

Stress in university students: The DECORE-Student Questionnaire (DECORE-S)

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All authors designed the study. LL and JM collected the data. LL and DV analyzed the data. BT and LL prepared the manuscript. All authors approved the final version for submission.

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Abstract

Academic stress has attracted research interest in recent decades due to the similarity found between the occurrence of stress in students and that experienced by workers in organisations. However, tools to assess academic stress are either scarce, general or evaluate the consequences of academic stress. This study aims to validate the psychometric properties of the DECORE-S questionnaire in a sample of students, based on the original 44-item model used in the work context. A cross-sectional design was used in which 1117 university students from different subject areas participated. The results show an adequate fit for the four-factor model (cognitive demands, control, support, and rewards) and internal consistency indices greater than .70 for all scales using thirty items. Students had the highest scores on the cognitive demand scale. Consequently, the use of the DECORE-S questionnaire to assess academic stress is recommended.

Keywords: Students; university; academic stress; evaluation

Introduction

University students have to cope with the changing demands of the labour market, which generate ambiguity, uncertainty, and stress (Paralkar & Knutson, 2021). There has been a growing global concern for years about these students' mental health (Lipson et al., 2019), as well as the stress and burnout associated with high dropout rates (Stallman & Hurst, 2016).

Stress in students is associated with symptoms of anxiety and depression, especially during exam periods, although not everyone experiences stress with the same degree of severity (Beiter et al., 2015; Chapell et al., 2005). Additionally, delayed school completion and dropout occur more frequently in students with anxiety and are associated with suicidal behavior and high financial costs (Schaefer et al., 2007).

It is necessary to differentiate between academic stress and burnout. While stress is a state of tension associated with modifiable environmental factors of a certain context, burnout is more correlated than tension with outcome variables such as dissatisfaction, perceived level of performance or physical and emotional symptoms (Pines & Keinan, 2005). Specifically, Walburg (2014) differentiates between academic stress and academic burnout. Academic stress refers to a state of tension experienced by students, partly due to the demands of this context. Academic burnout, on the other hand, is the occurrence of emotional exhaustion, depersonalisation and lack of personal fulfilment in studies, due to high exposure to acute levels of chronic stress. When assessing burnout in students, it is assumed that academic activity in students is similar or equivalent to that of a formal worker (Dyrbye et al., 2006). According to the Demand-Control-Support (Karasek & Theorell, 1990) and Effort-Reward Imbalance (Siegrist, 1998) theoretical models, when an employee perceives little control over high demands, as well as little support from co-workers and superiors and few rewards in relation to effort invested, they experience stress which, when chronicled over time, can lead to burnout. This scenario would be replicated similarly in an academic context, since other studies have adapted these theoretical models to student samples (Palmieri et al., 2023; Kequn et al., 2023). Schaufeli et al. (2002) indicate that chronic stress or burnout was originally assumed to occur only in job context, but it has been extended to all activity domains (Walburg, 2014). Yusoff (2010) describes academic stress because of inadequate workloads or assignments, evaluations, and inappropriate treatment by teachers. Silvar (2001) specifies that academic burnout is a result of excessive demands, lack of control, scarce of rewards and lack of interpersonal relationships. In addition, the prevalence of chronic stress or burnout is higher in university students in the last years of their careers, since their insertion in the labour market is imminent (Galán et al., 2011).

While stress in university students has been analysed, research has used various tools to

assess it. These include: a) questionnaires that assess stress in general, such as the Perceived Stress Scale-PSS-10- (Andreou et al., 2011) or Trier Inventory of Chronic Stress- TICS- (Petrowski et al., 2019); b) questionnaires to assess the consequences of academic stress, such as the DASS-21 questionnaire (Crawford & Henry 2003) or the Maslach Burnout Inventory Student Survey- MBI-SS, which assesses academic burnout; c) specific questionnaires for the assessment of academic stress, such as Student Stress Inventory, Stress Manifestation-SSI-SM- (Fimian et al., 1989); Lakaev Academic Stress Response Scale- LASRS- (Lakaev, 2009); Stressor Academic Scale - SAS- (Cabanach et al., 2016); Effort Reward Imbalance Student Questionnaire-ERI-SQ (Wege et al., 2017).

The last mentioned questionnaire (ERI-SQ) is based on the aforementioned Effort-Reward Imbalance model, using samples of students in its adaptation to the academic context. However, there are no other questionnaires tailored to the work context for use in the assessment of academic stress in university students. The present study aims to validate the multidimensional DECORE questionnaire in a sample of university students and their stress scores. This questionnaire is based on the Demand-Control-Organisational Support and Effort-Reward Imbalance theoretical models and has been validated in samples of workers (Luceño & Martín, 2008), but has not been adapted to the academic context. The DECORE questionnaire, in its version used in university students (DECORE-S), is expected to have adequate psychometric properties, conforming to the four-factor model (cognitive demands, control, reward, and support) and with reliability indices greater than .70 on all scales. Furthermore, the students assessed are expected to have high scores on academic stress.

Method

Participants

A total of 1117 students were evaluated, 782 (70%) female and 335 (30%) male, with a mean

age of 22 years ($SD=3.22$). Of the total, 565 (50.6%) studied Health Sciences, 235 (21%) Social Sciences, 208 (18.6%) Experimental and Applied Sciences, and 109 (9.8%) Humanities. The sampling carried out was non-probabilistic by quotas, using as inclusion criteria the following: the student must be studying at university, be fluent in Spanish and have been studying for at least three months.

Measures

DECORE Questionnaire: the items of the original DECORE employee questionnaire (Luceño & Martín, 2008) were adapted to the academic context. It is composed of 44 items that assess the perception of demands, control over them, perceived support, as well as the perception of rewards within the work environment. It contains the following scales: a) Cognitive demands (12 items), which assesses the perception of quantitative task load; b) Control (9 items), which measures the subject's ability to make decisions and plan tasks; c) Organisational support (12 items), which assesses the employee's perception of their relationships at work with their bosses and co-workers; d) Rewards (11 items), which value the benefits that the worker perceives concerning the tasks they perform. It is possible to obtain the score for each scale as well as an overall score (Global Risk Index – GRI). The items are answered on a five-choice Likert scale (from 1 = strongly disagree to 5 = strongly agree). The range of scores for all scales is between 100 and 500. High scores on each scale (close to 500) indicate an adverse situation (perceived high demands, low control and support, and low rewards). It presents adequate psychometric properties of validity and reliability, with a four-factor solution and Cronbach's alpha coefficients between .81 and .84 (Luceño & Martín, 2008).

Maslach Burnout Inventory – Student Survey, MBI-SS (Schaufeli et al., 2002): consisting of 15 items assessing three factors: exhaustion (5 items), cynicism (4 items), and professional efficacy (6 items). The scale ranges from 0 (never) to 6 (always/every day). A combination of high scores on the factors "exhaustion" and "cynicism" with low scores on "professional

efficacy" indicates the presence of burnout. The MBI-SS presents Cronbach's alpha values between .74 and .80 for the exhaustion scale, .79 and .86 for the cynicism scale, and .67 and .76 for the professional efficacy scale. Furthermore, the three-factor model shows a good fit level (Schaufeli et al., 2002).

Hospital Anxiety and Depression Scale, HADS (Terol et al., 2007; Zigmond & Snaith, 1983): consisting of 14 items, it assesses symptoms of anxiety (7 items) and depression (7 items) in the general Spanish population. It is answered on a Likert scale with 4 response options, from 0 to 3. It shows adequate reliability values, $\alpha=.77$ for HADS-A, and $\alpha=.71$ for HADS-D, as well as a two-factor fit (Terol et al., 2007).

The Brief Scale Resilience, BSR (Smith et al., 2008), has been adapted to the Spanish population (Rodríguez-Rey et al., 2016). It assesses resilience resources and health outcomes as a single factor composed of 6 items with 6 response options, ranging from 1 (strongly disagree) to 6 (strongly agree). It presents Cronbach's alpha values of .83 and a good fit to one factor (Rodríguez-Rey et al., 2016).

Effort-Reward Imbalance-Student. ERI-Student (Wege et al., 2017): Adapted for students from the ERI questionnaire for workers. It consists of 14 items that assess the following factors: effort (3 items), referring to time pressure and workload; reward (6 items), which addresses the student's perception of respect and fair treatment by peers and teachers; and overcommitment (5 items), ease or difficulty in disconnecting from academic life, sacrifice, and preoccupation with academic problems. Each item is answered on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Reliability indices for effort, reward, and over-commitment are .67, .65, and .79 respectively. The Confirmatory Factor Analysis reflects an adequate level of fit to two factors (Wege et al., 2017).

Procedure

This research was approved by the Ethics Committee of the Faculty of Psychology of the Complutense University of Madrid (Ref. 2020/21-019). Participants completed the questionnaires anonymously and confidentially using Google Forms, signing a prior informed consent form explaining the purpose of the research and the use of the data collected for scientific dissemination purposes. The average completion time was 15 minutes.

Data analysis

The data was analysed using the RStudio interface and the statistical analysis program SPSS 24. Confirmatory factor analysis was performed on the 44 original items, using the following indices to check model fit: CFI (Comparative Fit Index), TLI (Tucker-Lewis Index), RMSEA (Root mean square error of approximation), and SRMR (standardised root-mean-square residual). Cronbach's alpha and McDonald's Omega reliability indices were also calculated (McDonald, 1999; Revelle & Zinbarg, 2009). Lastly, the correlations between the scales of all the questionnaires used in this study were assessed and the academic stress scores of the participants were determined.

Results

Construct validity

CFI, TLI, RMSEA and SRMR were analysed to assess the adjustment of the original model of 44 items in the student sample (Table 1).

INSERT TABLE 1

As we can see in Table 1, the CFI, TLI, RMSEA and SRMR for the original model of 44 items grouped in four factors (cognitive demands, control, support, and rewards) were not within acceptable values (.84, .83, .10 and .10, respectively).

At this point, the original model of DECORE was deeply examined to assess the differences when using the model in a student sample and aiming at reducing the number of items to get a short version of the test. Items were eliminated depending on factorial loads, indices of modification, distribution analysis and reliability analysis as long as the content validity was not harmed.

INSERT TABLE 2

In total, 14 items were eliminated: 3 items of the Cognitive Demands factor; 2 items of the Control factor; 5 items of the Support factor; and, finally, 4 items of the Rewards factor . After the elimination of the previous items, another CFA was carried out using the same fit indices. There was stated an adapted fit with the model of four factors and 30 items in the sample of this study (Table 3):

INSERT TABLE 3

As can be observed in table 3, by eliminating 14 items, a suitable fit of the model is obtained keeping its four dimensions. The Cognitive demands scale is now composed of 9 items and Control scale of 7 items, the same as the Support scale and the Rewards scale.

The correlations, averages, and standard deviations for each factor (cognitive demands, control, support, and rewards) are shown in Table 4:

INSERT TABLE 4

Table 4 shows the correlations between the different DECORE factors and burnout, anxiety, depression, resilience, and effort-reward imbalance. The highest scores between the DECORE scales and the rest of the factors are between cognitive demands and exhaustion (MBI) $-.56$ ($p < .001$); cognitive demands and overcommitment $.52$ ($p < .001$); control and exhaustion (MBI) $.40$ ($p < .001$); control and overcommitment (ERIQ) $.45$ ($p < .001$); reward and effort (ERIQ) $-.57$ ($p < .001$); support and cynicism (MBI) $.40$ ($p < .001$); support and rewards (ERIQ) $-.45$ ($p < .001$). The highest correlations between the DECORE Total Score

and the scales of the other questionnaires are with exhaustion (MBI) .56 ($p < .001$); anxiety (HADS) .46 ($p < .001$); depression (HADS) .51 ($p < .001$); rewards (ERIQ) -.57 ($p < .001$); and overcommitment .51 ($p < .001$).

In relation to the correlations between the DECORE factors, the lowest correlation is .05 ($p = .082$) between the Cognitive Demands and Support scales and the highest correlation is .39 ($p < .001$) between the Cognitive Demands and Control scales.

Reliability

The indices of reliability were calculated in both versions of the questionnaire (44 and 30 items) (Table 5):

INSERT TABLE 5

As we can see in Table 5, using the Cronbach's alpha index, the levels of reliability are between .70 and .83 for all the scales of DECORE-44. The values of the omega index are similar to those of Cronbach's alpha, with values between .71 and .89 in the scales of DECORE-44, except for the Rewards Scale. With the new model of 30 items, the reliability indices are like the original model of 44 items.

As a result, the items of the DECORE-30 questionnaire can be viewed in Table 6.

INSERT TABLE 6

After confirming that the psychometric properties of the questionnaire are adequate, the mean scores on academic stress were studied (Table 4). The students' mean DECORE-S score is below the scale mean (300), except for the Demands factor, which is above the mean (352), indicating that these students perceive quite a lot of cognitive demands in their academic tasks.

Discussion

The aim of the research was to evaluate the psychometric characteristics of the DECORE questionnaire in a sample of university students and to determine their academic stress scores.

A conservative approach was used to eliminate as many items as possible that did not have sufficient factor weights. The indices showed an adequate fit with 30 items and four scales (cognitive demands, control, rewards, and support). Reliability indices also showed adequate values, greater than .70, for all scales.

The Cognitive Demands scale of the DECORE-S questionnaire shows high and significant correlations with the Exhaustion scale of the MBI-SS, related to job demands. Likewise, the DECORE-S Rewards scale shows high and significant correlations with the ERI-SQ Rewards scale, indicating that they measure similar constructs. Similarly, the DECORE-S total scale shows high and significant correlations with all the scales of the ERI-SQ questionnaire, so it can be concluded that the DECORE-S questionnaire and the ERI-SQ questionnaire assess similar, although not equal, constructs. On the other hand, the internal consistency values for all scales are higher in the DECORE-S questionnaire than in the student adaptation of the ERI-SQ. For example, the Rewards factor in the ERI-SQ scores below .70, specifically .66 (Wegel et al., 2017). The relationship between lack of support and depression and between lack of support and cynicism is striking (Mostert & Pienaar, 2020; Newhart et al., 2023). Students with less perceived support have more depressive symptoms and/or are more depersonalised. Other studies have identified such associations. For example, Alsubaie et al. (2019) identified lack of support as a determinant stressor associated with mental health problems. They found that the prevalence of depressive symptoms was 33% higher in university students who perceived a lack of peer support and that this affected the perception of quality of life, which was perceived as worse by these students. Some studies have even identified a lack of support as a factor related to suicidal ideation (Mao et al., 2022; Urme et

al., 2022). Conversely, Sveinsdóttir et al. (2021) point to a lack of support as a predictor of burnout.

After confirming the adequate psychometric properties of the DECORE-S questionnaire, the academic stress perceived by the participating students was assessed. The high scores on the Cognitive Demands scale are noteworthy. This indicates that students perceive that they must carry out many tasks in their studies (in the form of assignments or activities, note-taking, exams, papers, etc.). Other authors have noted that, prior to the pandemic, university students reported high caffeine consumption and reduced sleep to cope with academic demands. After COVID-19, they reported increased stress to cope with demands due to the disruption of their study routine (Clarke et al., 2021).

With these results, it is advisable in future research to analyse the psychometric properties and academic stress after further adaptation to the situation experienced during the pandemic. Some restrictions or habits acquired after COVID-19 are still in place today and this may continue to affect the mental health of university students, as other studies have shown (Fraser et al., 2022; Sverdlik et al., 2022). It is therefore necessary to identify the factors that can be controlled to avoid an increase in stress (Baker, 1985). The questionnaire validated in the present study is particularly useful in identifying elements associated with academic stress that can be modified to avoid subsequent negative consequences, as would be done in the organisational context. While the strategies followed to reduce stress in students in recent years have been associated with the intervention part, such as the promotion of resilience (Chua et al., 2022; Fullerton et al., 2021; Gong et al., 2021), the DECORE-S questionnaire is also oriented towards the prevention of negative situations, where the context can be adapted (adaptation of demands, increase of elements of control, promotion of support and reinforcement systems). Manipulating these factors can help mitigate the effects of stress. Academic stress is associated with academic demands on students, as they must do in-class

assignments, homework, exams, curriculum book purchases, and have to deal with expectations from teachers and parents, which is associated with depressive moods (Kumar et al., 2012). Academic stress and the demands that generate it are associated with negative emotions (Alzahrani et al., 2020) and may affect learning (Dabney, 1995). One of the most common is anxiety, which affects normal life activities and learning, as it is associated with reduced executive functioning and decreased working memory (Quince et al., 2012). On the other hand, assessing academic stress by knowing which elements to control improves cognitive learning strategies. For example, repeated review of lessons, idiosyncratic underlining or reviewing aloud have been associated with greater stress, while the application of theory, the use of metaphors or concept maps are considered protective strategies against academic stress. Likewise, the promotion of support through the improvement of social interactions has a significant influence on information processing (Fuster-Guillén et al., 2021).

In addition to the above, it is worth mentioning the usefulness of adapting the DECORE questionnaire to the academic context, since, as has already been mentioned, on many occasions tools have been used to assess perceived stress in a generalised way, or burnout has been assessed in students who had previously experienced a situation of sustained stress over time. However, certain limitations of this study should be mentioned. The cross-sectional nature of the study suggests the need to explore the perception of academic stress in future longitudinal studies. On the other hand, it is possible that the results obtained in the academic stress scores are influenced by the consequences of the COVID-19 pandemic. Other authors have demonstrated that stress, loneliness, and poor mental health in college students are increased during this period (Krendl, 2023). Also, it would be advisable to validate the instrument on other students. For example, PhD students who are also at the University.

Theoretical implications

The instrument presented provides adequate validity and reliability indices, even surpassing the reliability indices in comparison with some other instruments designed to assess academic stress, such as the ERI-SQ. In addition, it is based on two theoretical models widely used to describe the development of stress in other areas, such as the workplace.

Practical implications

This questionnaire can be administered by faculty and staff who assess the health of the university environment. Its application establishes scores that make it possible to adjust students' workloads, to know if they need institutional or peer support, to know if lessons need to be modified to provide a greater sense of control, and to modify reward systems. Because it assesses academic stress, it is possible to adapt the environment through the factors it examines to avoid health problems and improve student performance.

As a conclusion, it can be concluded that the DECORE-S questionnaire can be used as a reliable tool to assess academic stress in order to improve interventions to reduce stress in university students and to adapt training programmes at the university.

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Table 1. Indices of adjustment obtained in the Confirmatory factor analysis using the DECORE-44 model.

Indices of adjustment	Value	Accepted values
CFI	.84	>.90
TLI	.83	>.90
RMSEA	.10	<.10
SRMR	.10	<.10

Note. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

Table 2. Item load corresponding to the original model of 44 items of the DECORE questionnaire in the sample of study, mean (*M*) and standard deviation (*SD*) by item.

Item	Cognitive demands	Control	Support	Rewards	<i>M</i>	<i>SD</i>
Cog 2	.72				3.66	1.08
Cog14	.35				4.03	.99
Cog18	.54				2.71	1.19
Cog21	.49				3.64	1.04
Cog22	.55				3.59	1.06
Cog23	.56				3.56	1.00
Cog25	.66				3.72	.96
Cog33	.41				3.08	1.03
Cog36	.39				3.74	.96
Con4*		.53			2.01	.87
Con8*		.74			2.40	1.15
Con15*		.61			2.30	.93
Con16		.63			2.41	1.09
Con28*		.49			2.03	.81
Con34		.45			3.36	1.29
Con41		.56			2.60	1.04
Sup7*			.81		1.79	.86
Sup12*			.68		2.09	.84
Sup26*			.70		2.22	.96
Sup31			.65		2.30	1.10
Sup32			.77		1.57	.92
Sup37			.57		2.40	.95
Sup43			.43		2.56	.99
Rew1*				.85	2.59	1.02
Rew6*				.75	2.80	1.01
Rew9*				.47	2.21	.96
Rew10*				.73	2.62	1.02
Rew20*				.61	2.44	.91
Rew39*				.51	2.20	1.06
Rew44*				.87	2.66	1.04

Table 3. Indices of adjustment obtained in the Confirmatory factor analysis using the DECORE-30 model.

Indices of adjustment	Value	Accepted values
CFI	.92	>.90
TLI	.92	>.90
RMSEA	.08	<.10
SRMR	.07	<.10

Note. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

Table 4. Correlations between factors, mean (*M*) and standard deviation (*SD*) of each dimension of DECORE-30 (n = 1117)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. MBI (exhaustion)	-	.35***	-.11***	.46***	.44***	-.31***	.58***	-.36***	.52***	.56***	.40***	.34***	.20***	.56***
2. MBI (cynism)		-	-.47***	.32***	.45***	-.19***	.15***	-.49***	.12***	.07*	.21***	.31***	.40***	.38***
3. MBI (professional efficacy)			-	-.20***	-.37***	.22***	-.07*	.45***	.03	.05	-.15***	-.37***	-.32***	-.31***
4. HADS (anxiety)				-	.63***	-.46***	.42***	-.38***	.51***	.33***	.33***	.33***	.22***	.46***
5. HADS (depression)					-	-.41***	.33***	-.48***	.42***	.25***	.36***	.36***	.38***	.51***
6. Resilience						-	-.31***	.22***	-.34***	-.27***	-.19***	-.24***	-.13***	-.31***
7. ERIQ (effort)							-	-.25***	.48***	.57***	.35***	.28***	.07**	.46***
8. ERIQ (rewards)								-	-.22***	-.16***	-.29***	-.57***	-.45***	-.57***
9. ERIQ (overcommitment)									-	.52***	.45***	.27***	.15***	.51***
10. DECORE (demands)										-	.39***	.23***	.05	.60***
11. DECORE (control)											-	.35***	.26***	.75***
12. DECORE (rewards)												-	.23***	.71***
13. DECORE (support)													-	.59***
14. DECORE (total score)														-
<i>M</i>	16.23	5.91	25.86	8.38	4.79	3.18	2.75	2.79	2.38	352.47	258.54	250.83	224.43	265.16
<i>SD</i>	6.59	5.82	5.66	4.16	3.63	.85	.58	.48	.65	56.84	62.80	69.59	62.90	41.82

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5. Reliability indices of the factors of DECORE-44 and DECORE-30.

Factor	DECORE-44		DECORE -30	
	α	Ω	α	Ω
Rewards	.81	.89	.82	.87
Support	.83	.84	.79	.80
Cognitive Demands	.70	.71	.71	.72
Control	.74	.74	.72	.72

Note. α : Cronbach's alpha index; Ω : Omega index

Table 6. Items of the DECORE-30 Student Questionnaire.

I consider the grades I have received so far to be fair (Rew1)

I feel very pressed for time due to my studies (Cog2)

I set my own pace of work/study (Con4*)

I consider the evaluations made of my academic performance to be fair (Rew6*)

My relationships with my classmates are good (Sup7*)

I can easily take a break if I need to (Con8*)

Future prospects with my studies are good (Rew9*)

I am satisfied with my grades (Rew10*)

There are generally good relations within the Faculty (Sup12*)

I do a lot of my work at home, because I don't have enough time at the Faculty (Cog14)

I can interrupt my studies if I need to (Con15*)

I have very little freedom to decide how and when I study (Con16)

I spend more time than I should on my studies (Cog18)

I believe that I will graduate with good grades when the time comes (Rew20*)

I often have to spend more time than I planned to finish my homework (Cog21)

As time goes by, my studies are becoming more and more complicated (Cog22)

My studies require the use of complex or highly specialised skills (Cog23)

My studies require a high level of mental effort and concentration. The activity is very complex and requires full attention (Cog25)

My classmates are always willing to listen to my problems (Sup26*)

I can decide on the order in which I carry out my study activities (Con28*)

Interactions between classmates are very limited (Sup31)

I suffer from social isolation in my faculty (Sup32)

The consequences of my mistakes are serious (Cog33)

I cannot take holidays or days off from school when I want to (Con34)

I often have to deal with several tasks at the same time (Cog36)

Students do not have enough opportunities to help each other out if necessary (Sup37)

If I try harder, I get better grades (Rew39*)

I do not have any flexibility within my study timetable (Con41)

I often do not get enough support from my classmates and teachers (Sup43)

I feel that the grades I receive are adequate in relation to the effort I put in (Rew44*)
