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An Environmental Resource within the Job Demands-Resources Model: The Mediating Role of Self-Efficacy between Properties of the Learning Environment and Academic Engagement

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Abstract: The characteristics of learning environments are relevant for promoting academic engagement and learning achievement. Thus, this study seeks to identify whether perceived characteristics of the learning environment, and specifically, the sub-dimensions of Perceived Restorativeness (compatibility, being away, extent, fascination), can promote academic Engagement and self-efficacy using the Job Demands-Resources Model as the underlying conceptual framework. Further, we tested the mediating effect of self-efficacy on the relationship between Perceived Restorativeness and academic engagement. Data were collected from a sample of 188 Italian university students. Hierarchical multivariate regression analysis indicated that a restorative quality of the learning environment (i.e., compatibility and fascination) was positively correlated with academic engagement, but that there was a non-significant relationship between being Away and academic engagement and between extent and academic engagement. Regression analyses showed significant indirect effects of compatibility and extent through students' self-Efficacy. Further, self-efficacy was a complete mediator between extent and academic engagement. Furthermore, self-efficacy was found to play a partially mediating role between compatibility and academic engagement. The results of this study provide important information that students, teachers and designers should pay attention to levels of restorative quality in the environment for improving engagement and self-efficacy.

Keywords: restorative environments; engagement; academic context; self-efficacy; environmental resources



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1. Introduction

To improve their levels of productivity, university students need high levels of engagement (Zhong et al. 2020; Ellwood and Abrams 2017; Lee 2014), with self-efficacy also relevant for learning (for a review, see Honicke and Broadbent 2016; Schöber et al. 2018). Self-efficacy has been defined as a “person’s beliefs in one’s capabilities to organize and execute the courses of action required producing given attainments” (Bandura 1997, p. 3). However, contextual demands, such as physical and social aspect of environments, long studying hours and noise, can drain energy and affect learning engagement. Therefore, it is important to examine the role of physical and social features/properties of the learning environment—generally described as resources—able to restore individuals from context demands and increase engagement (Bellini et al. 2015; Robayo-Tamayo et al. 2020) and related personal capacities such as self-efficacy (Gebauer et al. 2020).

In keeping with previous studies of learning contexts characterised by substantial demands, we seek to identify and consider the presence of characteristics of such learning environments, and resources that may positively affect students’ achievement and learning goals.

Given this, the aim of this study is to investigate the role of features of the learning environment (home or academic context) in promoting engagement and self-efficacy. Furthermore, we examine the possibility that perceived characteristics of the learning environment act positively, both in a direct way on engagement as well as indirectly through self-efficacy.

The relationships between the constructs considered here are explored by adopting the conceptual framework of the Job Demands-Resources Model (JD-R Model; Bakker and Demerouti 2014). This model has been applied in the context of the positive consequences of studying (Bakker et al. 2015), and is relevant in this study because it describes the positive interplay between job/learning characteristics and positive outcomes such as student engagement (Burch et al. 2015; Marôco et al. 2016), improved student performance (Bakker et al. 2015; Mas-Expósito et al. 2022) and personal resources such as self-efficacy in the learning context (Chen et al. 2021; Simbula et al. 2011). However, although the JD-R Model is one of the most widespread theoretical frameworks for studying the relationship between job characteristics and outcomes, the relationship between the environmental quality of the learning context and engagement through the provision of resources has not yet received sufficient attention within the university context. Specifically, the novelty of this study derives from its exploration of the role played by an environmental resource (i.e., restorativeness) in promoting personal resources such as self-efficacy and positive outcomes such as engagement on a sample of university students within the JD-R Model.

In the following sections, we first provide the theoretical framework, with particular reference to the JD-R Model. We then present the construct of restorativeness as an environmental resource and its properties, and the concepts of engagement and self-efficacy. In subsequent sections, we introduce the hypotheses of this research, the data analyses and the research findings, with a discussion of the research implications.

2. Theoretical Framework

2.1. The Job Demands-Resources Model

The JD-R Model (Bakker and Demerouti 2007) is a theoretical framework that refers to the relationship between job/learning characteristics and outcomes such as academic engagement (Cho et al. 2022), well-being (Zito et al. 2019) and student performance (Mas-Expósito et al. 2022). According to the JD-R Model (Demerouti et al. 2001), every job or learning environment is characterised by job demands (the physical, psychological or social aspects of the job that require sustained physical or mental effort), such as long studying hours or noise in the learning context, and job resources (those aspects of the job that are functional in achieving work goals), such as environmental and social support that may help to achieve students' goals. Further, the JD-R Model integrates personal resources (Schaufeli and Taris 2014)—those aspects of the self-able to successfully control circumstances, such as self-efficacy, optimism, hope and resilience (Sweetman and Luthans 2010)—that positively influence job resources and outcomes (Bakker and Demerouti 2017).

The dynamic interactions between demands and job/personal resources are explained by dual psychological processes: a stress process and a motivational process. A stress process involves excessive job demands or a lack of resources that may cause exhaustion and negatively affect outcomes such as performance (Bakker and Demerouti 2017; Pelon 2017). According to the Conservation of Resources (COR) theory (Hobfoll et al. 2003), a stress process drains energy and resources, and occurs when an individual's energy resources are depleted or new resources are not available.

A motivational process, which is triggered by job resources, may lead to positive outcomes such as improved performance (Taris 2017). This process acts to enhance individuals' energy, affecting engagement and fostering growth, learning and development (Hakanen et al. 2008; Cilliers and Nel 2017). The positive effect of resources on job engagement has been summarised by Mazzetti and colleagues (Mazzetti et al. 2021), who combined the results of multiple scientific studies that indicate the positive impact of job resources on work engagement and satisfaction.

Generally, resources can have positive effects on individuals, facilitating their engagement and protecting them from psychological discomfort (Van Wingerden et al. 2017; Cabras et al. 2017), and predicting their motivation (Bakker and Demerouti 2007). Further, high job/personal resources can buffer against the adverse effects of demands and promote learning engagement (Dormann et al. 2017). In contrast, demands may lead to a decreased level of engagement among individuals (Einarsen et al. 2018).

Based on the JD-R Model and the literature cited above, we expect that environmental resources are positively linked with other personal resources and positive outcomes through a motivational process. In the following subsection, we present the constructs included in this study and elaborate on the JD-R Model. Specifically, we present the concept of restorativeness and explain why it can be considered a resource in the JD-R Model, and then describe the constructs of engagement and self-efficacy.

2.2. Restorativeness and Its Properties in the Learning Context

University students face many demands able to reduce learning efficacy, such as taking exams and being engaged in a plethora of other activities (Choi et al. 2014a, 2014b). Further, students often study/work in a physical environment with low perceived quality (e.g., high noise, poor lighting, poor physical design for learning), which may increase mental fatigue and reduce learning efficiency (Xiong et al. 2018).

Therefore, it is important to consider students' recovery from everyday work demands. In this respect, restorativeness (Hartig et al. 1997) refers to the capacity of an environment "to offer a concrete and available means of reducing suffering and enhancing effectiveness" (Kaplan and Kaplan 1989, p. 176). More precisely, restorativeness facilitates the recovery of resources (biological, physical, cognitive, social) in individuals (Hartig 2004) through the restoration of attentional resources (Kaplan 1995; Kaplan and Kaplan 1989). Kaplan's Attentional Restoration Theory shows that properties of a social-physical environment—including fascination, being away, extent, and compatibility (Herzog et al. 2003)—reduce mental fatigue and stress generated by extended use of voluntary attention (which requires effort) through encouraging engagement in effortless and interesting activities. Thereby, individuals recover from mental fatigue and free mental resources that allow them to meet environmental demands.

Fascination refers to an effortless form of attention that allows a fatigued attentional system to rest (Kaplan and Kaplan 1989). This property occurs when interesting elements of the environment attract students' involuntary attention. Being away refers to a feeling of freedom from the everyday cares and demands that increase attentional fatigue. Under this condition, students have a sense of being in a different place and/or engaged with different mental contents (Kaplan and Kaplan 1989). Extent refers to the opportunity afforded by an environment that has rich content that encourages exploration. Compatibility refers to the correspondence between the expectations of individuals and setting environment quality, and individuals' goals. This correspondence helps students to reach their goals.

Although evident in the literature, research has given relatively little attention to the characteristics of learning environments that facilitate students' restoration.

The positive effects of restorativeness have been recently examined by researchers in the work context (Lee et al. 2018; Bellini et al. 2019), the academic context (Yusli et al. 2021) and the school context (Amicone et al. 2018). Notably, in the university context, Yusli and colleagues (Yusli et al. 2021) showed a positive relationship between restorativeness and well-being.

In summary, a restorative experience in learning environments (i.e., places where students work) can support the restoration of resources and the gaining of internal resources to meet environmental and learning demands by fostering psychological distance from ordinary and tiring activities. Thus, tracing back to the definition of resources depicted in the JD-R Model, restorativeness is functional to achieve students' goals and learning (Hakanen et al. 2008). Thus, we may assume that restorativeness or restorative properties of environments are relevant resources of the environment that promote personal resources

(such as self-efficacy in this study) and positive outcomes (such as academic engagement). These two constructs are described in the following subsections.

2.3. Academic Engagement

The concept of engagement has been mainly studied in the field of positive psychology (Seligman and Csikszentmihalyi 2014) and work and organisational psychology (Schaufeli et al. 2002). It has been defined as a “positive, fulfilling, work-related state of mind featured by vigor (i.e., high level of energy, willingness and ability to face of difficulty in one’s work), dedication (i.e., enthusiasm, pride and willingness to challenge task and being involved at work)” (Schaufeli et al. 2002, p. 74) and absorption (i.e., indicating a state of concentrating on and being happily engrossed in one’s work, and a feeling of “being away” when working; Schaufeli et al. 2002). As above cited, the concept of engagement comprises three factors but empirical studies also support the one-factor structure (for a review, see Kulikowski 2017).

Similarly, this concept has been studied in the learning context as academic engagement (Cho et al. 2022; Zhong et al. 2020). Academic engagement refers to amount of psycho-social energy a student spends doing academic work (Lee and Shute 2010). Academic engagement comprises three types of dimensions or strategies used by learner to learn: behavioural engagement refers to on-task behaviours (Northey et al. 2015), especially positive interaction and collaboration on learning tasks; emotional engagement (Costa and Faria 2020) relates to commitment or positive impact towards academic activities; and cognitive engagement includes cognitive resources and effort towards learning, such as a cognitive learning strategy (Fredricks et al. 2004; Jimerson et al. 2003; Skinner et al. 2008). High levels of academic engagement are directly related to academic achievement (Galla et al. 2014; Partovi and Razavi 2019) and an increase in students’ participation in educational activities (You 2016); low levels are associated with negative outcomes such as amotivation (Datu et al. 2018), academic burnout (Marôco et al. 2020; Wang et al. 2021), depression (Li and Lerner 2011) and reduced well-being (Datu and King 2018).

As noted above in the section on restorativeness and its properties for the learning context, evidence supports an association between job resources and engagement (e.g., Hakanen et al. 2006; Mazzetti et al. 2021) through a motivational process. Students tend to be engaged in academic contexts that provide the right support for their needs (Jang et al. 2010; Opdenakker 2021).

The results of a recent meta-analysis by Mazzetti and colleagues (Mazzetti et al. 2021) showed that personal resources have a strong positive relationship with work engagement. Thus, we also argue later that the influence of restorativeness on engagement may also be affected by another mediator such as self-efficacy.

2.4. Self-Efficacy, Learning and Academic Engagement

Bandura defines self-efficacy as “belief in one’s capability to organize and execute the courses of action required producing given attainments” (Bandura 1997, p. 3). More precisely, self-efficacy refers to a sense of competence (a judgement of one’s capacities) to cope with a specific task and an individual’s perception of control over work or life. In the learning context, this construct refers to a set of beliefs regarding ability to do homework (Zimmerman et al. 2017).

Studies have shown that individuals with a high sense of self-efficacy perceive themselves as being in positive situations that act as drivers of their performance (Zimmerman and Schunk 2011). Thanks to this boost, individuals with high self-efficacy make an effort to overcome difficulties through increasing expectations of improve performance (Peng et al. 2015), which in turn become a challenge for them, rather an obstacle (Wang et al. 2019).

Based on the COR theory, as cited in the theoretical framework section, people constantly try to acquire and maintain resources that are relevant for them; after their needs are met, they try to obtain more resources from their existing resources. Hence, for example,

after receiving environmental support, students obtain more resources, and are therefore more committed to, and concentrated more on, learning (Hobfoll 1989, 2001).

In other words, self-efficacy contributes to having more energy to complete the learning task (Siu et al. 2014) by influencing the challenges that people pursue, the effort they expend and their perseverance in the face of obstacles (Bandura 1989). In this regard, high self-efficacy is often associated with a proactive personality and a boundaryless mindset (Kim and Park 2017; Mondo et al. 2022; Ng and Feldman 2014).

On this point, previous research has also shown the positive impact of self-efficacy and personal resources on academic engagement (Olivier et al. 2019; Ozkal 2019) via longitudinal studies (Sánchez-Cardona et al. 2012; Simbula et al. 2011). Simbula and colleagues (Simbula et al. 2011) underlined that job resources and self-efficacy had a short- (4 months) and longer-term (8 months) lagged effect on work engagement.

It is relevant to note that resources and self-efficacy mutually reinforce each other (Rošková and Faragová 2020), and that resources can predict other resources, such as a restorative environment or self-efficacy facilitating greater perceived job resources, and so on in a virtuous circle (Salanova et al. 2006). Further, some authors (Xanthopoulou et al. 2009; Luthans et al. 2006) have found that self-efficacy serves as a mediator between resources and work engagement; in particular, this personal resource may help students to deal with their high demands and positively influence performance (Feldman et al. 2015).

Such personal resources (i.e., self-efficacy) are integrated in the JD-R Model and predict work engagement; thus, we argue that self-efficacy (as a personal resource) may influence/motivate students or increase their academic engagement, but may also be affected by other job/environmental resources (i.e., restorativeness). Accordingly, we expect the self-efficacy of students to mediate the relationship between restorativeness and engagement. Figure 1 depicts the conceptual model.

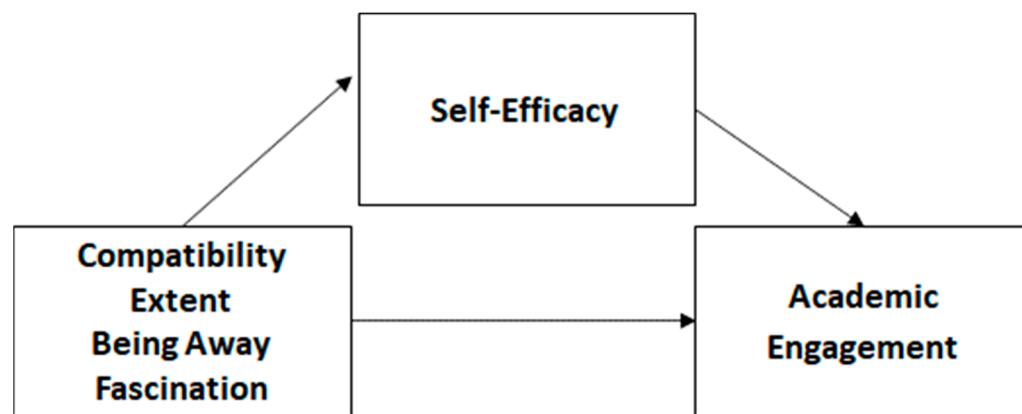


Figure 1. Conceptual model.

2.5. Study Aims and Hypotheses

The aim of the present study is to examine the positive relationship between the perceived restorative quality of students' learning context and academic engagement via self-efficacy. The following hypotheses are proposed:

Hypothesis 1. *The restorativeness of the learning context (compatibility, extent, being away, fascination) is positively associated with academic engagement.*

Hypothesis 2. *Self-efficacy mediates the relationship between the restorativeness of the learning context (compatibility, extent, being away, fascination) and academic engagement.*

3. Methodology

3.1. Procedure and Participants

The study was conducted from March to July 2022 in five Italian universities. Participants were recruited during lessons by the teacher/researcher. The sample consisted of 188 students, who responded to an online survey on the Google Form platform containing an invitation to participate in a well-being survey. The survey homepage provided the online informed consent form, with information on the aim of the study, the anonymity of data, the privacy policy and the voluntary basis of participation. To ensure anonymity, we did not register IP addresses. Students filled out a questionnaire at home or on the university campus. Of the 188 students, 50 were male (26.6%) and 133 were women (73.4%). The mean was 23.6 years ($SD = 6.9$). In relation to year of course, first-year students accounted for 33%, second-year students for 34%, third-year students for 23.9%, fourth-year students for 2.1%, fifth-year students for 2.7%, and the remaining 4.3% fell outside the prescribed time. Regarding learning environments, students mainly studied at home (55.3%), with the remainder (44.7%) mainly studying at the university (classroom, reading rooms, library).

3.2. Measures

In order to measure the construct, the questionnaire included three pre-existing scales, as described in the following.

Perceived restorativeness was made up of 16 items from an Italian version (Pasini et al. 2009) of the Perceived Restorativeness Scale (PRS; Hartig et al. 1997). Instructions for the scale directed students to consider their learning environment. Each item was rated on a 7-point scale, from strongly disagree (=0) to strongly agree (=6). Examples of items include “Spending time here gives me a good break from my day-to-day routine” (being away); “I would like to spend more time looking at the surroundings” (fascination); “I have a sense of oneness with the setting” (compatibility); and “There is too much going on” (coherence as an aspect of extent; negatively formulated).

The *General Self-Efficacy Scale* (GSES; Schwarzer and Jerusalem 1995, 2010) was made up of 10 items. We used an Italian adaptation (Sibilia et al. 1995). Respondents rated their level of agreement with the survey statements on a 5-point scale with options ranging from strongly disagree (=1) to strongly agree (=5). A sample item from the scale is “I can always manage to solve difficult problems if I try hard enough.”

The *Utrecht Work Engagement Scale—9S* (Schaufeli et al. 2006) (Student version) is made up of 9 items. We used an Italian version (UTWS; Loscalzo and Giannini 2019). The response format of the scale is a 7-point Likert scale ranging from never (=0) to always/every day (=6). Instructions for the scale were focused on students’ activities. A sample item from the scale is “When I’m doing my work as a student, I feel bursting with energy.”

3.3. Data Analysis

First, we tested the validity of the measures by performing exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) using SPSS Version 20 and Amos Version 20 for Windows, respectively. To evaluate goodness of fit, we calculated the chi-square value, which was less than 3 as recommended (Schermelleh-Engel et al. 2003). We also met all the standard criteria for fit indices, including Tucker–Lewis Index (TLI; Tucker and Lewis 1973) >0.90 , Comparative Fit Index >0.90 (Bentler 1990), Root Mean Square Error of Approximation Index <0.08 (RMSEA; Hu and Bentler 1999) and Standardised Root Mean Square Residual Index (SRMR; Pavlov et al. 2021) <0.08 . Next, we analysed the internal consistency of each scale by calculating Cronbach’s alpha, which is considered acceptable if higher than 0.60 (Pallant 2001). Reliability was tested also via composite reliability (CR), which is acceptable with a value higher than 0.60 (Fornell and Larcker 1981). Further, we calculated convergent validity through average variance extracted (AVE), which should be greater than 0.50 (Bagozzi and Yi 1988), but can be lower than 0.50 if CR is higher than 0.60 (Lam 2012). Next, discriminant validity was tested by considering whether the square root

of the AVE value of each construct exceeded the correlation values between the constructs (Fornell and Larcker 1981).

Furthermore, we examined the potential effects of common method bias (CMB) using Harman's single-factor procedure (Podsakoff and Organ 1986), which was tested using the Amos statistical package in SPSS Version 20.

Last, we tested our hypothesis H1 using hierarchical multiple linear regression to test three models. In the first model, we included socio-demographic (age, gender) and learning context variables (type of university, place of study) to control a possible confounding effect of these latter variables on engagement. In the second model, we entered each restorativeness sub-dimension as an independent variable, and engagement as the dependent variable. In the third model, we simultaneously put compatibility, extent, being away, fascination for predicting academic engagement while controlling (in the second model) each sub-dimension of restorativeness. To test the mediating effect (hypothesis H2) we used Amos version 20 for Windows. To estimate the significance of the indirect effects, we used a bootstrapping approach with 5000 resamples (MacKinnon et al. 2004).

4. Results

4.1. Descriptive Statistics

The results of bivariate Pearson correlation coefficients among the measured variables and socio-demographic and learning context variables (included means and standard deviation) are presented in Table 1. We found that sub-scale scores for compatibility and being away were significantly positively correlated with engagement and self-efficacy, but that self-efficacy showed a negative relationship with engagement. Fascination was not significantly correlated with engagement or self-efficacy. Among the control variables (age, gender, type of university, place of study), only age and type of university were significantly related with self-efficacy.

Table 1. Study Variables: Descriptive Statistics and Bivariate Correlations (N = 188).

	M	SD	1	2	3	4	5	6	7	8	9	10
1. Age	23.6	6.97	1									
2. Gender	-	-	−0.041	1								
3. University	-	-	−0.177 *	0.069	1							
4. Place of study	-	-	0.021	−0.040	0.112	1						
5. Compatibility	4.64	1.26	0.010	0.015	0.005	0.160 *	1					
6. Fascination	5.22	1.45	0.042	−0.025	−0.024	0.010	−0.075	1				
7. Being Away	3.47	1.84	0.123	0.036	0.028	0.080	0.457 **	0.050	1			
8. Extent	2.66	0.839	−0.142	0.109	0.035	−0.034	−0.146 *	−0.128	−0.130	1		
9. Self-Efficacy	3.50	0.728	0.167 *	−0.071	−0.193 **	−0.047	0.352 **	0.127	0.203 **	−0.477 **	1	
10. Engagement	5.11	1.21	0.066	−0.009	−0.070	0.025	0.575 **	0.096	0.279 **	−0.202 **	0.531 **	1

Note: For sex (two categories, Male = 1, Female = 2), universities (five categories, University, 1 = Cagliari, 2 = Enna, 3 = Catania, 4 = Naples, 5 = Bergamo) and place of study (two categories, 1 = University, 2 = home), means and standard deviations were not reported because these variables were categorical in the questionnaire. Sub-dimensions of restorativeness were measured on a 7-point scale, with higher values indicating greater perceived restorativeness. Engagement was measured on a 7-point scale, with higher values indicating higher levels of the construct. Self-efficacy was measured on 5-point scales with higher values indicating higher levels of the constructs. * $p < 0.05$; ** $p < 0.01$.

4.2. Confirmatory Factor Analyses and Reliability

All the assessed measures showed an acceptable model fit, and all the variables had good reliability, as reported in the following. Moreover, the square root of the AVE value of each construct was greater than the correlation values between the constructs; thus, discriminant validity was also verified, as shown in Table 2.

Perceived Restorativeness Scale. CFA supported a four-factor structure ($\chi^2 = 127.063$, $df = 53$, $p = 0.000$, $\chi^2/df = 2.397$, CFI = 0.920, TLI = 0.882, SRMR = 0.072, RMSEA = 0.086). Cronbach's alpha was 0.69 for fascination, 0.85 for compatibility, 0.80 for extent and 0.82 for

being away. For fascination, CR was 0.84 and AVE was 0.72. For compatibility, CR was 0.85 and AVE was 0.45. For extent, CR was 0.73 and AVE was 0.61. For being away, CR was 0.83, and AVE was 0.72.

Self-Efficacy. CFA supported a one-factor structure ($\chi^2 = 46.343$, $df = 30$, $p = 0.051$, $\chi^2/df = 1.454$, CFI = 0.986, TLI = 0.975, SRMR = 0.032, RMSEA = 0.071). Cronbach's alpha = 0.92, CR was 0.91 and AVE was 0.53.

Engagement. CFA supported a one-factor structure ($\chi^2 = 38.878$, $df = 20$, $p = 0.007$, $\chi^2/df = 1.944$, CFI = 0.994, TLI = 0.987, SRMR = 0.028, RMSEA = 0.053). Cronbach's alpha = 0.93, CR was 0.92 and AVE was 0.62.

Table 2. Average variance extracted (AVE), AVE root square, discriminant validity and correlations.

	AVE	1	2	3	4	5	6
1. Compatibility	0.45	0.67					
2. Fascination	0.72	−0.07	0.84				
3. Being Away	0.72	0.45	0.05	0.84			
4. Extent	0.61	−0.14	−0.12	−0.13	0.78		
5. Self-Efficacy	0.53	0.35	0.12	0.20	−0.47	0.72	
6. Engagement	0.62	0.57	0.09	0.27	−0.20	0.53	0.78

Note: On the diagonal, we report the square root of the AVE (in bold). The numbers under the diagonal are the correlations between the constructs.

4.3. Evaluation of Common Method Bias

We performed EFA with different methods, and this indicated the presence of seven factors. Together, these seven factors accounted for 68.8% of the total variance. No over-riding factor accounted for more the 50% of the variance; the largest factors accounted for 33.4% of the total variance. Furthermore, we found that the single-factor (common method) model did not fit the data well ($\chi^2 = 1959.448$, $df = 405$, $p = 0.000$, $\chi^2/df = 4.838$, CFI = 0.560, TLI = 0.527, SRMR = 0.125, RMSEA = 0.143). Thus, CMB is not a concern in this study.

4.4. Hypothesis Tests

In the linear hierarchical regression analysis (with the socio-demographic and learning context variables in the first model), we did not find a significant association between age, gender, type of university and place where students work with engagement, and the fit was not acceptable ($F > 0.05$). The socio-demographic and learning context variables did not have a significant relationship with engagement in the second model either. We used this model to test our hypotheses, H1 and H2.

Hypothesis 1. *The restorativeness of the learning context (compatibility, extent, being away, fascination) is positively associated with engagement.*

As reported in Table 3, the second hierarchical regression analysis results confirmed a positive effect of compatibility ($\beta = 0.585$, $p < 0.01$) and being away ($\beta = 0.279$, $p < 0.01$) on engagement, and a negative effect of extent ($\beta = -0.197$, $p < 0.05$) on engagement, whereas fascination did not have a significant effect on engagement ($p > 0.01$). The hierarchical regression analysis results confirmed a positive effect of compatibility ($\beta = 0.582$, $p < 0.01$) on engagement in the third model either. However, extent ($\beta = -0.097$, $p > 0.01$), and being away ($\beta = 0.003$, $p > 0.01$) did not have such a significant relationship with engagement in the third model. Indeed, we found that fascination ($\beta = 0.092$, $p > 0.01$) did not have a significant effect on engagement in the second model but that ($\beta = 0.092$, $p > 0.01$) showed a significant association on engagement in the third model. Hypothesis 1 was thus partially supported.

Table 3. Hierarchical regression analyses of the independent and interactive associations between socio-demographic and contextual variables and sub-dimensions of perceived restorativeness (compatibility, extent, being away, fascination) with engagement (N = 188).

Engagement												
Model 1	β	t	p									
Age	0.055	0.730	n.s									
Gender	−0.006	−0.081	n.s									
University	−0.063	−0.836	n.s									
Place of study	0.031	0.411	n.s									
R^2	0.009											
Adjusted R^2	−0.013											
Omnibus test	$F(5,182) = \text{n.s}$											
Engagement				Engagement			Engagement			Engagement		
Model 2	β	t	p	β	t	p	β	t	p	β	t	p
Age	0.053	0.860	n.s	0.055	0.730	n.s	0.026	0.350	n.s	0.051	0.681	n.s
Gender	−0.019	−0.317	n.s	−0.006	−0.081	n.s	0.017	0.226	n.s	−0.004	−0.049	n.s
University	−0.055	−0.886	n.s	−0.063	−0.836	n.s	−0.062	−0.838	n.s	−0.062	−0.817	n.s
Place of study	−0.065	−1.053	n.s	0.031	0.411	n.s	0.025	0.347	n.s	0.030	0.400	n.s
Compatibility	0.585	9.606	<0.001									
Being away				0.279	3.881	<0.001						
Extent							−0.197	−2.679	<0.01			
Fascination										0.092	1.250	n.s
R^2	0.342			0.085					0.046			
Adjusted R^2	0.324			0.059					0.020			−0.010
Omnibus test	$F(5,182) \leq 0.001$			$F(5,182) \leq 0.01$			$F(5,182) = \text{n.s}$			$F(5,182) = \text{n.s}$		
Engagement												
Model 3	β	t	p									
Age	0.034	0.553	n.s									
Gender	−0.005	−0.079	n.s									
University	−0.052	−0.853	n.s									
Place of study	−0.068	−1.117	n.s									
Compatibility	0.582	8.511	<0.001									
Being away	0.003	0.047	n.s									
Extent	−0.097	−1.570	n.s									
Fascination	0.125	2.076	<0.05									
R^2	0.370	0.553	n.s									
Adjusted R^2	0.342	−0.079	n.s									
Omnibus test	$F(8,179) \leq 0.001$											

Hypothesis 2. *Self-efficacy mediates the relationship between the restorativeness of the learning context (compatibility, extent, being away, fascination) and flow state.*

Overall, the results confirmed the mediating role of self-efficacy between the restorativeness sub-scales of the learning setting and engagement. More specifically, we found indirect effect of compatibility ($\beta = 0.114$, $p < 0.001$; 95% CI = 0.051 to 0.194) and extent ($\beta = -0.164$, $p < 0.001$; 95% CI = −0.246 to −0.103) on engagement through self-efficacy. However, we did not find an indirect effect of fascination and being away on engagement through self-efficacy ($p > 0.05$).

Thus, the results partially support hypothesis H2.

As reported in Table 4, we found that the direct effects of the restorativeness sub-scales (in the presence of self-efficacy) on engagement were significant for compatibility ($\beta = 0.456$, $p < 0.001$; 95% CI = 0.340 to 0.566). However, for being away, extent and fascination, the direct effects on engagement were not significant with the presence of self-efficacy ($p > 0.001$).

Table 4. Direct and indirect effects of fascination, extent, being away and compatibility on engagement through self-efficacy, and total effects.

Model	Direct E. Estim.	Direct E.		Indirect E. Estim.	Indirect E. 95% BC Bootstrap CI (5000 Samples)		Total E. Estim.	Total Effect	
		LLCI	ULCI		LLCI	ULCI		LLCI	ULCI
COMPATIBILITY → SELF-EFFICACY → ENGAGEMENT	0.456	0.340	0.566	0.114	0.051	0.194	0.557	0.439	0.684
EXTENT → SELF-EFFICACY → ENGAGEMENT	0.061	−0.058	0.175	−0.164	−0.246	−0.103	−0.103	−0.022	−0.016
BEING AWAY → SELF-EFFICACY → ENGAGEMENT	0.005	−0.123	0.111	0.004	−0.051	0.056	−0.001	−0.051	0.056
FASCINATION → SELF-EFFICACY → ENGAGEMENT	0.089	−0.018	0.205	−0.164	−0.239	0.099	0.126	0.008	0.254

Note: BC = Bias Corrected; CI = Confidence Interval; LLCI = Lower Limit CI; ULCI = Upper Limit CI.

In regard to the simple relationship (total effects) between the restorativeness sub-dimensions and engagement, we found a positive and significant association for compatibility ($\beta = 0.570$, $p < 0.001$; 95% CI = 0.439 to 0.684) and fascination ($\beta = 0.126$, $p < 0.05$; 95% CI = 0.008 to 0.254). However, the simple relationship between being away and engagement and between extent and engagement were not significant ($p > 0.05$).

Thus, results support a partial mediating effect for compatibility, and a complete mediating effect of extent, on engagement through self-efficacy.

5. Discussion

The present study addresses the relationship between the perceived quality of the academic learning context and its four properties (compatibility, being away, extent, fascination), and engagement, both directly and indirectly through the mediational effect of self-efficacy. The results, as a whole, confirm the findings of previous studies that support the positive effects of restorativeness on engagement (Amicone et al. 2018; Bellini et al. 2015), and the mediational effect of self-efficacy between resources and engagement (Rošková and Faragová 2020; Xanthopoulou et al. 2009). Specifically, our findings show that compatibility and fascination have a positive association with engagement (H1). In addition, association between being away and engagement and between extent and engagement is not supported. Further, the indirect effect between restorativeness (i.e., compatibility and extent) and engagement via self-efficacy was confirmed (H2). Precisely, self-efficacy acts as partial mediator between compatibility and engagement, and as a complete mediator between extent and engagement. Contrary of our expectations, the results did not confirm the mediating effect of self-efficacy between being away and engagement and between fascination and engagement. Further, extent negatively effects self-efficacy.

Overall, our findings align with the JD-R Model (Bakker and Demerouti 2007, 2014; Mazzetti et al. 2021) and with the results of previous research that find a positive association between job resources and other resources (Salanova et al. 2006) and engagement (Mazzetti et al. 2021; Bakker and Demerouti 2007), and between restorativeness and positive outcomes (Yusli et al. 2021; Bellini et al. 2019). The results of this study underline the importance of compatibility and fascination for students in increasing energy and of compatibility in promoting belief in one's capabilities.

However, in contrast with our hypotheses, the findings reveal the absence of an association between extent and engagement, and between being away and engagement. Further, the findings show a negative relationship of extent with self-efficacy. These unexpected results might depend on the characteristics of the learning context. For example, a recent

study (Yusli et al. 2021) showed that when campus settings had not familiar environment (i.e., was not sufficiently coherence and rich to engage the mind and explore it) extent was not significantly associated with well-being. This result is consistent with Sun's and colleagues' (Sun et al. 2021) findings that showed that extent did not affect mental restoration in different campus environments. Regarding the negative effect of extent on self-efficacy, this result may be explained by the negative correlation between extent and compatibility. This negative correlation seems to highlight that the learning environment may not be "compatible" with achievement of students' goals, thus may negatively influence belief in one's capabilities to achieve them. However, given the lack of previous studies on this issue, further research should be conducted to corroborate our interpretation. Last, in regard to the absence of a relationship between being away with engagement, we may note that being away, referring to gaining some psychological distance from the learning context (Kaplan and Kaplan 1989), in some environments and circumstances may act as a form of negative distraction from the students' responsibilities and activities that do not promote internal resources (i.e., self-efficacy and engagement). Conceptually, this result aligns with previous studies that stressed that when university campus had insufficient restorative objects, they did not promote relevant mental restoration (Lau et al. 2014).

In any case, few researchers have addressed the specific problem in focus here and the importance of restoration across the four properties, thus these results suggest the need for further analysis in future studies.

The present study extends the existing literature by confirming that the restorativeness properties of the academic environment are significant resources to improve self-efficacy and engagement. Our findings offer practical implications for the learning context. Based on the present study, designers, students and teachers might adapt their environment to promote positive outcomes but also further internal resources. In particular, the results suggest an interesting new strategy to develop self-efficacy. Perceived Environment (i.e., compatibility) seem able to support belief in ability to overcome obstacles and control circumstances. In other words, the level and features of the perceived learning environment should be measured to develop a compatible and adaptable environment to engage students and increase their self-efficacy. This strategy also implies that students, designers and teachers should be made aware of the relevance of the environment and its properties to feeling capable and engaged. However, some properties of the environment should be controlled because they may become forms of distraction, such as extent and being away. Furthermore, the role of the compatibility and extent dimensions that act via self-efficacy, but also via engagement, should be considered.

Although our study showed promising results and makes important contributions, several limitations should be considered in future research. The study used a cross-sectional correlational design, which did not allow us to assume a causal relationship between variables. In addition, the results were based on self-report instruments, which are characterised by social desirability. A longitudinal study is necessary to increase the robustness of this study and corroborate our hypotheses. Further, participant samples were statistically small and heterogeneous in terms of gender, being mostly composed of women. A larger and more balanced sample would be useful to generalise our findings. Further studies, in a larger sample, should simultaneously consider the effect of the four properties of the environment on self-efficacy and engagement in a more complex statistical model. Finally, the data were collected only in Italy and all participants were Italian. Thus, studies in other countries should be realised to extend our conclusions.

It would also be interesting to explore the role of gender in the relationship between restorativeness and positive outcomes. In addition, studies could investigate the mediating role of other variables and possible moderating effects between restorativeness and engagement or outcomes. In addition, given the slight difference between positive and negative distraction that emerged in this study, a new instrument specifically designed to measure and better distinguish the properties of the work and learning environment could be developed.

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