-being. In the future, it would be interesting to assess the impact of contextual variables, such as academic overload and sociocultural or biographical characteristics, known to contribute to student distress in American students (Dyrbye, et al., 2010a, b), such as academic overload and the psychological toll of meeting the standards of a highly demanding medical culture.

In this study, we used multiple self-report measures within the same survey, which carries the risk of common methods bias. Thus, it would be useful in further studies to measure the different constructs using additional methods. This would allow for modelling their common effects on the scores and therefore reducing bias and the risk of spurious correlations (Podsakoff et al., 2012).

According to present findings, we hypothesize that other dimensions of mindfulness, such as acting with awareness, nonreacting, and non-judging, may also have a predictive power on medical students' burnout and flourishing.

We observed that some of the variables—for which dispositional mindfulness showed leading effects—presented leading effects onto other variables (e.g., dispositional mindfulness led to increases in general well-being, and general well-being led to decreases in depression). It would be interesting to assess mediated and indirect effects at short, medium, and long terms across medical studies.

Present data suggested that efforts aimed at preventing medical student burnout and improving well-being should include a curriculum on how to cultivate qualities such as mindful awareness attention, academic engagement, and psychosocial well-being. Many institutions are currently designing educational interventions to cultivate these skills. Implementing these interventions and evaluating their effectiveness should be the next steps in acting on these findings. Giving future physicians more resources to deal with the stressful and exhausting experiences inherent to their formation and creating an educational culture of respect might

help alleviate the appalling level of physical and psychological distress felt by many medical students.

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**Author Contribution** DZ: designed and executed the study. MT-S: assisted with the data analyses, and wrote the paper. AR: collaborated with the design and the writing of the paper. NP: collaborated with the design and the writing of the paper. GE: assisted with the data analyses, and wrote the paper. OP: collaborated with the design and assisted with the data analyses. AL: collaborated with the design and executed the study. PC: collaborated with the design and executed the study. OT: collaborated with the design and executed the study. MC: collaborated with the design and executed the study. CG: collaborated with the design and executed the study. JB: collaborated with the design and executed the study. AMM: collaborated with the design and executed the study. PA: collaborated with the design and executed the study. ED: collaborated with the design and executed the study. MM: collaborated with the design and executed the study. CB: collaborated with the design and executed the study. RE: collaborated in the writing and editing of the final manuscript. MB: designed and executed the study, wrote the paper, and participated in editing of the final manuscript. All authors approved the final version of the manuscript for submission.

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## Declarations

**Ethical Standards** This study was examined and approved by Ethics Committee of the School of Medicine of Pontificia Universidad Católica de Chile (approval no. 14–235) and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All participants gave their informed consent prior to their inclusion in the study. Any detail that might disclose the identity of the subjects under study has been omitted.

**Conflict of Interest** The authors declare no competing interests.

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We presented some of these results at the 2018 AMEE conference; that poster received the Medical Teacher Third Top Poster Award.

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