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The Inherent Shield: Learning-Based Stress Symptoms Among People Diagnosed with Specific Learning Disability and Its Relationship with Dispositional Mindfulness

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Abstract: Background: Past research suggests that individuals with learning disabilities experience higher levels of emotional difficulties. Objective: The aim of the current study was to investigate the relationships between specific learning disabilities (SLDs) and learning-based stress symptoms (LBSSs). Further, this study examines whether dispositional mindfulness (DM) can be used as a moderating factor for these symptoms resulting from the same stressful learning experience. Methods: The sample consisted of 133 participants (73 male) aged 23–44 years (M = 34.41; SD = 9.69). In this sample, 56 reported that they have been officially diagnosed with a SLD. Participants completed an online survey comprising a demographics questionnaire, self-report SLD questionnaire, school learning-based stress symptoms, and five-facet mindfulness questionnaire (FFMQ-24). Results: Results revealed that participants with an SLD had higher levels of LBSSs compared to the general population. Furthermore, findings revealed that DM significantly predicts LBSS levels. Conclusions: The present study provides further evidence on the impact of learning experiences on stress symptoms among individuals with SLDs, and this phenomenon we have termed as "learning-based stress symptoms". Additionally, our findings introduce novel evidence that DM may influence the relationship between LBSSs and SLDs, suggesting that a high level of DM can serve as a protective factor against these learning-based stress symptoms.

Keywords: specific learning disability; post-traumatic stress disorder; dispositional mindfulness

1. Introduction

Learning disabilities and their emotional effects exist even beyond school age. Over the years, studies investigated the emotional processes encountered by people diagnosed with learning disabilities in an attempt to better understand the mental experience among this population. In the current study, we examine whether one of the most recently studied approaches, mindfulness, may be effective as a possible protective factor against stress symptoms stemming from learning experiences among adults diagnosed with specific learning disabilities. The following literature review presents the difficulties faced by people with learning disabilities and how mindfulness can help them cope.

1.1. Learning Disabilities and Emotional Aspects

The American Psychiatric Association defines specific learning disabilities (SLDs) as neurodevelopmental disorders that impair the ability to learn or use basic academic skills such as reading, writing, or arithmetic [1]. In order to be considered an SLD, academic difficulties must persist despite good teaching opportunities and not result from intellectual disability, hearing or vision impairments, poor instruction, sociocultural deprivation, or acquired conditions [2]. Studies show that apart from academic difficulties, children with learning disabilities tend to suffer from difficulties in emotional and social domains as well [3,4]. Thus, compared to the general population, this population is at a higher risk for developing significant mental pathologies [5]. These difficulties often continue and

accompany people with SLDs throughout their adult lives, as will be further discussed in the following sections.

1.2. SLDs and Emotional Implications Throughout Life

Raskind et al. found that the learning-based stress felt by participants having SLDs outweighed stress caused by other sources that had a major influence on their lives [6]. This extreme threat is prolonged, as it is often experienced on a daily basis throughout one's school years and thereafter [7]. Moreover, there is ample evidence in the research literature that people with learning disabilities present significantly more emotional difficulties than people without a learning disability [8–11]. Manifestations of these emotions appear in the form of crying, worrying, symptoms of physical distress, avoidant behavior [12], and higher levels of helplessness compared to other members of their peer group [13–15]. For example, children and adolescents diagnosed with SLDs reported lower levels of mental well-being and higher levels of anxiety and depression relative to the general population (e.g., [16–21]). People with SLDs were also found to feel a lower sense of competence, lower self-esteem, less positive mood, more negative mood, and lower levels of hope and to report a higher level of loneliness compared to their peer group [22].

Coping with a learning disability was found to be associated with high levels of psychological distress. The results of additional data (Polak and Grossman, manuscript in preparation) show that participants with a diagnosis of SLD reported significantly more psychological distress compared to participants without SLD, consistent with findings from previous studies, e.g., [23–25]. The above review of the literature indicates a clear relationship between SLDs and mental health. The relationship between scholastic difficulty and emotional difficulties is not surprising considering the primacy and superiority of school experiences in shaping the social and emotional functioning and general mental health of young people [26]. However, the impact of SLDs extends to higher education (e.g., [27]) and manifests in non-academic areas among older students, as it does among younger students [28]. The psychological and social harm associated with childhood learning disabilities can persist into later stages of life [29]. Over time, the accumulation of negative life events may lead to elevated stress levels, which in turn increases the risk of developing mental health issues [30]. Consequently, psychiatric disorders such as depression and anxiety are common among this population [31]. Moreover, schizophrenia, dementia, and personality disorder [32,33] are more common in adults diagnosed with SLDs compared to the general population [34–36]. Many times, these disorders are not detected and, therefore, not treated [37] and often lead to challenging mental function [38].

1.3. SLDs and Post-Traumatic Stress Disorder

People with SLDs are at risk of increased emotional symptoms following a traumatic experience. For example, subjects who were sexually abused and diagnosed with an SLD reported more post-traumatic stress disorder (PTSD) symptoms compared to subjects not diagnosed with an SLD [39]. Similarly, following exposure to a terror event, subjects with learning disabilities had higher PTSD scores than control group subjects [40]. With specific reference to school, previous reports uniquely address the relationship between learning and the resulting trauma. For example, concepts such as "classroom trauma" [41] and "educational trauma" [42] were mentioned. These qualitative studies presented personal stories illustrating the traumatic learning experience of those with learning disabilities. Alexander-Passe [43] examined PTSD symptoms in adult subjects with dyslexia, and some of them had depressive symptoms (N = 29). This study showed that an SLD by itself may elicit a sense of trauma and long-lasting symptoms. Participants reported that school-related stimuli, such as a school student chair, smell of school detergents, etc., triggered high levels of anxiety, feelings of inferiority, weakness, vulnerability, and a tendency to avoidance. In another study, PTSD symptoms were related to self-reporting of SLDs and ADHD symptoms; however, a sense of self-efficacy and social support could reduce this risk [44].

According to the DSM-5 [1], PTSD is typically caused by direct or indirect exposure to life-threatening events, serious injury, or sexual violence, leading to intense fear, helplessness, or horror. The ICD-11 (International Classification of Diseases, 11th Revision) allows for PTSD diagnosis following extreme, prolonged exposure to threats, characterized by symptoms in three clusters: re-experiencing, avoidance, and arousal [45]. Hyland et al. [46] found that PTSD can also develop from non-life-threatening stressors, challenging the DSM-5's emphasis on life-threatening events as a necessary criterion. For people with SLDs, the long-lasting, daily, difficult learning experience can thus match the ICD-11 exposure criteria. In addition, studies show that the three symptom clusters prevail among people with SLDs as specified below.

1.3.1. Re-Experiencing

Subjects diagnosed with dyslexia, one of the specific learning disabilities, suffer from intrusive thoughts characteristic of the first cluster of the ICD definition of PTSD. For example, intrusive concerns regarding their ability to maintain their place of work, even when the workplace is guaranteed and without danger [47]. Some may express concerns or report challenges in their learning abilities, often characterized by negative thoughts about the learning process [48–50]. In addition, many people with SLDs repeatedly recall the experience of past insecurity, even when they experience success. Previous studies have also found that parents with SLDs experience negative feelings merely by entering their children's school, evoking in them memories of themselves as students [43].

1.3.2. Avoidance

Regarding avoidance, it has been found that dyslexic adults avoid writing and reading official documents, even at the cost of losing an allowance or health care [51]. Adolescents with learning disabilities drop out of educational systems due to negative emotions towards themselves created because of educational, social, and performance gaps [52]. Other people describe avoiding attending their old school and having strong feelings towards their past teachers [43]. In another study, findings indicate that students with learning disabilities hold higher performance-avoidance orientation and are less likely to be mastery-oriented than non-LD students [53,54].

1.3.3. Physical Arousal

Finally, regarding arousal, it was found that school children [21] and university students [55] who were diagnosed with SLDs reported higher levels of anxiety than their peers without SLDs. Anxiety consists of both psychological and somatic manifestations and hyperarousal and is frequently accompanied by behavioral reactions [56,57]. When children with dyslexia were asked to read aloud, they presented alerted skin conductivity due to the experience of a threat [58]. These authors interpreted this alerted skin conductivity as a sign of threat experienced while dyslexic children struggled with reading aloud. It was suggested that dyslexic children expect the negative consequences of failure associated with this task [7].

It is thus apparent that reports of intrusive memories and thoughts, avoidance, and physical arousal are all exhibited by people with SLDs. In this regard, people with SLDs report symptoms that fulfill ICD-11 PTSD diagnostic demands. When taking these symptoms into account together with the exposure to extreme and prolonged learning-based threat experience, it is relevant to ask whether we actually find elevated levels of learning-based stress symptoms (LBSS) similar to those presented after traumatic events in people with SLDs. Indeed, recent research used the ICD-11 PTSD Symptom Survey and found stress symptoms associated with learning experiences among subjects who reported themselves as having SLDs [7]. The data indicated significantly more cases of learning-based stress symptoms with severe clinical PTSD levels among subjects with self-reported SLDs (26%) compared to the participants who did not report having SLDs (5%). The authors did note a limitation of their study that it relied on non-verified self-reporting of SLDs. In addition, it

was found that the present experience of psychological distress is related to the accumulated experiences of trauma related to learning during the different school periods (primary and secondary), so that the accumulated traumatic learning experiences were found to be positively correlated with a higher score in the reporting of learning-based PTSD symptoms. As noted, Grossman and colleagues referred to this phenomenon as learning-based PTSD; however, in the current study, we refer to these symptoms as learning-based stress symptoms (LBSSs).

1.4. Mindfulness and PTSD

The psychological construct "mindfulness" has received much attention in the past decades and has been proposed as a common factor in all schools of psychotherapy [59]. Mindfulness meditation, which emerged from traditional Buddhist meditations [60], is considered the heart of these meditations [61]. However, mindfulness is more than meditation and is fundamentally a state of mind defined in psychological terms as characterized by giving full attention to the present while giving a nonjudgmental awareness of internal or external experiences [62].

Studies indicate that the effects of mindfulness practice can be expressed in cognitive [63,64] and emotional aspects (e.g., [65,66]). Beauchemin et al. found that a 5-week mindfulness-based intervention reduced anxiety, promoted social skills, and improved academic performance among adolescents with learning disabilities [67]. Research on self-reported dispositional mindfulness (DM) and its influence on mental health gained momentum in recent years [68]. DM refers to the level of attentiveness a person has in daily activities and is considered stable over time [69]. Thus, the concept refers to innate personality, dispositional abilities that characterize mindfulness rather than those developed due to a program or practice of mindfulness meditation. Numerous studies have found that DM is associated with mental health. DM is negatively correlated with depressive symptoms [70,71], stress [72], anxiety [73], and PD [74]. A significant positive correlation was found between DM and well-being [75,76]. In contrast to a maladaptive strategy of thought suppression, DM appears to be a protective factor that buffers individuals from experiencing more severe post-traumatic stress symptoms. Negative associations were found between DM and PTSD symptoms as well [77,78]. These findings suggest an examination of DM as a moderating variable in the association between SLDs and LBSSs.

1.5. Current Research

Previous studies highlight the intensity of the stressful experiences encountered by people with SLDs. The literature review indicated that people diagnosed with SLDs are at risk of developing severe mental symptoms as a result of such experiences. We suggest that people diagnosed with SLDs report symptoms characteristic of people who develop significant distress after undergoing a life-threatening traumatic event. Such research findings may highlight the intensity of the stressful experiences encountered by people with SLDs. Additionally, the current study examines whether DM can be used as a moderating factor for these symptoms resulting from the same stressful learning experience. This led us to the following hypotheses:

H1. *Subjects with SLDs will report a higher score on LBSSs compared to subjects without SLDs, with self-reported severity particularly associated with higher LBSS levels.*

H2. *DM will be negatively correlated with LBSSs.*

H3. *An interaction effect between SLDs and DM will be found for LBSSs. Participants diagnosed with SLDs with a higher score in DM will report fewer LBSSs than participants with SLDs who score lower in DM.*

The theoretical model is shown in Figure 1.
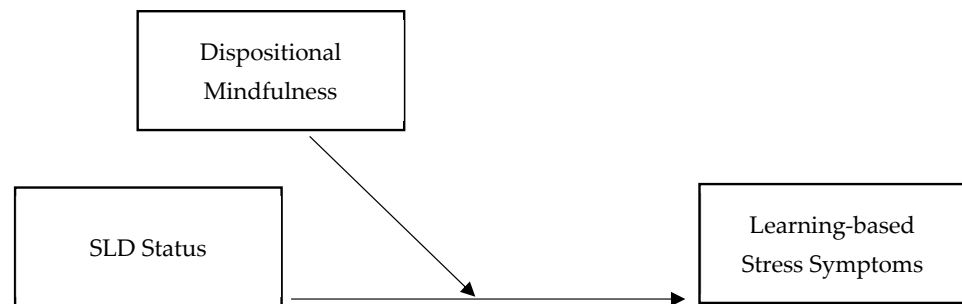
Figure 1. Research theoretical model. Note: diagram of the moderation model. independent variable = SLD status; moderator variable = dispositional mindfulness; and dependent variable = learning-based stress symptoms.

The importance of this study lies in exploring mindfulness as a potential protective factor against the mental consequences of stressful learning experiences for individuals with SLDs. Additionally, the study aims to replicate previous findings of high levels of stress symptoms among individuals with SLDs [7], and this time ensuring that diagnoses are officially validated and not based solely on self-reports. Another key objective is to examine the relationship between these stress-related consequences and DM.

2. Methods

2.1. Participants and Procedure

The study staff recruited volunteers by advertising the study in centers for students with learning disabilities in various academic institutions and by publishing the study in various student groups representing a variety of academic institutions on the social network. A sample comprising 133 adults (73 males and 60 females; aged 23–44; average age = 34.41; SD = 9.69) responded to an online questionnaire (7 participants were excluded from the analysis because they did not correctly answer embedded test items). Within this sample, 56 (41.3%) participants reported that they have been officially diagnosed with an SLD. Initially, we contacted candidates who reported having SLDs and requested that they submit a valid diagnosis. The diagnoses of 39 participants were validated through the presentation to the first author of a valid diagnosis in accordance with the criteria set by the Israeli Ministry of Education. Upon verification, each participant was assigned a serial number to ensure anonymity. Subsequently, they were directed to an online questionnaire, which included a self-reported learning disabilities assessment. The remaining 78 participants (59%) who reported that they had no SLD constituted the control group. Questionnaires began with a short statement assuring confidentiality and participants' rights not to answer all questions and/or refuse to participate at all. All methods were performed in accordance with the relevant guidelines and regulations and were approved by the Social Science Faculty Review Board at Ariel University. Respondents indicated informed consent for participating according to the review boards' approval.

2.2. Measures

Each subject completed the following four questionnaires in the following order:

(1) Dispositional mindfulness: We used the five-facet mindfulness questionnaire (FFMQ-24) [79], which is the abbreviated version of the FFMQ-39 questionnaire [80]. This questionnaire examines the extent to which the subject matches the measured mindfulness features in their personal qualities. The abbreviated questionnaire consists of 24 statements (of these items, 5 refer to "describe", 5 items refer to "nonreactivity", 5 items refer to "nonjudging", 4 items refer to "observing", and 5 items refer to "acting with awareness" facets of mindfulness). For each item, subjects were asked to indicate on a Likert scale the description that best suits their characteristics by choosing one of the 6 options ranging from 1 (almost always wrong) to 6 (almost always true). The reliability of this questionnaire was good, $\alpha = 0.89$.

(2) Self-reported SLDs: In addition to verifying a valid diagnosis, we also used self-reports for identifying the presence of learning disabilities, the severity of the disabilities, and their type (reading, writing, or arithmetic). In this questionnaire, participants read a paragraph describing what SLDs are [81]. Based on this paragraph, participants responded whether they have an SLD, are not sure they have one, or they do not have one. In addition, participants rated items indicating how much SLD symptoms disturbed them. These items were rated on a Likert scale ranging from 1 (never) to 4 (often). The items on this questionnaire corresponded to SLD types (reading, writing, and arithmetic). A higher score on this questionnaire indicates a higher severity of symptoms of each SLD type. The reliability of this aggregated variable was good, $\alpha = 0.91$. The reliability for reading, writing, and arithmetic parts were $\alpha = 0.88$, $\alpha = 0.64$, and $\alpha = 0.89$, correspondingly.

(3) School learning-based stress symptoms (LBSSs): LBSSs were assessed on ICD-11 PTSD Symptom Survey [82]. This questionnaire is based on the six symptoms of PTSD described in ICD-11 [45], so that each cluster ("re-experience", "avoidance", "arousal") was measured by two items. In this questionnaire, participants are instructed to answer the items based on what they experience while learning. Symptom severity was rated on a Likert scale ranging between 1 (not at all) and 5 (to an exceptionally large extent). The cumulative PTSD symptoms are scored by the average of the symptoms rated moderately or higher [82], so that a higher score indicates a higher level of PTSD symptoms. This adaptation of the ICD-11 PTSD Symptom Survey was previously used to measure LBSSs by Grossman, et al. [7]. The reliability of this measure was good, $\alpha = 0.88$.

(4) Questionnaire of personal details and health status: A questionnaire that includes personal details such as gender, age, details about the diagnosis of an SLD (when and by which professional), and perception of health status and sleep quality subjectively compared to others. In addition, the questionnaire included an item aimed at examining whether the subject practices or does not practice meditation regularly.

2.3. Data Analysis

Data were analyzed using the SPSS software version 27. The level of significance defined for all statistical analyses was 0.05.

An independent samples *t*-test was used to examine the differences between subjects reporting of having and of not having SLDs. Significant effects were analyzed using Bonferroni post hoc tests. In addition, a Chi-square test was used to examine differences between the groups regarding the presence of clinical PTSD (yes or no) based on learning experiences. The association between DM and LBSSs was measured by a Pearson correlation. Finally, in order to test the third hypothesis of an interaction effect between SLDs and DM on LBSSs, several statistical tests were conducted. First, a Pearson correlation was performed between the main variables. Subsequently, a hierarchical linear regression was used to examine the relative contribution of the different variables to learning-based stress symptoms. A Chi-square test was used to examine the dependence between DM and LBSSs. Finally, a two-factor variance analysis 2 × 2 (two-way ANOVA) was performed to examine the interaction effect.

3. Results

3.1. Variable Handling and Descriptive Statistics

Two "learning disability" variables were created. One according to the direct report of being diagnosed with SLDs in the demographic questionnaire and a second according to presentation of a valid diagnosis. This initially reflected a verification of the SLD self-report. To test the first research hypothesis, subjects were divided into three groups: those who did not indicate they had an SLD and did not have any record of diagnosis, those who did indicate that they had an SLD but did not have a validated record to confirm it, and those who reported they had an SLD and handed a validated record of this diagnosis. Next,

we also created two types for the variable "self-reported SLDs": first, we calculated the average responses according to responses for level of difficulties (reading, writing, and arithmetic), due to learning disabilities. Second, participants were divided into two groups depicting high and low SLD severity according to scores above and below median in this difficulty measure. Dispositional mindfulness was similarly calculated as the average of FFMQ responses. Similarly, a dichotomous variable that divided participants into a low DM score and a high DM score was determined by the median of this questionnaire. The LBSS variable was derived from the average responses to the amended ICD-11 PTSD Symptom Survey. Additionally, a clinical dichotomous LBSS variable was calculated using the algorithm for a clinical PTSD diagnosis—requiring at least one symptom from each cluster scored as moderately or higher. The clinical-PTSD variable was established using a modified ICD-11-based questionnaire, with the original 0–4 scale adjusted to 1–5. A response of moderate or higher on any of the six symptom-related questions was considered a positive indicator. To qualify for clinical-PTSD, subjects needed to score moderate or higher on at least one question in each of three pairs of symptoms, resulting in possible values for clinical-PTSD ranging from 0 to 6. Based on this, a dichotomous LBSS variable was created to classify subjects as either meeting (1) or not meeting (0) the criteria for clinical PTSD. This simplified measure distinguishes between the presence and absence of clinically significant PTSD symptoms according to ICD-11 criteria. Descriptive statistics of study variables are indicated in Table 1.

Table 1. Descriptive statistics of the main variables.

N = 133	Average	Standard Deviation	Minimum	Maximum
Self-reported SLD severity	2.14	1.03	1	4
LBSSs	2.26	1.03	1	5
DM	3.95	0.78	1.96	5.83

Note: This table presents the descriptive statistics (mean, standard deviation, minimum, maximum) for the main variables: dispositional mindfulness (DM), self-reported SLD severity, and learning-based stress symptoms (LBSSs).

3.2. SLD and Learning-Based Stress Symptoms

A significant difference between the mean score of LBSS in subjects with SLD versus subjects without SLD was confirmed by an independent samples *t*-test ($t(99) = 4.77$, $p < 0.001$). This result indicates that subjects with SLD scored higher on the LBSS questionnaire ($M = 2.74$, $SD = 1.09$) compared to those without SLD ($M = 1.91$, $SD = 0.84$). We used a one-way ANOVA to for differences in LBSS scores between subjects diagnosed with a verified SLD versus those diagnosed with a non-verified SLD versus subjects without SLD. Data analysis revealed significant differences ($F(2,38) = 11.06$, $p < 0.001$, $\eta2 = 0.19$). A multiple-comparison post hoc Bonferroni correction revealed differences between subjects with a verified SLD scored higher in LBSSs ($n = 39$, $M = 2.77$, $SD = 1.1$) compared to subjects without an SLD ($n = 79$, $M = 1.91$, $SD = 0.84$). Data also revealed that subjects with a non-verified SLD ($n = 16$, $M = 2.69$, $SD = 1.1$) also scored higher in LBSSs compared to subjects without an SLD ($n = 79$, $M = 1.91$, $SD = 0.84$). However, no significant difference was found between the scores of subjects with a verified SLD and subjects with a non-verified SLD. These results confirm both our first hypothesis that the level of LBSS scores would be higher among subjects with SLDs and the validity of the self-report of having SLDs. Based on these results, we combined the two self-report SLD groups (verified diagnosis and non-verified diagnosis) into one group (the SLD group).

Additionally, a Chi-square test was used to assess whether there is a significant difference in the proportion of individuals with and without SLDs who meet the clinical criteria for PTSD symptoms related to learning experiences, as shown in Table 2.

Table 2. SLD status. * Clinical PTSD threshold crosstabulation among SLD and non-SLD statuses.

SLD Status		Clinical PTSD		
		No	**Yes**	X^2(**df**)
SLD	Count	32	24	13.13 (1) *
	%	57.10%	42.90%	
Non-SLD	Count	66	11	
	%	85.80%	14.20%	
Total	Count	98	35	
	%	73.70%	26.30%	

Note. * $p < 0.001$. This table displays the distribution of participants who meet or do not meet the clinical PTSD threshold (based on learning experiences), categorized by their SLD status (SLD vs. non-SLD).

The relation between these variables was significant (X^2(1, N = 133) = 13.13, $p < 0.001$). These results further substantiate the evidence, demonstrating that individuals with SLDs report significantly higher levels of learning-based clinical PTSD (42.9%) compared to those without SLDs (14.2%).

3.3. Correlations Between SLD Status, Self-Reported SLD Severity, Dispositional Mindfulness, and Learning-Based Stress Symptoms

Pearson correlations were calculated to study the relationship between the main variables in order to test the research hypotheses regarding these relationships. Correlations between the variables in the study are indicated in Table 3.

Table 3. Pearson correlation coefficients among SLD status, self-reported SLD severity, learning-based stress symptoms (LBSSs), and dispositional mindfulness (DM).

N = 133	SLD Status	Self-Reported SLDs	LBSSs	DM
SLD Status	1	0.62 **	0.42 **	−0.39 **
Self-reported SLDs		1	0.67 **	−0.60 **
LBSSs			1	−0.67 **
DM				1

** Correlation is significant at the 0.01 level (two-tailed). Coefficients between SLD status, self-reported SLD severity, learning-based stress symptoms, and dispositional mindfulness.

Pearson correlations for the study variables indicated that self-reported SLD severity is positively associated with LBSSs. As predicted, a negative correlation was observed between DM and LBSSs. Thus, as DM score increases, LBSSs decrease, and vice versa. Additionally, negative correlation was found between DM and self-reported SLD severity. These results confirm our second hypothesis of a negative relationship between DM and LBSSs.

3.4. SLD Status, Self-Reported SLD Severity, Dispositional Mindfulness, and Learning-Based Stress Symptoms

Table 4 shows the three steps of the hierarchical regression model. In this model, the criterion-dependent measure was LBSS. We conducted hierarchical regression models in which the background variables were added in the first step, self-reported SLD severity added in the second step, and DM added in the third step.

Table 4. Summary of hierarchical linear regression analysis.

		Model Summary			
Model	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**F Change**	**Sig. F Change**
1	0.18	0.16	0.283	9.74	$p < 0.001$
2	0.45	0.43	0.468	60.35	$p < 0.001$
3	0.56	0.54	0.559	32.14	$p < 0.001$

Note: This table summarizes the steps in the hierarchical linear regression analysis predicting learning-based stress symptoms (LBSSs). In model 1, gender, age, and SLD status were entered. In model 2, these background variables were included along with self-reported SLD severity. Model 3 added dispositional mindfulness (DM) to the model.

We obtained that the contribution of the background variables—gender, age and SLD status—is significant ($F(3,128) = 8.75$, $p < 0.001$), so that these variables significantly explain 18.6% of the variance in the LBSS variable. In the second step, which included the background variables, SLD status and self-reported SLD severity, the model clearly explains 44.8% of LBSS variance ($F(4,127) = 25.80$, $p < 0.001$). These results indicate that as the subjective self-reported SLD severity increases so do LBSS scores. In the third and final step, which included the background variables, SLD status, self-reported SLD severity and DM, the model explains 56% of the variance in the LBSS variable ($F(5,126) = 32.15$, $p < 0.001$). This means that, when controlling for background variables, SLD status and self-reported SLD severity, DM significantly increases the accounting of variance in LBSS.

According to these results, the most significant predictors of LBSSs are self-reported SLD severity ($\beta = 0.611$, $t = 8.002$, $p < 0.001$) and DM ($\beta = -0.320$, $t = -5.674$, $p < 0.001$), and SLD status has also been found to be a significant predictor of LBSSs ($\beta = -0.385$, $t = -3.711$, $p < 0.001$) as indicated in Tables 4 and 5.

Table 5. Coefficient of hierarchical linear regression analysis.

Variable	Standardized Beta Coefficient	p
Step 1		
$\Delta R^2 = 0.091$; $p < 0.001$		
Gender	0.093	n.s
Age	−0.094	n.s
SLD status	0.362	<0.001
Step 2		
$\Delta R^2 = 0.199$; $p < 0.001$		
Sex	0.036	n.s
Age	−0.059	n.s
SLD status	−0.023	n.s
Self-reported SLDs	0.657	<0.001
Step 3		
$\Delta R^2 = 0.024$; $p < 0.001$		
Sex	−0.008	n.s
Age	0.008	n.s
SLD status	−0.008	n.s
Self-reported SLDs	0.415	<0.001
DM	−0.431	<0.001

Note: Dependent variable: learning-based stress symptoms (LBSSs). Predictor variables: gender, age, SLD status, self-reported SLD severity, and dispositional mindfulness (DM).

Next, and acting as another validation of our results, a Chi-square test of independence was performed to examine the relation between DM and the dichotomous LBSS variable. The relation between these variables was significant ($X^2(1, N = 91) = 38.0$, $p < 0.001$). These results further indicate that high DM scores are associated with low LBSS scores. In addition, these results become even clearer when separating those with an SLD diagnosis from those who were undiagnosed, as indicated in Table 6.
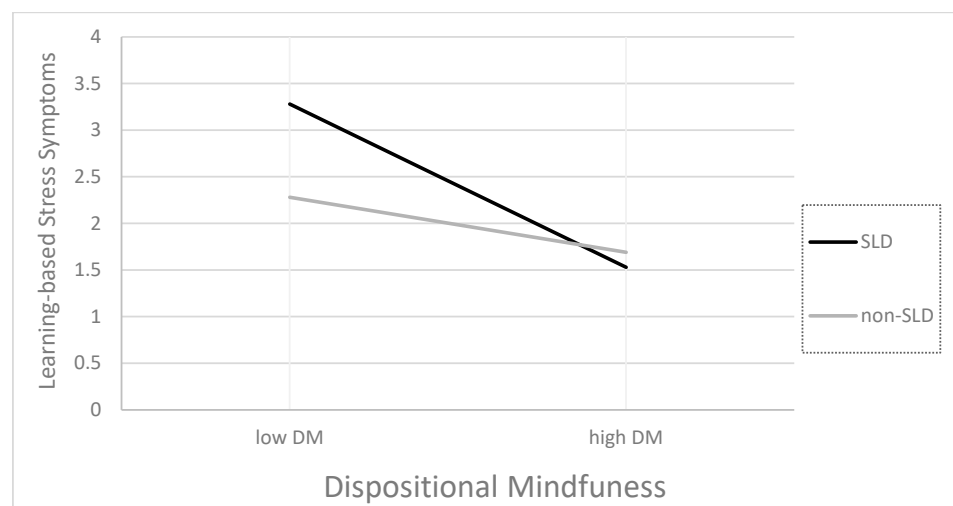
Table 6. Dispositional mindfulness (DM). * Learning-based stress symptoms (LBSSs) crosstabulation among SLD and non-SLD statuses.

			LBSS		
			Low	**High**	
SLD Status			%	%	X^2**(df)**
SLD	Mindfulness	Low	21.10%	78.90%	28.4 (1) *
		High	87.50%	12.50%	
	Total		46.40%	53.60%	
Non-SLD	Mindfulness	Low	72.40%	27.60%	
		High	91.70%	8.30%	
	Total		84.40%	15.60%	
Total	Mindfulness	Low	44.10%	55.90%	
		High	93.80%	6.20%	
	Total		68.40%	31.60%	

Note: * $p < 0.001$ This table presents the distribution of participants across different levels of dispositional mindfulness (DM) and learning-based stress symptoms (LBSSs) within the specific learning disability (SLD) and non-SLD groups.

According to Table 6, among individuals with an SLD diagnosis, 14 out of 16 (87.5%) who have a high DM score also have a low LBSS score. Conversely, 2 out of 16 (12.5%) with a high DM score have a high LBSS score. In contrast, among those with a low DM score, only 8 out of 38 (21.1%) have a low LBSS score, while 30 out of 38 (78.9%) have a high LBSS score (χ^2 (1, $N = 38$) = 28.4, $p < 0.001$).

Finally, a two-way ANOVA was performed to analyze the effect of SLDs and DM on LBSSs. According to the main hypothesis, data revealed a significant interaction between the effects of SLDs and DM ($F(1,129) = 9.62$, $p < 0.001$, $\eta^2 = 0.11$). Simple main analysis effects showed that SLDs did have a statistically significant effect on LBSSs ($p = 0.005$). Likewise, simple main analysis effects showed that DM did have a statistically significant effect on LBSSs ($p < 0.001$). The interaction effect is illustrated in Figure 2.

Figure 2. The interaction effect between specific learning disabilities (SLDs) and dispositional mindfulness (DM) on learning-based stress symptoms (LBSS). Note: This figure displays the interaction effect between specific learning disability (SLD) status and dispositional mindfulness (DM) on learning-based stress symptoms (LBSSs). The x-axis represents dispositional mindfulness (low to high), and the y-axis shows learning-based stress symptoms. Lines indicate the SLD status (SLD vs. non-SLD).

The results supported the main hypothesis, revealing a significant interaction between the SLD status and DM. The data showed that individuals with an SLD and low DM scores reported higher levels of LBSSs compared to those without an SLD but with similarly low

DM scores. Conversely, among individuals with high DM scores, the difference in LBSS between those with and without an SLD was less pronounced. These findings indicate that DM moderates the relationship between the SLD status and LBSSs, confirming our hypothesis that the interaction between SLDs and DM significantly impacts the severity of LBSSs.

4. Discussion

The current study sought to examine the association between SLDs and LBSSs; the association between DM and LBSSs; and the interaction effect between SLDs and DM on LBSSs. Consistent with our first hypothesis, the SLD status (SLD/non-SLD) was significantly related to LBSSs. Individuals with SLDs report more LBSSs than individuals without SLDs. This result was consistent with research by Grossman and colleagues [7], who found subjects with self-rated SLDs to be characterized by higher levels of LBSSs. Additionally, our analysis revealed that a greater self-reported SLD severity results in higher LBSS scores. Supporting our second hypothesis, the findings revealed that DM is significantly associated with LBSS levels. Furthermore, we showed for the first time that DM plays a critical role in reducing long-term stress due to learning experiences of people with SLDs. This result is consistent with our third and main hypothesis.

4.1. SLD Status, Self-Reported SLD Severity, and LBSSs

Limited studies directly address the long-term outcomes of traumatic learning experiences, focusing primarily on individuals with dyslexia. The findings of this study and previous relevant studies suggest that those with SLDs may have had learning experiences so adverse that their reactions evoke symptoms similar to those observed in PTSD [7]. McCarthy [83] highlights that the risk of developing PTSD is influenced by factors such as prolonged exposure to trauma and early childhood distress, suggesting that chronic and complex PTSD can result from sustained and early trauma exposure. Among those with SLD, similar prolonged and repetitive exposure to adverse events over the years significantly contributes to the development of PTSD symptoms. Scott [84] and Alexander-Passe [51,85] report that many individuals with reading difficulties suffer from PTSD symptoms as a result of negative learning experiences. Alexander-Passe's studies suggest that these symptoms stem from factors related to interpersonal relationships, such as exclusion from peer groups, severe reactions from teachers or parents, and school bullying. He notes that individuals with SLDs may internalize feelings of abnormality, stupidity, and laziness [84,86,87]. He also posits that long-term trauma related to school experiences, including teacher abuse and peer bullying, generates fear, leading to lifelong post-traumatic symptoms [43]. This persistent trauma, characterized by continuous failure and a lack of adapted teaching methods, can result in adults with reading difficulties experiencing learning helplessness, depression, guilt, and even self-harm [83]. Grossman et al. found that the earlier the traumatic learning experience begins, the more severe the symptoms associated with learning-based PTSD. These findings illustrate the connection between school learning periods and contemporary psychological distress [7]. In line with previous findings, the current study indicates that individuals with SLDs report higher PTSD-like symptoms from their learning experiences compared to the general population. Therefore, the current study reinforces the hypothesis regarding the association between SLDs and LBSSs. It provides additional support for the ongoing research in the field and represents another milestone in establishing the concept called "learning-based stress symptoms".

In the pedagogical context, books such *as Teaching Students with Special Needs in Inclusive Settings* by Smith [88] and *The Inclusive Classroom: Strategies for Effective Differentiated Instruction* by Mastropieri and Scruggs (2018) [89] outline the diverse educational needs and ongoing emotional challenges that individuals with SLDs encounter. These resources emphasize the impact of SLDs across different life stages, highlighting how learning difficulties, if not adequately addressed, may contribute to persistent academic and emotional stress. Furthermore, Dell et al.'s assistive technology in the classroom [90] highlights the critical role of tailored interventions and assistive technologies in supporting individuals with SLDs. This aligns with

our study's focus on LBSSs and their lasting impact as another aspect of emotional challenge encountered by individuals with SLDs. Thus, our findings stand within a broader framework of pedagogical research on learning challenges. These insights highlight the importance of sustained support that continues beyond the school environment.

In the regression analysis, the significance of the SLD status (SLD/non-SLD) classification diminishes once the level of subjective difficulty (self-report SLD severity) is introduced in the next step. This indicates that the trauma is not directly caused by the disability itself but by the subjective difficulties associated with it. Furthermore, when individuals report having a disability, they are often conveying their experience of these underlying difficulties.

4.2. LBSSs and Dispositional Mindfulness

The second research hypothesis focused on the innovative idea of an effect of dispositional mindfulness (DM) on LBSSs. We hypothesized that subjects with higher DM would report fewer LBSSs. An analysis of the data revealed a strong and negative association between DM and LBSSs, thereby confirming the second research hypothesis. These results are consistent with previous cross-sectional studies which found that higher levels of mindfulness are associated with lower levels of post-traumatic stress symptoms [77,91,92], better adaptation after exposure to trauma [93] and fewer symptoms of PTSD, physiological symptoms, depression, and post-exposure alcohol use [76]. Similar associations between mindfulness levels and severity of PTSD symptoms have been reported in patients with PTSD [94–98]. Given these results, it seems that higher levels of DM also contribute to the reduction in PTSD symptoms generated from a stressful learning experience.

4.3. SLD Status, LBSSs, and Dispositional Mindfulness

The third and main hypothesis of this study predicted an interaction effect between SLDs and DM on LBSSs. Following the positive findings, the question arises as to how does mindfulness as an internal inherent ability (rather than as an ability acquired through meditation practice or other mindfulness-based program) specifically help those with SLDs cope with the trauma of learning? Previous studies illustrate the positive effects of DM on trauma, in general, and on PTSD, in particular (e.g., [76,99]). For example, the study by Garland and Roberts-Lewis [77] illustrates the relationship between dispositional mindfulness (DM) and cognitive suppression as a coping strategy. They found that post-traumatic experiences are linked to increased cognitive suppression, while higher levels of DM are associated with reduced cognitive suppression. Therefore, DM appears to be an effective protective factor against more severe post-traumatic symptoms. In another study of 151 adults recruited immediately after the 2010 Carmel Forest fire, it was found that subjects with higher levels of DM reported fewer PTSD symptoms [98]. Similarly, the authors explain that DM reduces cognitive suppression, thereby reducing anxiety and mental rumination after exposure to trauma. In addition, this study addresses the concepts of cognitive fusion and cognitive defusion. Cognitive fusion refers to the uncritical acceptance of thoughts as absolute truths, leading to behavior dictated by those thoughts. In contrast, cognitive defusion involves creating distance from these thoughts, allowing individuals to observe them without being controlled by them. High levels of DM have been found to reduce cognitive fusion and thereby decrease negative emotions, such as depression and post-traumatic stress after trauma. The authors argue that higher DM creates "self-distance" and reduced identification with various internal states, such as negative thoughts—as reflected by the lowering in cognitive fusion. This ability contributes to its transformation into cognitive defusion, which draws attention to emotions and sensations, helps to identify the negatives among them, and to create separation and non-assimilation within them.

Mindfulness mechanisms, as proposed by Hölzel et al. [100], focus on attentional control, body awareness, emotion regulation (via reappraisal and exposure), and a shift in self-perspective, all of which are beneficial in emotional processing. Cebolla et al. [101] further

emphasize attentional control as a key component in maintaining present moment awareness, which supports emotional regulation strategies by reducing mind wandering—a benefit seen even in non-meditators [102,103]. For individuals with learning disabilities, these mechanisms can be particularly valuable in processing academic challenges. Attentional control, for instance, may prevent cognitive drifting, allowing individuals to frame academic difficulties as context-bound rather than defining traits, while emotion regulation and perspective shifts can facilitate a more constructive emotional response to learning challenges. This integration of mindfulness techniques could thus foster resilience, aiding in the emotional management of academic stressors.

In summary, the reduction in the suppression of thoughts helps to give space to negative emotions and thoughts instead of fighting them, and by doing so, a "rebound effect" that ironically increases negative thoughts is avoided [104]. The maladaptive strategy of thought suppression appears to be linked with adverse psychological consequences of traumatic life events. In contrast, DM appears to be a protective shield that buffers individuals from experiencing more severe PTSD [77], even in non-meditator participants. The use of mindfulness can help regulate emotions and acceptance, thereby reducing suffering [105], such as stress symptoms stemming from traumatic learning experiences.

Given that learning challenges often begin early in a child's life, addressing them from the outset is crucial. Mindfulness helps children with learning disabilities by enabling them to focus on the present moment, reducing their attention given to past failures or future anxieties. Since many psychological problems stem from dwelling on the past or worrying about the future, mindfulness offers a way to break this cycle [106]. By teaching children to observe their emotions and physical sensations without judgment, mindfulness helps them accept and manage the stress and psychological challenges related to their learning difficulties. This acceptance can reduce the stress symptoms they might otherwise carry into adulthood. In their systematic literature review, Monsillion et al. [107] discuss the positive impact of mindfulness on emotional regulation, self-awareness, and attention control—skills often impaired in individuals with SLDs, particularly in educational settings. Therefore, it is not surprising that subjects with SLDs with high DM scores reported fewer LBSSs, even when compared to the general population. These findings could explain the relationship between DM, SLDs, and LBSSs as found in the current study.

4.4. Implications

The discovery of significant stress symptoms among adults with SLDs, stemming from their stressful learning experiences, underscores the long-term psychological impact of such experiences and the necessity for early intervention and continuous support. Based on these findings, several relevant applications can be proposed to address the stress symptoms experienced by individuals with SLDs. Educational institutions and mental health professionals can integrate mindfulness-based interventions into their support programs for students with SLDs. These interventions may include mindfulness training sessions, workshops, or incorporating mindfulness practices into the classroom environment. By fostering DM, these programs can help reduce LBSSs, ultimately improving academic performance and overall well-being.

Additionally, training educators and caregivers in mindfulness techniques can enhance their ability to support students effectively, creating a more supportive and stress-reducing learning environment. These applications underscore the importance of addressing the emotional and psychological needs of students with SLDs to promote their academic and personal success, while also preventing the persistence of stress and anxiety into adulthood, thereby improving their overall mental health.

4.5. Limitations and Future Research

Despite the promising results, it should be noted that the results may be affected by how the data are collected. Van Dam and colleagues [108] noted that many factors can cause bias in the self-report DM, as has been repeatedly observed in the psychological

literature. The research evidence, especially the one related to mindfulness questionnaires, attests to the important role of biases in self-reporting. Similar to Baer and colleagues [80], van Dam and colleagues also found a significant difference in the reporting of mindfulness meditation practitioners compared to those who are not [109]. According to their research, meditation practitioners are more likely to support items that offer mindfulness or absent-mindedness, while subjects who are not meditation practitioners are more likely to reject the mental disconnection items than to support items that imply attentiveness. Van Dam and colleagues' work indicates that different subjects may obtain similar scores on the mindfulness questionnaires, but the meaning of the score is completely different. Therefore, there may also be biases in the attribute mindfulness indices resulting from both self-reporting and the difference between the population of subjects who practice meditation regularly and those who do not practice meditation. In future studies, this limitation must be considered. In addition, other life events of the participants were not controlled for. It is possible that the reported stress symptoms originated from another trauma. Finally, there is a relatively wide age range among the participants—ranging from the ages of 24 to 44. The broad age range of participants (23–44 years) was intentionally chosen to illustrate the long-term impact of learning-based stress symptoms (LBSSs) beyond the immediate school years, extending into adult contexts, including academic and professional environments. While we recognize that this variability in age could influence our findings—particularly due to the distinct challenges associated with different life stages, such as the transitional experiences of emerging adulthood (ages 18–29) [110]—we did not specifically test these effects across various developmental phases. Acknowledging this limitation is important, as it may affect the interpretation of our results and the generalizability of our conclusions regarding the relationship between SLDs and LBSSs. A study focusing on school-aged adolescents may shed more light on this issue.

Follow-up studies on LBSSs among people with SLDs should explore more deeply the risk factors (abuse, fear of failing/disappointing, difficulty in strategy and emotion regulation, etc.) from which LBSSs emerge, so that an early response can be provided, even during the school period. In addition, future research will try to examine whether it is possible to replicate the promising effect of mindfulness on LBSS, but instead of relying on self-reporting measurement, a mindfulness-based intervention should be operated that will lead to the cultivation of mindfulness traits in subjects who report LBSSs and the impact of the intervention should be examined afterwards. The study of risk/protection factors—such as mindfulness—is extraordinarily important because it will be able to identify applied objectives in order to produce early intervention strategies (or prevent manner risk factors), in order to promote recovery and reduce the risk of psychopathology after exposure to potentially traumatic events [111,112], such as an extremely stressful learning experience among people with SLDs.

5. Conclusions

In conclusion, this study found further evidence of the impact of the learning experience on stress symptoms following this experience among people with SLDs, as we named this phenomenon "learning-based stress symptoms". Furthermore, this study's results provide novel evidence indicating that DM may play a role in the relationship between LBSSs and SLDs, so a high level of DM can protect from these learning-based stress symptoms.

accordance with the relevant guidelines and regulations and were approved by the Social Science Faculty Review Board at Ariel University.

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