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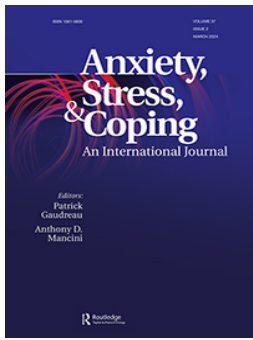
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Sources of stress among domestic and international students: a cross-sectional study of university students in Amsterdam, The Netherlands

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ABSTRACT

High perceived stress is associated with psychological and academic difficulties among college students. In this study, we aimed to investigate associations of student status (international vs domestic student in the Netherlands) with eight common sources of stress (i.e., financial, health, love life, relationship with family, relationship with people at work/ school, the health of loved ones, other problems of loved ones, and life in general). Participants were 2,196 college students (domestic: $n = 1,642$, international: $n = 554$) from two universities in Amsterdam, the Netherlands. Hierarchical linear regression analyses were used to estimate associations of student status with all eight sources of stress. Student status was significantly associated with higher levels of perceived stress in almost all life domains. International student status was significantly associated with higher perceived stress in the domains of financial situation and health of loved ones after adjusting for sociodemographic characteristics, depressive and anxiety symptoms, and other sources of stress. Findings highlight that several differences exist in the magnitude of perceived stress in certain areas between international and domestic students in the Netherlands. Consequently, it is essential to uncover the different needs of college students and develop specific strategies to deliver the most suitable services.

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Introduction

The first onset of common mental health disorders, including depressive and anxiety disorders, substance use disorders, or eating disorders typically occurs between 17 and 25 years of age (Mcgorry et al., 2011; Solmi et al., 2021). The developmental changes during the transition from adolescence to

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adulthood such as leaving home, being more autonomous, and adjusting to a new lifestyle can be challenging (Arnett et al., 2014; Gustavson et al., 2018). This is also reflected by the findings that many college students report psychological and physical symptoms and suffer from mental disorders (Auerbach et al., 2016; Eisenberg et al., 2013; Stallman, 2010).

Students may encounter potential stressors during their college years, such as academic demands, financial difficulties, and relationship problems (Andrews & Wilding, 2004; Bewick et al., 2010). Experience of stress could vary depending on various factors including the appraisals about the situations and one's resources (Lazarus & Folkman, 1984; Ursin & Eriksen, 2004). Individuals widely differ in terms of their perceptions of what is stressful, and their stress responses (Fink, 2016). Stress could result in positive outcomes such as increased performance and learning, and growth (Everly et al., 2002; Lazarus & Folkman, 1984, p. 33). However, subjective appraisal of the circumstances as taxing one's ability to cope leads to psychological stress (Cohen et al., 2007). Several studies found links between high levels of stress and depressive and anxiety symptoms as well as academic difficulties among college students (Adams et al., 2016; Karyotaki et al., 2020; Leppink et al., 2016; Saleh et al., 2017).

It is likely that particular groups of students are more vulnerable to stress or are exposed to more sources of stress (Hurst et al., 2013; Zavadil & Kooyman, 2014, p. 55). Specifically, international students face additional stressors compared to domestic students, including loneliness, homesickness, conflicts due to cultural differences (e.g., differences in communication and teaching styles), and discrimination (Alharbi & Smith, 2018; Smith & Khawaja, 2011). Moreover, cultural differences and language barriers, as unique sources of stress for international students, can exacerbate the impact of the common college life stressors (Sümer et al., 2008). As a result, international students may be more susceptible to mental health difficulties than domestic students (Acharya et al., 2018; Kim et al., 2019). On the other hand, some studies from English-speaking countries found no differences between international and domestic students in terms of emotional problems (Clough et al., 2019), academic difficulties (Fritz et al., 2008), or financial concerns (Khawaja & Dempsey, 2008), noting that country of origin of international students differs between English-speaking countries (OECD, 2021). Given the current evidence derived mostly from the international students in English-speaking countries such as the USA, the UK, or Australia, more studies are needed to understand the situation of international students in non-English speaking countries. The distinction between the countries based on the spoken language is important as the experiences of international students in English-speaking countries versus non-English-speaking countries could vary significantly because of language differences. Language is a key component of sociocultural adjustment (Bierwiazzonek & Waldzus, 2016). Although students can easily communicate in English in the university environment, they may experience increased daily hassles, difficulties in socialization, or feelings of alienation and loneliness because they do not know the language of the host country (Masgoret, 2006; Selmer & Luring, 2015; Yeh & Inose, 2003).

In the last decade, the number of international students has been increasing in several European countries. Indicatively, in 2020, 12.2% of the students in tertiary education in the Netherlands were international students who were mainly from other European countries (Elfferich et al., 2020). Since there is a lack of information in this cultural context, more studies are needed to gain insight into this topic. Based on previous studies in other countries, international students in the Netherlands might have higher stress levels in life domains than domestic students. One potential difference could be financial stress. International students might report higher financial stress, because of higher tuition fees and working visa restrictions, depending on the student's country of origin (Wilson et al., 2022). Moreover, international students generally have limited side-job opportunities due to not knowing the local language (Rienties et al., 2011). Another difference could be observed in the social domain, including the relationship with family, friends, people at school/work, and partners. University students already experience several changes in their social life as soon as they begin their college education. Most of them leave their homes and separate from their family and friends. International students could experience these changes substantially because of relocation.

International students may also differ from domestic students in terms of their health-related concerns. Surveys yielded that majority of students generally do not have major concerns related to their health (American College Health Association, 2018), and international student populations are no exception (Rosenthal et al., 2008). However, when the two groups are compared, disparities could be expected, as international students may encounter additional difficulties because of the differences in health systems between the home and host country, and lack of knowledge about the health system (Russell et al., 2008). Exploring the sources of stress among domestic and international students can improve our understanding of their needs to map out more inclusive and accessible psychological interventions.

Therefore, this study aimed to describe sources of stress in both domestic and international students in the Netherlands. We aimed to investigate whether there is a significant association between student status (i.e., domestic vs international) and perceived stress in several life areas (i.e., finance, health, love life, relationship with family, relationship with people at work/school, health-related issues of loved ones, other problems experienced by loved ones, and life in general).

Methods

Study design and data collection procedure

We conducted a cross-sectional study as a part of the WHO World Mental Health International College Student Initiative (WMH-ICS) survey (Cuijpers et al., 2019). In the present study, the recruitment was conducted in two universities in the Netherlands (i.e., the Vrije Universiteit Amsterdam and the Universiteit van Amsterdam). Participants were eligible if they (1) were 18 years old or older, (2) enrolled in an undergraduate or master's program in these two universities, and (3) gave digital informed consent for research participation. Participants were recruited between March 2018 and September 2019 using convenience sampling. This is a non-probability sampling method in which individuals within reach of the researcher participate in the study (Galloway, 2005). The recruitment was performed in multiple ways:

- (1) All potential participants at both universities received an email including information about the study and screening questionnaires as a part of the WMH-ICS survey.
- (2) Announcements were placed on online platforms such as websites and social media, faculty newsletters, and flyers at the campus.
- (3) A website (<https://caring-universities.com>) was launched to provide information about this study.
- (4) Study advisors, mentors, and student ambassadors informed the students about the study.
- (5) Advertisements of the study were made through a mental health awareness week.

Data collection was conducted via an electronic platform (Qualtrics) in Dutch and English to reach domestic and international students. Before the start of the study, the medical ethics committee of the Amsterdam University Medical Center concluded that this study was not subject to the regulations of medical research involving human subjects. The approval of the study protocol was obtained by the scientific committee of the Amsterdam Public Health Research Institute.

We invited 37,679 students to participate in the survey, and 4,088 students (10.8%) responded to the invitation. In total, 2,201 (5.8%) students completed all questions about the sources of stress and student status. Due to the lack of available data, we could not calculate response rates separately for domestic and international students. Among all respondents, we did not include participants who reported their gender other than female and male ($n = 5$), as another study is planned to be conducted specifically focusing on this population. In total, we included 2,196 students for the data analysis.

Measures

Perceived stress

Eight items measuring perceived stress in major life areas were retrieved from the survey of the Midlife Development in the U. S. (MIDUS; Kessler et al., 2004). The MIDUS is a self-report scale on a 5-point assessment with scores ranging between 0 and 4, meaning none, mild, moderate, severe, and very severe stress, respectively. This scale measures the current perceived stress during the data collection at several domains: financial situation, health, love life, relationship with family, relationship with people at work or school, the health of loved ones, other problems experienced by loved ones, and life in general.

Control variables

Anxiety and depression. We included depression and anxiety together to control for general negative affect, because both anxiety and depression are known for their potential interrelations with perceived stress (Cohen, 1986; de Rooij et al., 2010; Hammen, 2015). Moreover, individuals might perceive a particular situation as more stressful when they experience higher levels of depression and anxiety. The Generalized Anxiety Scale (GAD-7) was used to measure anxiety symptoms (Spitzer et al., 2006). This scale consists of seven items, with each item ranging from 0 to 3. A sample item from the GAD-7 is “becoming easily annoyed or irritable”. Higher scores suggest high levels of anxiety. In the original work, the severity of the anxiety symptoms was categorized as minimal (0-4), mild (5-9), moderate (10-14), and severe (15-21). This scale has shown high reliability and validity in college student samples (Byrd-Bredbenner et al., 2021; Lee & Kim, 2019). In this study, the internal consistency of the GAD-7 was high ($\alpha = .88$).

Depression scores were assessed with the Patient Health Questionnaire- 9 (PHQ-9; Kroenke et al., 2001). The total score can range from 0 to 27 with higher scores meaning higher levels of depression. An example item from the PHQ-9 is “Feeling down, depressed, or hopeless”. Depressive symptom severity is classified as; minimal (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27). Previous studies showed that this scale is reliable and applicable to measure depressive symptoms in college students (Keum et al., 2018). In this study, the internal consistency of the PHQ-9 was high ($\alpha = .87$).

Sociodemographic characteristics. Students’ sociodemographic information was asked, including age, gender, student status (international vs. domestic students), their university, and parental education. From the parental education variable, we generated a new variable that defines whether the student is a first-generation university student (referring to students whose parents did not have a college education) or not. We selected age, gender, and first-generation student status as control variables because of their associations with stress as previous studies indicated (Cohen & Janicki-Deverts, 2012; Sy et al., 2011).

Data analysis

All analyses were conducted using Stata (Stata/SE version 16). In order to adjust for non-response bias across different age and gender groups, we used standard post-stratification methods to weight data (Groves & Couper, 2012). Standard post-stratification weights are calculated using the auxiliary statistics retrieved from the two universities to adjust the distribution of the age and gender characteristics of the sample data. These two variables were selected because men and individuals of younger age are usually underrepresented in surveys (Elliott et al., 2005; Fotini et al., 2013). We used this approach to compensate for non-response bias and make more reliable inferences, as there could be specific differences between age groups and genders in perceived stress.

For descriptive statistics, we calculated the differences between international and domestic students in terms of sociodemographic characteristics (e.g., age, gender, being a first-generation

student or not) using independent t-test and chi-squared test. Then, we calculated the means and standard errors of each source of stress, depressive and anxiety symptoms for the full sample, and separately for domestic and international students. We also categorized stress responses as some stress (i.e., no stress, mild or moderate stress) and severe stress (i.e., severe or very severe stress) to calculate the proportions of students having high stress. We made this categorization because stress to some extent is expected, but ongoing, severe stress would have detrimental effects on mental health. Therefore students who reported severe or very severe stress can provide the most clinically relevant findings.

Before conducting our main analysis, we generated a correlation matrix and calculated Variance Inflation Factors (VIF), and 1/ VIF (Field, 2009, p. 224) to identify whether intercorrelations between depression, anxiety, and sources of stress carry a potential risk for the analysis. As a result, we did not find any threat which could be defined by correlations higher than .80, VIF scores higher than 2.5, and 1/ VIF scores below 0.2 (Field, 2009, p. 224; Johnston et al., 2018). Results can be seen in Online Appendix A.

After weighting the data, we estimated associations between student status (domestic student vs international student) as a predictor and each source of stress as a dependent variable using hierarchical linear regression analyses. We tested several models to understand the associations between student status and perceived stress in each life domain. First, we estimated associations without adjusting for any variable (Model 1). Second, we estimated associations by only adjusting for several sociodemographic characteristics, including age, gender, and whether they were a first-generation student or not (Model 2). Third, we calculated estimations adjusting for sociodemographic characteristics, depressive (PHQ-9), and anxiety symptoms (GAD-7) to control general negative affect (Model 3). Lastly, we calculated the estimation between student status and each source of stress when adjusted for sociodemographic characteristics, depressive, and anxiety symptoms, and other sources of stress apart from the source of stress that we investigated as the dependent variable in the model (Model 4). In this model, we included stress sources as a set of covariates considering the potential influences of stress sources on each other. For example, financial stress could lead to higher stress in relationships with significant others.

We also performed sensitivity analyses by conducting unweighted analyses to provide more detailed information about the influence of weighting procedures.

Results

Sample characteristics and descriptive statistics of sources of stress, symptoms of depression and anxiety

Sample characteristics

The full sample consisted of 2,196 students with the age ranging from 18 to 36 ($M = 22.45$, $SE = 0.09$). Fifty-five percent of the weighted sample were female students. The total number of international students was 554, constituting 25.67% of the full sample. International and domestic students did not significantly differ in terms of age, gender, and education level. Domestic students were significantly more likely to be first-generation students than international students, $\chi^2(1) = 118.14$, $p < .001$. International students were predominantly from the European region ($n = 411$, 74.18%). Majority of the international students were from Germany ($n = 102$, 18.4%), Italy ($n = 33$, 6%), the UK ($n = 30$, 5.4%), and Greece ($n = 20$, 3.6%). Students from the Asia-Pacific region consisted of 8.8% ($n = 49$) of the international students and the largest proportions among students from Asia-Pacific were from China ($n = 17$, 3.1%). Sociodemographic characteristics of the students are presented in Table 1.

Sources of stress

On average, international students reported significantly higher levels of perceived stress compared to domestic students in all domains except for stress related to health (Table 2).

Table 1. Sample characteristics.

Characteristics	Total (N = 2, 196)	Domestic students (n = 1,642)	International students (n = 554)	<i>p</i>	Effect size ^a
Mean age (<i>SE</i>)	22.45 (0.09)	22.37 (0.10)	22.68 (0.18)	.140	−0.09
Gender female %	55.44	54.23	58.94	.118	0.04
First generation %	47.55	54.49	27.53	< .001	0.24
University %					
VU	84.05	88.54	71.03	< .001	0.21
UvA	15.95	11.46	28.97		
Current Student Status %					
Full-time degree student	97.48	97.06	98.69		−0.06
Part-time degree student	2.31	2.75	1.03	.180	
Education Level %					
Bachelor	59.85	60.11	59.1	.719	0.01
Master	40.15	39.89	40.9		

Note. VU = Vrije Universiteit, UvA = Universiteit van Amsterdam

^aCohens' *d* value was reported for age and Cramer's *V* results were reported for the other variables.

Differences between international and domestic students with regard to sources of stress can be seen in [Figure 1](#).

Depressive and anxiety symptoms

There were missing cases on the PHQ-9 ($n = 16$) and the GAD-7 ($n = 17$). We decided to exclude those participants who did not provide any data for these scales because of low rate of missingness (< 5) (Tabachnick & Fidell, 2014, p. 97). After excluding participants with missing values, we found that international students ($M = 7.43$, $SE = 0.30$) had significantly more depressive symptoms than domestic students ($M = 5.37$, $SE = 0.13$, $p < .001$). International students also had significantly more anxiety symptoms ($M = 5.95$, $SE = 0.25$) than domestic students ($M = 4.48$, $SE = 0.11$, $p < .001$) ([Table 2](#)).

Categorization of stress levels

Stress domains were categorized into some stress versus severe stress ([Table 3](#)). We observed that almost a quarter of the overall sample reported elevated stress in life in general (international students: 30%; domestic students: 22%). Around a fifth of the full sample stated that they experience elevated stress in the financial domain (international students: 25%; domestic students: 18%). Proportions of students who reported elevated levels of stress in other areas ranged between 11 and 18%.

Associations between student status and sources of stress

We first examined the associations between student status and each source of stress separately finding that international students experienced significantly higher levels of perceived stress in

Table 2. Means and standard errors of perceived stress at several stress sources, depressive and anxiety symptoms in domestic and international students.

	Total <i>M (SE)</i>	Domestic <i>M (SE)</i>	International <i>M (SE)</i>	<i>p</i>	Cohen's <i>d</i>
Sources of Stress (N = 2,196)					
Financial	1.45 (0.03)	1.37 (0.03)	1.69 (0.06)	< .001	−0.28
Own health	1.19 (0.03)	1.16 (0.03)	1.26 (0.05)	0.113	−0.09
Love Life	1.27 (0.03)	1.23 (0.03)	1.40 (0.06)	0.016	−0.14
Relationship with family	0.91 (0.03)	0.85 (0.03)	1.06 (0.05)	0.001	−0.19
People at work/school	0.99 (0.03)	0.93 (0.03)	1.15 (0.05)	< .001	−0.20
Health of loved ones	1.12 (0.03)	1.06 (0.03)	1.30 (0.06)	< .001	−0.21
Other problems of loved ones	1.08 (0.03)	1.03 (0.03)	1.21 (0.06)	0.005	−0.17
Life in general	1.64 (0.03)	1.55 (0.03)	1.92 (0.05)	< .001	−0.34
Depressive Symptoms (N = 2,180)	5.90 (0.13)	5.37 (0.13)	7.43 (0.30)	< .001	−0.41
Anxiety Symptoms (N = 2,179)	4.86 (0.11)	4.48 (0.11)	5.95 (0.25)	< .001	−0.34

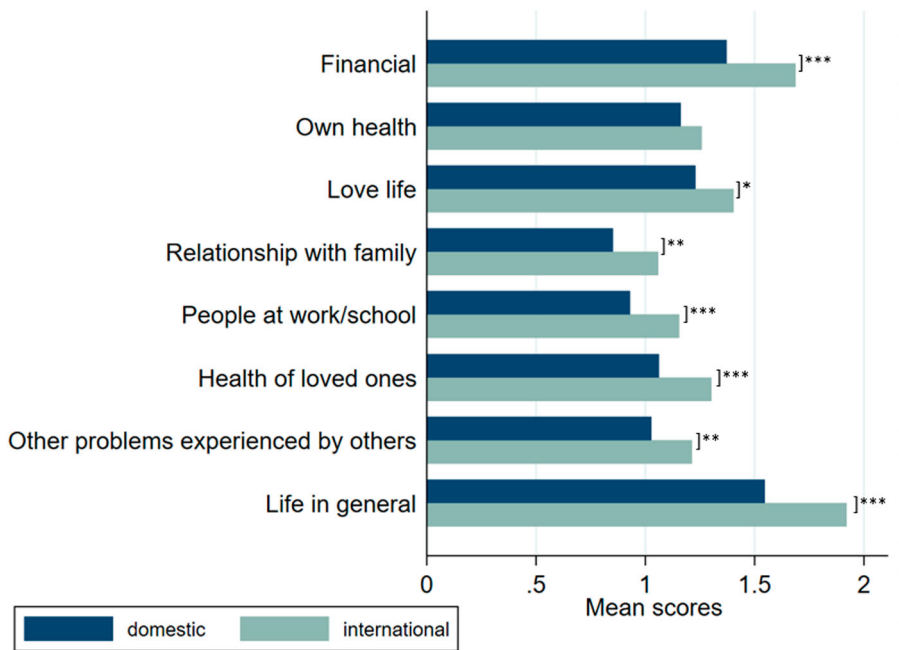


Figure 1. Mean scores in each source of stress separately for international and domestic students.

financial situation, love life, relationship with family, relationship with people at work/school, health problems of loved ones, other problems experienced by loved ones, and life in general (Model 1 in Tables 4–11).

After adjusting for sociodemographic characteristics, we found that international students experienced significantly higher levels of perceived stress in the same domains (unstandardized coefficients ranging from 0.19 to 0.38; Model 2). No significant indication of association was found between being an international student and health-related stress. When adjusted for depressive and anxiety symptoms, only perceived stress related to financial situation ($b = 0.18$, $SE = 0.07$, $p < .01$), health of loved ones ($b = 0.15$, $SE = 0.07$, $p < .05$), and life in general ($b = 0.11$, $SE = 0.05$, $p < .05$) remained significant (Model 3, Tables 4, 9 and 11).

Lastly, when adjusted for sociodemographic characteristics, depression, anxiety, and other sources of stress, student status was positively and significantly associated with financial stress ($b = 0.15$, $SE = 0.06$, $p < 0.05$) and perceived stress related to health of loved ones ($b = 0.12$, $SE = 0.06$, $p < 0.05$) (Tables 4 and 9). A significant negative association was found between student status

Table 3. Proportions of students with severe stress.

Stress Sources	Proportions		
	Total	Domestic	International
	% (SE)	% (SE)	% (SE)
Financial	0.19 (0.01)	0.18 (0.01)	0.25 (0.02)
Own health	0.13 (0.01)	0.13 (0.01)	0.13 (0.02)
Love Life	0.18 (0.01)	0.17 (0.01)	0.20 (0.02)
Relationship with family	0.11 (0.01)	0.11 (0.01)	0.12 (0.02)
People at work/school	0.12 (0.01)	0.11 (0.01)	0.13 (0.02)
Health of loved ones	0.13 (0.01)	0.12 (0.01)	0.17 (0.02)
Other problems experienced by others	0.14 (0.01)	0.13 (0.01)	0.16 (0.02)
Life in general	0.24 (0.01)	0.22 (0.01)	0.30 (0.02)

Table 4. Hierarchical linear regression analysis predicting financial stress.

	Model 1 <i>B</i> (SE)	Model 2 <i>B</i> (SE)	Model 3 <i>B</i> (SE)	Model 4 <i>B</i> (SE)
Student status ^a	0.31 (0.07) ***	0.33 (0.07) ***	0.18 (0.07) **	0.15 (0.06) *
Age		0.05 (0.01) ***	0.05 (0.01) ***	0.05 (0.01) ***
Gender ^b		0.16 (0.06) **	0.06 (0.06)	0.05 (0.05)
First generation ^c		0.17 (0.06) **	0.17 (0.05) **	0.14 (0.05) **
PHQ-9			0.06 (0.01) ***	0.02 (0.01)
GAD-7			0.03 (0.01) **	0.00 (0.01)
Health				0.13 (0.03) ***
Love Life				0.03 (0.02)
Relationship with family				0.12 (0.03) ***
People at work/school				−0.01 (0.03)
Health of loved ones				0.02 (0.03)
Other problems of loved ones				0.06 (0.03)
Life in general				0.23 (0.03) ***
<i>F</i>	<i>F</i> (1, 2195) = 20.86 ***	<i>F</i> (4, 2115) = 14.11***	<i>F</i> (6, 2096) = 46.67***	<i>F</i> (13, 2089) = 42.79***
<i>R</i> ²	0.01	0.04	0.15	0.25
<i>η</i> ²	0.01	0.03	0.12	0.21

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; SE: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

and perceived stress related to health ($b = -0.16$, $SE = 0.05$, $p < 0.01$), suggesting that international students had significantly lower perceived stress related to their health (Table 5). We could not find a significant statistical association between being an international student and perceived stress in the remainder of the examined domains (Tables 6–8, 10 and 11). Details of all models can be found in Tables 4–11.

Results of unweighted analyses

In the descriptive analyses, as expected, we found higher proportions of female students in the unweighted analysis. Female students represented 73.63% of the sample. In other descriptive and inferential analyses, we found little to no differences between weighted and unweighted analyses. The results of the unweighted analyses are provided in Online Appendix B (Tables B1–B11).

Discussion

This study aimed to investigate the association between student status (international vs domestic students in the Netherlands) in terms of perceived stress at various life domains (financial, health, love life, relationship with family, relationship with people at work/school, health of loved ones, other problems of loved ones, and life in general). Results showed that international student status was significantly associated with higher levels of perceived stress in all domains except for stress related to own health after adjusting for sociodemographic characteristics. We also found that, after controlling for general negative affect and other sources of stress, international students experienced higher levels of perceived stress in the domains of financial situation, and the health of loved ones than domestic students and lower levels of perceived stress related to their health.

Table 5. Hierarchical linear regression analysis predicting stress related to health.

	Model 1 <i>B</i> (<i>SE</i>)	Model 2 <i>B</i> (<i>SE</i>)	Model 3 <i>B</i> (<i>SE</i>)	Model 4 <i>B</i> (<i>SE</i>)
Student status ^a	0.10 (0.06)	0.10 (0.06)	−0.09 (0.06)	−0.16 (0.05)**
Age		0.00 (0.01)	0.01 (0.01)	0.00 (0.01)
Gender ^b		0.18 (0.06)**	0.07 (0.05)	0.07 (0.05)
First generation ^c		0.06 (0.05)	0.06 (0.05)	0.02 (0.04)
PHQ-9			0.07 (0.01)***	0.03 (0.01)***
GAD-7			0.04 (0.01)***	0.01 (0.01)
Financial stress				0.10 (0.02)***
Love Life				0.06 (0.02)**
Relationship with family				0.07 (0.03)**
People at work/school				0.04 (0.03)
Health of loved ones				0.12 (0.03)***
Other problems of loved ones				−0.05 (0.03)
Life in general				0.26 (0.03)***
<i>F</i>	<i>F</i> (1, 2195) = 2.52, <i>p</i> = 0.113	<i>F</i> (4, 2115) = 3.59**	<i>F</i> (6, 2096) = 54.54***	<i>F</i> (13, 2089) = 55.33***
<i>R</i> ²	0.00	0.01	0.21	0.33
<i>η</i> ²	0.00	0.01	0.14	0.26

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; *SE*: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

According to some studies, international students reported higher levels of stress in the personal, social, and financial domains, aligning with some of our results (Redfern, 2016; Sherry et al., 2010). In these studies, results generally reflect the findings of samples including domestic and international students (mostly of Asian origin) in English-speaking countries. The sample and the contexts in these studies are quite different from our sample, as international students consisting of our sample predominantly come from relatively closer geographic locations in Europe. Therefore, non-significant associations between student status and some stress sources after controlling other psychological variables in our study could be explained by greater cultural commonalities and closer locations between host and home countries.

International students may show different patterns when grouped by country of origin and examined in different cultural contexts (Galchenko & Vijver, 2007; Rienties & Tempelaar, 2013). For instance, some studies found no differences between international and domestic students in the USA with regard to psychological distress or making new friends (Fritz et al., 2008; Msengi, 2007). Yet, when international students were clustered according to their country of origin in these studies, Asian international students reported higher personal and social difficulties than European international students (Fritz et al., 2008; Msengi, 2007). This is expected considering the evidence showing that students experience more difficulties during the transition to a new culture as the cultural and geographical differences between the host and home country increase (Galchenko & Vijver, 2007; Olivas & Li, 2006; Smith & Khawaja, 2011; Yan & Berliner, 2009).

In our study, comparable patterns between international and domestic students would have been expected given the similarities in cultural and societal characteristics (e.g., individual orientation) between European countries (Minkov et al., 2017; Triandis, 1996). Despite these similarities, we did observe several differences in sources of stress between international and domestic students.

Table 6. Hierarchical linear regression analysis predicting stress related to love life.

	Model 1 <i>B</i> (SE)	Model 2 <i>B</i> (SE)	Model 3 <i>B</i> (SE)	Model 4 <i>B</i> (SE)
Student status ^a	0.17 (0.07)*	0.19 (0.08)*	0.06 (0.07)	0.01 (0.07)
Age		−0.02 (0.01)	−0.01 (0.01)	−0.02 (0.01)*
Gender ^b		−0.17 (0.06)*	−0.26 (0.06)***	−0.28 (0.06)***
First generation ^c		0.02 (0.06)	0.02 (0.06)	−0.02 (0.05)
PHQ-9			0.04 (0.01)***	−0.01 (0.01)
GAD-7			0.04 (0.01)***	0.00 (0.01)
Financial stress				0.03 (0.03)
Health				0.09 (0.03)**
Relationship with family				0.15 (0.03)***
People at work/school				0.06 (0.03)
Health of loved ones				−0.01 (0.03)
Other problems of loved ones				0.08 (0.03)*
Life in general				0.29 (0.04)***
<i>F</i>	<i>F</i> (1, 2195) = 5.81*	<i>F</i> (4, 2115) = 3.15*	<i>F</i> (6, 2096) = 23.10***	<i>F</i> (13, 2089) = 30.89***
<i>R</i> ²	0.00	0.01	0.09	0.22
<i>η</i> ²	0.00	0.00	0.06	0.16

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; SE: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

Table 7. Hierarchical linear regression analysis predicting stress related to relationship with family.

	Model 1 <i>B</i> (SE)	Model 2 <i>B</i> (SE)	Model 3 <i>B</i> (SE)	Model 4 <i>B</i> (SE)
Student status ^a	0.21 (0.06)**	0.23 (0.07)***	0.06 (0.06)	0.01 (0.05)
Age		0.00 (0.01)	0.01 (0.01)	0.00 (0.01)
Gender ^b		0.13 (0.06)*	0.02 (0.05)	0.01 (0.05)
First generation ^c		0.05 (0.05)	0.05 (0.05)	0.00 (0.04)
PHQ-9			0.06 (0.01)***	0.03 (0.01)**
GAD-7			0.04 (0.01)***	0.01 (0.01)
Financial stress				0.10 (0.02)***
Health				0.08 (0.03)**
Love life				0.11 (0.02)***
People at work/school				0.07 (0.03)**
Health of loved ones				0.03 (0.03)
Other problems of loved ones				0.15 (0.03)***
Life in general				0.13 (0.03)***
<i>F</i>	<i>F</i> (1, 2195) = 11.14**	<i>F</i> (4, 2115) = 5.12**	<i>F</i> (6, 2096) = 50.48***	<i>F</i> (13, 2089) = 58.38***
<i>R</i> ²	0.01	0.01	0.18	0.32
<i>η</i> ²	0.01	0.01	0.13	0.27

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; SE: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

Table 8. Hierarchical linear regression analysis predicting stress related to relationship with people at work/school.

	Model 1 <i>B</i> (SE)	Model 2 <i>B</i> (SE)	Model 3 <i>B</i> (SE)	Model 4 <i>B</i> (SE)
Student status ^a	0.22 (0.06)***	0.25 (0.07)***	0.07 (0.06)	0.03 (0.06)
Age		−0.01 (0.01)	−0.01 (0.01)	−0.01 (0.01)
Gender ^b		0.02 (0.06)	−0.08 (0.05)	−0.09 (0.05)
First generation ^c		0.06 (0.06)	0.06 (0.05)	0.04 (0.05)
PHQ-9			0.06 (0.01)***	0.03 (0.01)***
GAD-7			0.04 (0.01)***	0.01 (0.01)
Financial stress				−0.01 (0.03)
Health				0.04 (0.03)
Love life				0.05 (0.02)
Relationship with family				0.08 (0.03)**
Health of loved ones				0.04 (0.03)
Other problems of loved ones				0.03 (0.03)
Life in general				0.28 (0.03)***
<i>F</i>	<i>F</i> (1, 2195) = 12.68**	<i>F</i> (4, 2115) = 4.00**	<i>F</i> (6, 2096) = 45.84***	<i>F</i> (13, 2089) = 40.68***
<i>R</i> ²	0.01	0.01	0.17	0.27
<i>η</i> ²	0.01	0.01	0.12	0.20

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; SE: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

Our results are consistent with the previous studies suggesting that international students, mostly from European countries, reported higher emotional/ psychological complaints in comparison to domestic students in the Netherlands (Rienties et al., 2011; Rienties & Tempelaar, 2013).

International students, even those from neighboring countries, experience social changes, cultural and educational disparities that can impact their stress levels (Mitchell et al., 2007; Rienties & Tempelaar, 2013; Sümer et al., 2008). This is also indicated in a recent study showing that international students reported higher levels of stress pertaining to the COVID-19 pandemic than domestic students in the Netherlands (Koelen et al., 2021). In addition, international students may evaluate the same situation as more stressful than domestic students because international students generally report fewer resources in the new environment such as low social support, lack of cultural knowledge, and not knowing the local language (Bender et al., 2019; Fritz et al., 2008).

Financial concerns emerged as one of the most prominent areas of stress related to international student status. International students generally reported financial stress because of limited work permit or fewer job opportunities in the host country and paying higher tuition fees (Mori, 2000; Poyrazli & Grahame, 2007; Sherry et al., 2010). Although tuition fees in the Netherlands are the same for domestic students and international students from the countries in the European Union, international students may still have higher financial concerns than domestic students because generally fewer financial sources are available for them. For example, international students were less likely to have a part-time job compared to domestic peers in the Netherlands, possibly due to the language barrier (Rienties et al., 2011).

Another noticeable difference between international and domestic students was perceived stress in the domain of health-related problems experienced by loved ones. Leaving home for pursuing a college education significantly alters the family routines and roles (Pitt et al., 2018). Moving abroad brings additional major changes, such as being physically away from loved ones or time-zone

Table 9. Hierarchical linear regression analysis predicting stress related to health of loved ones.

	Model 1 <i>B</i> (SE)	Model 2 <i>B</i> (SE)	Model 3 <i>B</i> (SE)	Model 4 <i>B</i> (SE)
Student status ^a	0.24 (0.07)***	0.26 (0.07)***	0.15 (0.07)*	0.12 (0.06)*
Age		0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Gender ^b		0.24 (0.06)***	0.18 (0.06)**	0.07 (0.05)
First generation ^c		0.10 (0.06)	0.11 (0.06)	0.04 (0.04)
PHQ-9			0.04 (0.01)***	0.00 (0.01)
GAD-7			0.03 (0.01)**	0.00 (0.01)
Financial stress				0.02 (0.02)
Health				0.11 (0.03)***
Love life				−0.01 (0.02)
Relationship with family				0.02 (0.03)
People at work/school				0.03 (0.03)
Other problems of loved ones				0.61 (0.03)***
Life in general				−0.01 (0.03)
<i>F</i>	<i>F</i> (1, 2195) = 12.54**	<i>F</i> (4, 2115) = 8.19***	<i>F</i> (6, 2096) = 21.27***	<i>F</i> (13, 2089) = 85.96***
<i>R</i> ²	0.01	0.02	0.08	0.44
<i>η</i> ²	0.01	0.02	0.06	0.35

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; SE: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

differences in some cases (Alharbi & Smith, 2018; Fritz et al., 2008; Hwang et al., 2014; Neri & Ville, 2008). These conditions may account for increased psychological strain when a loved one experiences a health-related problem. Although the majority of the international students in our study came from geographically close areas, international students may still evaluate their loved ones' health-related problems as more stressful because they are unable to provide immediate assistance in such circumstances.

One possible explanation of international students having higher levels of perceived stress at certain domains can be partly a reflection of chronic stressors having onset before moving abroad. Evidence from general student populations showed that many college students enter college with pre-existing mental health conditions (Auerbach et al., 2016). Students with ongoing or chronic stressors in their home country may prefer studying abroad to avoid or move away from these circumstances (Poyrazli & Mitchell, 2020). Such a hypothesis is worth investigating in future studies.

The present study adds to the scientific knowledge on perceived stress and stressors among non-domestic students. This is important, especially in the light of increased mobility of students worldwide, particularly in some European countries including the Netherlands, and the challenges that universities face in responding to various needs of students with different cultural backgrounds (de Wit, 2020; OECD, 2021; Prince, 2015; Stehouder & van Donselaar, 2019). However, our results are not free from limitations. First, we did not test the differences between subgroups of international students according to their country of origin because of the small number of students with non-European backgrounds. Despite the common characteristics, it might be misleading to examine the international students as one uniform group. In addition, stress sources of international students who pursue education in other countries can differ, as societal and cultural characteristics of the host country can shape to what extent one feels stressed out (Zhou et al., 2008). For example,

Table 10. Hierarchical linear regression analysis predicting stress related to other problems of loved ones.

	Model 1 <i>B</i> (<i>SE</i>)	Model 2 <i>B</i> (<i>SE</i>)	Model 3 <i>B</i> (<i>SE</i>)	Model 4 <i>B</i> (<i>SE</i>)
Student status ^a	0.19 (0.07)**	0.19 (0.07)**	0.06 (0.07)	−0.06 (0.05)
Age		−0.01 (0.01)	0.00 (0.01)	−0.01 (0.01)
Gender ^b		0.25 (0.06)***	0.16 (0.06)**	0.08 (0.04)
First generation ^c		0.08 (0.06)	0.08 (0.05)	0.01 (0.04)
PHQ-9			0.04 (0.01)***	0.00 (0.01)
GAD-7			0.04 (0.01)***	0.01 (0.01)
Financial stress				0.04 (0.02)
Health				−0.04 (0.03)
Love life				0.05 (0.02)*
Relationship with family				0.12 (0.02)***
People at work/school				0.02 (0.02)
Health of loved ones				0.55 (0.03)***
Life in general				0.12 (0.03)***
<i>F</i>	<i>F</i> (1, 2195) = 7.80**	<i>F</i> (4, 2115) = 7.38***	<i>F</i> (6, 2096) = 28.77***	<i>F</i> (13, 2089) = 101.22 ***
<i>R</i> ²	0.01	0.02	0.10	0.47
<i>η</i> ²	0.00	0.01	0.08	0.39

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; *SE*: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

the Netherlands is not an English-speaking country in contrast to the UK and the USA where the majority of the studies on this topic have been conducted. Language differences can be an excessive source of stress for international college students, although courses are in English.

Second, the psychological stress scale did not cover all domains that might be the most relevant to international students, such as acculturation stress (Pendse & Inman, 2017), academic stress (Acharya et al., 2018; Olivas & Li, 2006) or stress related to nature of work/study. Therefore in future studies, we recommend extending questions to cover these dimensions. There is also a limitation arising from the single-item measurement for assessing perceived stress severity. We only measured individuals' evaluation of stress severity in several life domains. However, it is also important to take the stress duration into account while interpreting these results. Third, the low response rate raises questions about selection bias. Although we tried to overcome this bias by using post-stratification weights, we could only consider limited sociodemographic characteristics, i.e., age and gender. Specific groups with other sociodemographic or psychological characteristics may have been under/overrepresented in our study. Previous epidemiological studies showed that responders may tend to report better mental health or more health-promoting behaviors compared to non-responders (Cheung et al., 2017; Loon et al., 2003). Similarly, in our study, responders may differ in certain characteristics, such as having lower or higher levels of stress, than non-responders. This may obscure the accuracy of the estimations, and impede our findings' generalizability.

Fourth, this is a cross-sectional study and longitudinal studies should be conducted to explore the changes over time because the type and intensity of the stresses can differ throughout college education (Pitt et al., 2018). Moreover, multivariate interactions and complex associations between sources of stress, depression, and anxiety might result in methodological limitations, and these conceptually related variables can be examined using network analysis in future studies. Future studies also should examine the interactions between student status and independent variables in

Table 11. Hierarchical linear regression analysis predicting stress in life in general.

	Model 1 <i>B</i> (SE)	Model 2 <i>B</i> (SE)	Model 3 <i>B</i> (SE)	Model 4 <i>B</i> (SE)
Student status ^a	0.37 (0.06)***	0.38 (0.07)***	0.11 (0.05)*	0.08 (0.04)
Age		0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Gender ^b		0.19 (0.06)**	0.00 (0.05)	0.02 (0.04)
First generation ^c		0.04 (0.06)	0.05 (0.04)	−0.01 (0.04)
PHQ-9			0.08 (0.01)***	0.04 (0.01)***
GAD-7			0.08 (0.01)***	0.05 (0.01)***
Financial stress				0.12 (0.02)***
Health				0.17 (0.02)***
Love life				0.14 (0.02)***
Relationship with family				0.09 (0.02)***
People at work/school				0.16 (0.02)***
Health of loved ones				−0.01 (0.02)
Other problems of loved ones				0.09 (0.02)***
<i>F</i>	<i>F</i> (1, 2195) = 36.27***	<i>F</i> (4, 2115) = 11.48***	<i>F</i> (6, 2096) = 137.98***	<i>F</i> (13, 2089) = 190.79***
<i>R</i> ²	0.02	0.03	0.40	0.57
<i>η</i> ²	0.02	0.02	0.28	0.54

Note. ^aDomestic student = 0, International student = 1, ^bMale = 0, Female = 1, ^cNot first generation student = 0, First generation = 1

Abbreviations: *B*: unstandardized regression coefficient; SE: standard error; PHQ: Patient Health Questionnaire; GAD: Generalized Anxiety Scale

Model 1: Each stress source = *f*(student status)

Model 2: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not)

Model 3: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms)

Model 4: Each stress source = *f*(student status, sociodemographic characteristics: age, gender, first-generation student or not, depressive and anxiety symptoms, other stress sources)

* *p* < 0.05

** *p* < 0.01

*** *p* < 0.001

predicting sources of stress. Fifth, in this study, we did not focus on early career researchers such as PhD candidates and post-doctoral researchers, as their sources of stress widely vary from the undergraduate students. For instance, career-related and work-life balance issues stand out as prominent stressors among PhD students and post-doctoral researchers, whereas relationship problems or familial problems could be higher in undergraduate students (Naumann et al., 2022; Satinsky et al., 2021; Wyatt & Oswalt, 2013). However, future studies could focus on these specific groups by expanding the list of stresses.

Another limitation of the study is that this study only reflects the students from two universities in Amsterdam, which is a city with a high number of international students. Experiences of international students living in other cities in the Netherlands could be different. Sixth, relationship status was not investigated in our study, which could be an important sociodemographic variable in predicting stress sources (Ta et al., 2017). Future studies should investigate the role of this variable. Last but not least, low effect sizes of the student status predicting each source of stress are another limitation in this study. We did not conduct a power analysis prior to our study. Therefore it is unclear if the weak effects are because of the relatively small sample size.

Despite the limitations, this study illustrates that international students in the Netherlands experience psychological stress in different life areas ranging from intra- or interpersonal to finances. Therefore, universities should take an active role in identifying students with different needs and creating a supportive environment for those students who might suffer from severe stress. Counseling centers, social services, faculty, and staff can work in coordination to facilitate the well-being of college students and ease the strain on college students. Recognition of international students' unique challenges is essential to providing relevant services. Providing inclusive services, such as culturally adapted stress management programs or adjusting existing programs to meet the needs of international students and offering them in different languages is recommended. Further, given that

international students underutilize university counseling services (Hwang et al., 2014), tailored outreach strategies can be applied to make psychological interventions more accessible to this sensitive target group. Finally, workshops or training can be designed for faculty and staff to improve their intercultural competencies and knowledge about the referral options for students with differing needs.

In conclusion, college students may differ according to sources of stress. This study shows that international students experience high levels of stress in several major life domains. More studies investigating the large variety of stress sources, including cultural differences or academic difficulties, and longitudinal studies are needed to provide the most accurate psychological interventions for subgroups of college students.

Disclosure statement

In the past 3 years, Dr. Kessler was a consultant for Cambridge Health Alliance, Canandaigua VA Medical Center, Holmusk, Partners Healthcare, Inc., RallyPoint Networks, Inc., and Sage Therapeutics. He has stock options in Cerebral Inc., Mirah, PYM, Roga Sciences and Verisense Health.

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