# The relationship between medical students' empathy, mental health, and burnout: A cross-sectional study

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## Abstract

**Objective**. To investigate how medical students' empathy is related to their mental health and burnout.

**Methods**. This cross-sectional study included 886 medical students from curriculum years 1 to 6. The cognitive, affective, and behavioural dimensions of empathy were measured with self-report questionnaires and an emotion recognition test. Regressions were used to test the relationship between the empathy dimensions, depressive symptoms, anxiety, and burnout as well as the influence of curriculum year and gender.

**Results**. Cognitive and behavioural empathy were significantly related to less mental health issues and burnout, whereas affective empathy was related to more mental health issues and burnout. Students in later curriculum years reported less mental health issues and burnout than students in earlier years, whereas no systematic difference could be observed for empathy. Female students reported more mental health issues and burnout as well as higher empathy, except for behavioural empathy for which male students scored higher.

**Conclusions**. The cognitive, affective, and behavioural dimensions of empathy were differently related to the mental health and burnout of medical students. Students presenting mental health issues or burnout might have more difficulty to adapt their behaviour in social situations and keep a certain distance when taking others' perspective.

**Keywords:** Undergraduate, Medical education research, Communication skills, Student support

## Practice Points

- Medical students' cognitive and behavioural empathy was related to less mental health issues and burnout, whereas affective empathy was related to more mental health issues and burnout.
- Students in later curriculum years reported less mental health issues and burnout than first year students.
- Accounting for empathy's multidimensionality allows a better understanding of its relationship to mental health and burnout.

## Introduction

Medical students have been shown to present poorer mental health than the general population and aged-matched peers (Dyrbye et al. 2006) as well as a high prevalence of burnout (Frajerman et al. 2019). Depression and burnout are characterized by disengaged or cynical attitudes, which could hinder medical students' development of important clinical skills and empathy. The literature has indeed documented that the presence of depression (Carter 2017) and burnout (Thomas et al. 2007; Brazeau et al. 2010; Koehl-Hackert et al. 2012; Carter 2017) is related to lower empathy in medical students.

Most of these past studies used a single instrument to measure empathy and, with the exception of Thomas et al.'s work (2007), they assessed only one dimension of empathy (cognitive empathy). However, empathy has long been recognized as a multidimensional construct (Davis 1983). Most authors agree that a comprehensive conceptual framework of empathy would encompass at least two dimensions: cognitive and affective (Cuff et al. 2016). Cognitive empathy is defined as the ability to recognize and understand others' feelings by taking their perspective, whereas affective empathy designates a resonance with or contagion of others' emotions (Cuff et al. 2016). Additionally, some authors have included a behavioural dimension to the conceptualization of empathy, which has been defined as "demonstrating unequivocally that we [the healthcare professionals] do indeed grasp what the patient is experiencing, and are able to act accurately on the basis of this understanding" (Mercer and Reynolds 2002, p. s10). Acting accurately based on one's understanding of others' emotions imply the aptitude to tailor one's behaviour to the demands of a social situation as it is perceived. Thus, in the present study, we chose to measure behavioural empathy as the ability to adapt one's expressive behaviour in social situations (see Measure section).

So far, the different dimensions of empathy have been mostly measured with self-report questionnaires, but one can also rely on well validated performance task-based tests assessing the ability to identify emotions portrayed by individuals in pictures or short videos (Schlegel et al. 2017). These emotion recognition tests have been shown to correlate significantly (although weakly) with self-report questionnaires of both cognitive and affective empathy (Murphy and Lilienfeld 2019), which suggests that recognizing other's emotion might rely on the ability to understand others' emotions, but also to resonate with them.

Given that the different facets of empathy imply different psychological processes, Thirioux et al. (2016) suggested that they relate differently to mental health and burnout. Nevertheless, studies including different dimensions of empathy when investigating its link to mental health issues are extremely scarce and even rarer are such studies conducted within a sample of medical students. Moreover, even though the few existing studies indeed reported differences between cognitive and affective empathy, their results remain inconclusive whether the different dimensions of empathy are positively or negatively related to mental health or burnout (Thomas et al. 2007; Gleichgerrcht and Decety 2013; Duarte et al. 2016; Dionigi et al. 2020). For instance, the only study that we found within a sample of medical students showed that burnout was related to higher affective empathy and unrelated to cognitive empathy (Thomas et al. 2007), but other studies conducted with samples of physicians, healthcare volunteers, or nurses found that burnout is related to lower affective empathy (Duarte et al. 2016) or that wellbeing is related to higher cognitive empathy and unrelated to affective empathy (Dionigi et al. 2020). Thus, there is a need for further studies using a comprehensive framework that accounts for the multidimensionality of empathy in order to disentangle its link with mental health and burnout. Such research is especially needed in the context of medical school education, where the first foundations of physicians' clinical skills are laid. Its results could indeed enable to draw specific strategies to counteract

potential effects of students' mental health on their different empathic abilities (or vice versa), the ultimate objective being the improvement of medical students' mental health and, in turn, of their ability to provide compassionate care.

The primary aim of the present study was thus to investigate how medical students' mental health (depressive symptoms and anxiety) and burnout relate to the cognitive, affective, and behavioural dimensions of empathy measured with validated self-report questionnaires and a performance-based test. Influences of curriculum year and gender on empathy, mental health, and burnout of medical students were also explored.

## Materials and Methods

### *Design*

A cross-sectional design was used. This study uses the data from the first wave of the ETMED-L project (Berney et al. 2021), an ongoing longitudinal open cohort study surveying medical students at the University of Lausanne's Medical School (Switzerland) on a yearly basis.

### *Participants and procedure*

The University of Lausanne's Medical School is a 6-year program with three Bachelor years (B1, B2, B3) followed by three Master years (M1, M2, M3). Students typically enter the B1 year after high school at the age of 19. There is no entry exam to the Medical School, but the exam at the end of the B1 year is very selective with 70% of the students failing to pass this academic year. Communication training is implemented from the B1 year: fundamentals of clinical communication including empathy (B1 and B2); practical learning based on video material and role-play (B2); and simulated patient interviews on specific communication situations (B2 to M2) such as breaking bad news (M1). As for formal clinical practice, it is introduced with internships from the M1 year on.

All medical students of the University of Lausanne, except external students who are in the university as part of an academic exchange, were eligible for participation during the spring semester of 2021 ($N$ = 1793). They were informed about the current study via an email sent by the Medical School, and then received a link to the online questionnaire. The survey was open between March 5 and April 5, 2021, and the students received two participation reminders via email. Questionnaire completion took approximatively 60 minutes and students received a remuneration of 50 CHF (≈ 50 USD) as we consider good practice to fairly compensate the time and effort students take for a study. The ETMED-L project protocol was approved by the Research Ethics Committee of the Canton de Vaud (protocol number 2020-02474).

### ***Measures***

Empathy, mental health, and burnout of medical students were measured with well-validated instruments, whose psychometric properties are reviewed elsewhere (Berney et al. 2021).

#### *Empathy*

Three self-report questionnaires and a performance-based test were used to measure the different dimensions of empathy. The first was a French back-translation of the Jefferson Scale of Physician Empathy-Student version (JSPE-S; Hojat et al. 2001). The JSPE-S includes 20 items and is the most often used instrument to measure medical students' cognitive empathy (Cronbach's alpha = .68).

The French version of the Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al. 2011; Myszkowski et al. 2017) was included as a multidimensional measure of empathy. The QCAE is a self-report questionnaire assessing both cognitive empathy with 19 items (Cronbach's alpha = .83) and affective empathy with 12 items (Cronbach's alpha = .79).

The present study also included a behavioural dimension of empathy measured with the French version of the Ability to Modify Self-Presentation Scale (AMSP; Myszkowski et al. 2017). This subscale of the Lennox and Wolfe revised self-monitoring scale (Lennox and Wolfe 1984) includes 7 items assessing students' ability to adapt their expressive behaviour in social situations (Cronbach's alpha = .81).

Finally, to complement self-report measures of empathy, we added to the questionnaire a performance-based assessment of emotion recognition designed to be administered through online platforms (Schlegel et al. 2014). The Geneva Emotion Recognition Test short form (GERT-S; Schlegel and Scherer 2016) presents 42 short videos (about 3 seconds each) of actors portraying one out of 14 different emotions (e.g., fear, despair, surprise, disgust, anger). The final score is computed as the proportion of correctly recognized portrayals.

*Mental Health*

As in many previous studies, depression and anxiety were chosen as indicators of mental health (Breedvelt et al. 2020). Depressive symptoms were assessed with the French version of the Center for Epidemiological Studies-Depression (CES-D; Radloff 1977). This 20-item instrument's score indicate the extent to which depressive symptoms were experienced over the past week (Cronbach's alpha = .94). CES-D cut-offs of 16 for men and 21 for women were well validated in a French sample in terms of sensitivity and specificity (Morin et al. 2011). Medical students' general level of anxiety was assessed with the 20 items of the trait subscale of the State-Trait Anxiety Inventory French version (STAI; Spielberger 1983), with higher scores indicating more general anxiety (Cronbach's alpha = .94).

*Burnout*

Burnout was measured with the French version of the Maslach Burnout Inventory Student-Survey (Faye-Dumanget et al. 2017), which is the instrument most widely used to measure students' burnout in research. It contains 15 items that evaluate three separate subdimensions: emotional exhaustion (Cronbach's alpha = .88), cynicism (Cronbach's alpha = .86), and academic efficacy (reversed subdimension; Cronbach's alpha = .76).

### *Analysis*

The influence of curriculum years and gender were explored in 10 linear regressions with curriculum years and gender as independent variables and each of the empathy, mental health, and burnout indicators separately as dependent variables. Then, the link between medical students' empathy, mental health, and burnout was tested in 25 linear regressions in which each of the empathy indicators was entered separately as independent variables with each of the mental health and burnout indicators as dependent variables. Given that curriculum years and gender were found to be associated with most of the variables of interest, they were entered as control variables in these regressions. Participants indicating a 'non-binary' gender were excluded from the analysis in which gender was included, because they represented less than 1% of our sample. The online questionnaire uses a forced answer strategy. Thus, there were no missing data for the participants included in the present study. STATA 16 (StataCorp 2019) was used for all analysis. P-values below .05 were considered significant, although p-values between .01 and .05 were treated with caution, because the high number of models increases the risk of type I error. Eta squared ($\eta 2$) were used to estimate effect sizes with values of .02, .13, and .26 indicating respectively small, medium, and large effects (Cohen 1988).

## Results

The participation flow chart is displayed in Figure 1. From a total of 1793 eligible students, 937 gave their consent for participation. Among them, 31 did not fully complete the survey and were excluded from the analysis as they all filled in less than 15% of the questionnaire. Furthermore, 20 participants who gave a wrong answer to at least one of two attention questions (e.g., 'In order to check your attention, please answer "Slightly agree" to this question.') were excluded. The final sample included 886 medical students representing 49.41% of the overall eligible students, with respectively 40.03%, 50.19%, 61.64%, 54.67%, 54.98%, and 50.45% of the eligible students from the first to the sixth curriculum year. Descriptive statistics are presented in Table 1 (see also Supplementary Material for descriptive statistics separately for male and female students and for correlations between the variables of interest). Our students were 68.4% female, had a mean age of 22.38, and were mostly native French speakers. $Chi^2$ tests confirmed that our gender distribution does not significantly differ from that of the overall population of students registered in the Medical School in spring 2021 (65.96% of female students). According to CES-D cut-offs, 40.18% of the students were at risk of clinically significant depressive symptoms.

### *Influence of curriculum year and gender*

The regressions presented in Table 2 showed that students in later curriculum years reported significantly fewer depressive symptoms, anxiety, and emotional exhaustion (dimension of burnout) than first year students. The progressively decreasing betas further indicate a linear decrease from the first to the sixth curriculum year. Similarly, we observed that the CES-D cut-offs indicate that the first-year students present the highest risk of clinically significant depressive symptoms (51.02%) with this percentage lowering gradually along the curriculum years (45.93%, 39.16%, 34.96%, 33.07%, and 24.78% respectively from the second to the last curriculum year).

There were also some significant differences between curriculum years in terms of empathy. First year students tend to report lower cognitive (JSPE-S and QCAE) and affective (QCAE) empathy than students in later curriculum years, but the betas indicate no linear increase.

Regarding gender differences, the regression models' results displayed in Table 2 showed that female students presented more depressive symptoms, anxiety, and emotional exhaustion (dimension of burnout) than male students. Female students also scored significantly higher on all empathy dimensions measured than male students, except for behavioural empathy, on which male student scored higher than female students.

### *Relationship between empathy, mental health, and burnout*

The regressions between medical students' empathy and mental health or burnout are presented in Table 3. Higher cognitive empathy measured with the JSPE-S and the QCAE was significantly related to less anxiety and more academic efficacy (reversed dimension of burnout), but with very small effect sizes. Slightly stronger effects (small effect sizes) were found for the results pertaining to behavioural empathy as measured with the AMSP indicating that the self-reported ability to adapt expressive behaviours in social situations was significantly related to less depressive symptoms, less anxiety, and more academic efficacy (reversed dimension of burnout). The opposite was observed for affective empathy measured with the QCAE, which was significantly related to more mental health issues and burnout on all indicators measured with small effect size. The performance-based test of emotion recognition, the GERT-S, showed no significant relationship to mental health or burnout.

## Discussion

The present study showed that empathy dimensions were differently related to mental health and burnout among medical students. Cognitive empathy and behavioural empathy

were linked to fewer depressive symptoms, anxiety, and burnout, whereas affective empathy was related to more depressive symptoms, anxiety, and burnout. This study further shows that students in later curriculum years present less mental health issues and burnout than early curriculum year's students. Finally, female students report lower mental health, more burnout, higher cognitive and affective empathy, lower behavioural empathy, and higher emotion recognition abilities than male students.

As other studies in the field (Thomas et al. 2007; Brazeau et al. 2010; Koehl-Hackert et al. 2012; Carter 2017), our analyses confirm that cognitive empathy is a dimension related to better individual mental health status, although weak effects were observed in the present results. This indicates that the detachment associated with depression and burnout could impair the ability to read others' emotions or that the ability to take the perspective of others while maintaining a certain distance could protect against the contagion of others' negative emotions, which might be especially important for future healthcare providers who will face patients' distress. This study further puts forward behavioral empathy as a rarely studied, but important dimension of empathy. Our analyses indeed showed that the ability to adapt expressive behaviours in social situations relates to better mental health and less burnout, indicating that this skill might relate to better interpersonal interactions and thus less social anxiety or that mental health issues and burnout inhibit adequate social involvement.

Our results showed the opposite for the affective dimension of empathy, which was related to more mental health issues and burnout. Halpern (2003) underlines the importance and beneficial aspect of affective empathy, as arising feelings in oneself can serve as cues regarding the emotions of the interactional partner. However, like other research in the field (Gleichgerrcht and Decety 2013; Duarte et al. 2016; Dionigi et al. 2020), our study points out a risk of over-sensitivity to others' emotion. Indeed, inappropriate regulation of emotional investment might be the ground for the emergence of mental health issues and burnout in the

face of pre-existing vulnerability and exposition to others' distress. Moreover, depression, anxiety, or burnout itself may amplify sensitivity to negative emotions when exposed to the distress of others and the accumulation of such negative emotions might in turn feed depression, anxiety, and burnout symptomatology.

Importantly, the cross-sectional design of the study precludes causal interpretation. The results might indicate that cognitive and behavioural empathy protects medical students against mental health issues and burnout, whereas affective empathy puts them at risk for the same issues, but it can also be that students presenting depressive symptoms, anxiety or burnout are less able to take the perspective of others, have more difficulty to adapt their expressive behaviour in social situations, and are more sensitive to others' emotions. Longitudinal or experimental studies are highly needed to determine the causal relationship between empathy dimensions, mental health, and burnout among medical students and further data collections within the ETMED-L project will enable to shed light on this question.

Even though the emotion recognition scores correlated with our self-report measures of cognitive and affective empathy, there was no significant link between medical student's emotion recognition and their mental health and burnout. A meta-analysis similarly showed that the GERT is only weakly related to psychological well-being (Schlegel et al. 2019). An explanation could be that emotion recognition as measured with a performance-based test might imply both the understanding of (cognitive empathy) and the contagion from (affective empathy) others' emotion (Murphy and Lilienfeld 2019). Given that we found opposing directions in the links between cognitive or affective empathy and mental health, these links might cancel each other in a task implying both the cognitive and affective dimensions of empathy simultaneously.

With respect to the influence of curriculum years, this study shows that mental health issues and the emotional exhaustion dimension of burnout decrease along the curriculum

years. This suggests that the stressful first years might have more impact on students' mental health and burnout than later years, even though the contact with patients and clinical settings happening later in the curriculum has been pointed out as potentially taxing (Hojat et al. 2009). Regarding the evolution of empathy along the medical curriculum, no linear trend can be observed in the present study. Importantly, we did not observe the decrease in JSPE-S scores found in past longitudinal studies (Neumann et al. 2011), nor the decline in affective empathy measures previously reported (Newton et al. 2008). The results of the present study indicate on the contrary that students in later curriculum years present higher JSPE-S and QCAE affective empathy scores than first year students. Authors have suggested that mixed findings in existing research regarding the evolution of medical students' empathy might result from cultural differences (Roff 2015); differences in curriculum structure between schools and countries might indeed explain the different evolution of empathy scores. In any case, longitudinal analysis would be needed to rule out potential cohort effects that could explain the observed differences between curriculum years.

Finally, our results replicate numerous past findings regarding gender differences with female students reporting more mental health issues (Maji 2018), higher cognitive and affective empathy (Hojat et al. 2001; Christov-Moore et al. 2014), as well as higher emotion recognition abilities (Schlegel et al. 2014) than male students. An unexpected gender difference observed in the present study is female students reporting lower abilities to adapt their behaviours in social situation than male students. Indeed, past studies usually found no gender differences when measuring this ability with the AMSP (O'Cass 2000). This result could indicate that behavioural empathy measured as the ability to adapt expressive behaviours in social situations might be one of the rare dimension of empathy for which men score higher than women, but further replications are needed.

***Strength and limitations***

The high response rate and the good representation of the Lausanne Medical School's students strengthen the validity of the present study's findings. The financial compensation may explain the high response rate, but comes with the risk of some students participating for financial reasons only and lacking attention when filling in the questionnaire. The exclusion of students giving a wrong answer to the attention questions was implemented to prevent this issue. This study's strength also lies in the measure of various dimensions of empathy and the use of validated instruments. Nevertheless, we cannot claim to have covered all aspects of the very complex concept of empathy and other measures of behavioural empathy need to be further explored. The present study is limited by its cross-sectional design. Future data collection of the ETMED-L project will enable to better understand the causality of the relationship between medical students' empathy, mental health, and burnout as well as their longitudinal trajectories. The high number of models tested might have increased the risk of type I error. Thus, the results with p-values lower than .01 (which also presented very low effect sizes) need to be interpreted cautiously and are in need of further replications.

### *Conclusion*

The high rate of mental health issues among medical students and its interaction with empathy needs further exploration as they may impact the development of clinical skills during medical school. The present study shows that taking into account the multidimensionality of empathy enables more nuanced findings. Some dimensions of empathy such as the ability to take the perspective of others and to modify behaviours in social situation could be highly positive for medical students, but other dimensions such as emotional contagion could come with a risk of over-sensitivity to distress. More studies taking into account the complexity of empathy are needed to shed light on its dynamic interaction with mental health factors and burnout in order to build specific strategies targeting different dimensions of empathy which in turn may lower mental strain and improve clinical skills.

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**Disclosure of interest**

The authors report no conflict of interest.

**Data availability statement**

The data that support the findings of this study are openly available in zenodo at http://doi.org/10.5281/zenodo.5702895.

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**Table 1.** Descriptive statistics of the final sample (N = 886)

| | M (SD) | Percent |
|---|---|---|
| **Sociodemographics** | | |
| Gender | | |
| *Female* | | 68.40 |
| *Male* | | 31.04 |
| *Non-binary* | | 0.56 |
| Age | 22.38 (3.30) | |
| Curriculum year | | |
| *B1* | | 27.65 |
| *B2* | | 15.24 |
| *B3* | | 16.14 |
| *M1* | | 13.88 |
| *M2* | | 14.33 |
| *M3* | | 12.75 |
| Mother tongue | | |
| *French* | | 80.93 |
| *Italian* | | 5.08 |
| *German* | | 3.50 |
| *Portuguese* | | 3.05 |
| *English* | | 2.48 |
| *Spanish* | | 2.03 |
| *Other*[a] | | 2.92 |
| Having a partner | | 56.32 |
| Having a paid job | | 34.88 |
| Hours of study/week[c] | 25.29 (15.93) | |
| Satisfaction with health[b] | 3.78 (1.06) | |
| Consulted a psy last year | | 22.46 |
| **Empathy** | | |
| JSPE-S | 106.37 (8.78) | |
| QCAE Cognitive | 58.53 (6.57) | |
| QCAE Affective | 34.78 (5.38) | |
| AMSP | 23.15 (4.99) | |
| GERT-S | 0.72 (0.09) | |
| **Mental Health** | | |
| Depressive symptoms | 18.05 (11.48) | |
| Anxiety | 42.90 (11.98) | |
| **Burnout** | | |
| Emotional Exhaustion | 16.88 (5.26) | |
| Cynicism | 10.08 (4.59) | |
| Academic Efficacy | 24.21 (4.63) | |

[a]Arabic, Chinese, Croatian, Dutch, Japanese, Lithuanian, Romanian, Russian, Serbian, Swedish, Turkish, Vietnamese. [b]Scale: 1 = Very unsatisfied; 2 = Unsatisfied; 3 = Neither satisfied, nor dissatisfied; 4 = Satisfied; 5 = Very satisfied. [c]On top of courses. B1 to 3 = 1st to 3rd year Bachelor, M1 to 3 = 1st to 3rd year Master, JSPE-S = Jefferson Scale of Physician Empathy Student version, QCAE = Questionnaire of Cognitive and Affective Empathy, AMSP = Ability to Monitor Self-Presentation, GERT-S = Geneva Emotion Recognition Test Short form.

**Table 2.** Influence of curriculum year and gender on empathy, mental health, and burnout (N=881)

| | **Mental Health** | | | | | | **Burnout** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depressive Symptoms | | | Anxiety | | | Emotional Exhaustion | | | Cynicism | | | Academic Efficacy | | |
| | β | η2 | SE | β | η2 | SE | β | η2 | SE | β | η2 | SE | β | η2 | SE |
| B2 vs B1 | -0.08* | .06 | 1.17 | -0.03 | .02 | 1.23 | 0.06 | .08 | 0.54 | -0.07 | .02 | 0.49 | 0.02 | .00 | 0.50 |
| B3 vs B1 | -0.12** | | 1.15 | -0.04 | | 1.21 | 0.02 | | 0.53 | -0.01 | | 0.48 | -0.01 | | 0.49 |
| M1 vs B1 | -0.16*** | | 1.21 | -0.09* | | 1.27 | -0.07 | | 0.55 | 0.05 | | 0.51 | -0.01 | | 0.51 |
| M2 vs B1 | -0.19*** | | 1.19 | -0.11** | | 1.26 | -0.15*** | | 0.55 | 0.08* | | 0.50 | -0.01 | | 0.51 |
| M3 vs B1 | -0.22*** | | 1.25 | -0.14*** | | 1.32 | -0.21*** | | 0.57 | 0.02 | | 0.52 | 0.01 | | 0.53 |
| Female vs Male | 0.22*** | .05 | 0.79 | 0.25*** | .06 | 0.84 | 0.15*** | .03 | 0.36 | 0.01 | .00 | 0.33 | -0.03 | .00 | 0.34 |
| F | 17.82*** | | | 14.34*** | | | 16.16*** | | | 2.55* | | | 0.32 | | |
| R2 | .11 | | | .09 | | | .10 | | | .02 | | | .00 | | |
| | **Empathy** | | | | | | | | | | | | | | |
| | JSPE-S | | | QCAE Cognitive | | | QCAE Affective | | | AMSP | | | GERT-S | | |
| | β | η2 | SE | β | η2 | SE | β | η2 | SE | β | η2 | SE | β | η2 | SE |
| B2 vs B1 | 0.17*** | .14 | 0.87 | 0.07 | .02 | 0.70 | 0.07* | .02 | 0.54 | -0.08* | .01 | 0.53 | -0.03 | .02 | 0.01 |
| B3 vs B1 | 0.33*** | | 0.86 | 0.12** | | 0.69 | 0.14*** | | 0.53 | -0.03 | | 0.52 | 0.06 | | 0.01 |
| M1 vs B1 | 0.31*** | | 0.90 | 0.04 | | 0.72 | 0.09** | | 0.55 | -0.08* | | 0.55 | 0.11** | | 0.01 |
| M2 vs B1 | 0.26*** | | 0.89 | 0.11** | | 0.71 | 0.10** | | 0.55 | -0.03 | | 0.54 | 0.11** | | 0.01 |
| M3 vs B1 | 0.28*** | | 0.93 | 0.08* | | 0.75 | 0.07 | | 0.57 | -0.03 | | 0.57 | 0.02 | | 0.01 |
| Female vs Male | 0.15*** | .02 | 0.59 | 0.12*** | .02 | 0.48 | 0.37*** | .14 | 0.36 | -0.14*** | .02 | 0.36 | 0.21*** | .05 | 0.01 |
| F | 25.72*** | | | 4.36*** | | | 24.74*** | | | 3.80** | | | 10.45*** | | |
| R2 | .15 | | | .03 | | | .15 | | | .03 | | | .07 | | |

*p<.05, **p<.01, ***p<.001. P values of .05 should be treated with caution due to multiple tests applied to the same data that increase the risk of Type I error. The six participants indicating a 'non-binary' gender were excluded from these analyses. JSPE-S = Jefferson Scale of Physician Empathy Student version, QCAE = Questionnaire of Cognitive and Affective Empathy, AMSP = Ability to Monitor Self-Presentation, GERT-S = Geneva Emotion Recognition Test Short form, B1 to 3 = 1st to 3rd year Bachelor, M1 to 3 = 1st to 3rd year Master.

**Table 3.** Relationship between empathy, mental health, and burnout (N=881)

| | Mental Health | | | | | | Burnout | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Depressive symptoms | | | Anxiety | | | Emotional Exhaustion | | | Cynicism | | | Academic Efficacy | | |
| **Empathy** | β | η2 | SE | β | η2 | SE | β | η2 | SE | β | η2 | SE | β | η2 | SE |
| JSPE-S | -0.04 | .00 | 0.05 | -0.07* | .00 | 0.05 | -0.02 | .00 | 0.02 | -0.03 | .00 | 0.02 | 0.11** | .01 | 0.02 |
| F | 15.42*** | | | 12.93*** | | | 13.87*** | | | 2.32* | | | 1.69 | | |
| R2 | .11 | | | .09 | | | .10 | | | .02 | | | .01 | | |
| QCAE-Cognitive | -0.04 | .00 | 0.06 | -0.10** | .01 | 0.06 | -0.03 | .00 | 0.03 | -0.03 | .00 | 0.02 | 0.19*** | .04 | 0.02 |
| F | 15.49*** | | | 13.69*** | | | 13.97*** | | | 2.28* | | | 5.02*** | | |
| R2 | .11 | | | .10 | | | .10 | | | .02 | | | .04 | | |
| QCAE-Affective | 0.22*** | .05 | 0.07 | 0.29*** | .08 | 0.07 | 0.19*** | .03 | 0.03 | 0.13*** | .02 | 0.03 | -0.11** | .01 | 0.03 |
| F | 22.15*** | | | 24.30*** | | | 18.66*** | | | 4.22*** | | | 1.64 | | |
| R2 | .15 | | | .16 | | | .13 | | | .03 | | | .01 | | |
| AMSP | -0.13*** | .02 | 0.07 | -0.22*** | .05 | 0.08 | -0.04 | .00 | 0.03 | -0.02 | .00 | 0.03 | 0.22*** | .05 | 0.03 |
| F | 17.78*** | | | 19.78*** | | | 14.09*** | | | 2.26* | | | 6.44*** | | |
| R2 | .12 | | | .14 | | | .10 | | | .02 | | | .05 | | |
| GERT-S | 0.00 | .00 | 4.06 | -0.01 | .00 | 4.29 | -0.01 | .00 | 1.87 | 0.04 | .00 | 1.70 | -0.02 | .00 | 1.73 |
| F | 15.26*** | | | 12.29*** | | | 13.84*** | | | 2.41* | | | 0.31 | | |
| R2 | .11 | | | .09 | | | .10 | | | .02 | | | .00 | | |

*p<.05, **p<.01, ***p<.001. P values of .05 should be treated with caution due to multiple tests applied to the same data that increase the risk of Type I error. The six participants indicating a 'non-binary' gender were excluded from these analyses. Every model included curriculum year and gender as categorical control variables. JSPE-S = Jefferson Scale of Physician Empathy Student version, QCAE = Questionnaire of Cognitive and Affective Empathy, AMSP = Ability to Monitor Self-Presentation, GERT-S = Geneva Emotion Recognition Test Short form.

## Figure captions

**Figure 1.** Participation flow chart