Psychological availability, mindfulness, and cognitive load in college students with and without learning disabilities

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Abstract: The goal of this study was to test whether psychological availability and mindfulness are associated with cognitive overload in two student populations with and without learning disabilities. This study tested hypotheses regarding the differences between the two study populations and the degree of association between the study variables. 60 students with learning disabilities and 60 students without learning disabilities were tested using three instruments: a psychological availability questionnaire, a mindfulness questionnaire, and a self-efficacy questionnaire. The findings show that the learning-disabled population performed consistently worse on psychological availability and mindfulness and on cognitive load compared with the normally-developed population. In addition, the study variables were strongly associated in the students without learning disabilities but not in the students with learning disabilities. These findings can be applied in the development of teacher training programs that focus on effective methods for increasing psychological availability, improving attention and mindfulness, so that cognitive load in students with learning disabilities can be reduced.

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PUBLIC INTEREST STATEMENT

We know that psychological availability and mindfulness are conducive to learning, and that cognitive overload interferes with it. The goal of this study was to test whether the two study variables, psychological availability and mindfulness, are associated with the third variable, cognitive overload, in two student populations—with and without learning disabilities.

The findings showed that learning-disabled students performed consistently worse on all three variables compared with the normally-developed population. In addition, the study variables were strongly associated in the students without learning disabilities but not in the students with learning disabilities. These findings can be applied in the development of teacher training programs that focus on effective methods for increasing psychological availability and improving attention and mindfulness, so that cognitive load is reduced. In other words, using teaching methods that help students with learning disabilities to be more psychologically available and mindful could help them reduce cognitive overload and learn better.
Subjects: Study of Higher Education; Teaching & Learning; Educational Psychology

Keywords: Psychological availability; mindfulness; cognitive load; learning disability

1. Introduction

The accelerated rate of technological development in recent years could have been expected to produce an improvement in learning quality, because roles and tasks that previously required much time and energy now take up far fewer resources. Somewhat surprisingly, the new developments have not reduced the number of tasks a learner must complete, but rather the reverse is true. Technology has been added to the list of stressors in modern daily life, and learners in particular are subject to a sense of overload. People seem to expect and also want to accomplish more in the time they have, and many learners find themselves in stressful or overload situations as the multiplicity of tasks generates confusion, which affects their emotional state and cognitive functions.

Mindfulness, which is based on the related notion of psychological availability, is one of the factors affecting cognitive load in learning. Mindfulness is a state of awareness of both context and content of information. A learner who is mindful is able to attend to present experiences uncritically and in this state will be able to perform more effectively under conditions of cognitive load. Psychological availability is a psychological-emotional state which affects the individual's cognitive availability to learn.

The goal of this study was to test whether psychological availability and mindfulness are associated with cognitive overload in students with and without learning disabilities. Understanding these associations can help teachers design more effective lesson plans. In addition, it may be possible to better identify pitfalls in the education system and propose intervention programs for students with learning disabilities experiencing academic difficulties.

1.1. Psychological availability

Psychological availability is a term borrowed from workplace relations and was defined by Kahn (Kahn, 1990) as a psychological-emotional state which affects the individual's ability to be cognitively available to work. Psychological availability draws on physiological, emotional, and cognitive resources which people need to be able to perform their tasks, e.g., people who are not psychologically available are troubled by distractions which leave them insufficient resources to meet their obligations at work (Kashi-Rosenbaum, 2011). Later, the term was expanded to apply more generally in the social-emotional area. In this context, Kahn (Kahn, 1992) defined psychological availability as an individual's sense of having the physical, emotional, and cognitive resources they need to express themselves, engage, and connect with an existing social system.

According to Bergman and Gardiner (Bergman & Gardiner, 2007), being psychologically available means being accessible in time and place and responsive to needs of others (i.e., the demands of an employer, or family needs). Bergman and Gardiner also distinguished between psychological availability and flexibility. They argue that while flexibility reflects the degree to which an employee is able to embrace internal or external changes in the organization and change with them, availability does not necessarily involve change.

Kahn (1990) proposes three conditions of being engaged in the workplace: meaningfulness, safety, and availability (discussed above). Together, these three conditions shape the way in which an individual will perform at work. For example, given a certain organizational situation, an employee may ask herself (often subconsciously) about the psychological conditions in the specific situation “How available am I to complete this task?” (Kahn, 1992). Psychological availability also plays a role in personal engagement with the present environment, and both affect an employee's level of energy and motivation to invest significant long-term effort at work (Kahn, 1990). Further
emphasize on the importance of psychological availability is evident from Bergman and Gardiner (2007) who state that employee energy will only develop if the person is in a psychological state that is open and available to their workplace.

1.1.1. Conditions affecting psychological availability
As noted above, a person can only be psychologically available when he or she believes they have the physical, emotional, and cognitive resources that the situation requires (Kahn, 1992). Accordingly, there are three main factors that affect psychological availability (Kahn, 1990): physical, cognitive, and emotional resources.

1.1.1.1. Physical resources. People differ from each other in their ability to meet the physical demands of different situations, depending on their physical strength, stamina, and flexibility. An individual’s psychological availability is also affected by level of physical energy—when a person is physically comfortable, it is easier to be available and engaged, whereas a person who feels empty and lethargic will often feel disconnected from surrounding events (Misra & Stokols, 2011).

1.1.1.2. Cognitive resources. Certain situations require high cognitive performance such as that required to manage knowledge. This is typical of learning environments where people find themselves overwhelmed by the quantity of information that must be processed and by their uncertainty and inability to think clearly. This state, known as role overload, will strain a person’s cognitive resources. A neurophenomenological (perceptual neuroscience) study found a link between states of awareness and level of performance while completing a task—participants who were focused showed a high level of brain activity that was steady and uniform, and performed their assigned task meticulously (Kashi-Rosenbaum, 2011).

1.1.1.3. Emotional resources. When performing tasks, people need emotional resources to achieve a high level of psychological availability and complete the task as required. Several factors may reduce or increase these resources: frequency of the emotional exposure, level of diversity, and emotional intensity (Kahn, 1990). Ekman (2007) has noted that any situation or stimulus to which we are exposed evokes some emotion in us and invariably stirs up memories associated with previous experiences. Negative experiences evoke negative feelings which inevitably impair the ability to rationalize and control awareness. A positive emotional state reflects the absence of any problem requiring attention, and allows the person to be emotionally and mentally available and attentive.

1.2. Mindfulness
Mindfulness is a state of awareness of both the information’s context and its content. It is also a state of openness to new things, in which the individual actively constructs categories and distinctions (Langer, 1992). Mindfulness means the ability to notice and reflect on one’s own thoughts. Mindful people are able to maintain sufficient detachment from their own thoughts to be able to present them objectively. This aspect of mindfulness is what makes it a meta-cognitive skill (Kabat-Zinn, 2003). Conversely, the mindless state relies extensively on context-dependent categories and distinctions made in the past, so a mindless individual will not be aware of all the aspects of a present situation. Mindlessness can be compared to the more familiar terms habit, functional fixedness, overlearning, and automatic (vs controlled) processing. As with mindlessness, these concepts describe rigid behavior that takes place with little or no awareness (Langer, 1992).

It is important to distinguish between mindfulness and awareness. Awareness remains in the background as a type of radar of consciousness, constantly monitoring the internal and external environments. This means that a person may for example, remain aware of surrounding stimuli without focusing attention on them. Mindfulness on the other hand is a process of actively focusing attention in order to achieve a high degree of sensitivity to the specific experience (K. W. Brown & Ryan, 2003). In practice, awareness and mindfulness are intertwined and the
individual will use both all the time. For example, a background noise like a kettle whistling, may at some point draw a reader’s attention when it is loud enough (particularly if the reader is expecting the noise, for instance, if she wants some tea).

In recent years, self-reported mindfulness questionnaires have been published in the literature. The development of these questionnaires is a significant advance in the study of mindfulness, as they provide opportunities for empirical study of mindfulness and its links with other psychological constructs. As with any self-reporting questionnaire which requires the authors to conceptualize the construct they are attempting to measure, any mindfulness questionnaire is an attempt to measure mindfulness using self-reported items about the nature of mindfulness. An empirical examination of such questionnaires can provide important information about the way mindfulness should be defined and described (Baer et al., 2006). The design of mindfulness questionnaires has inspired questions such as: Should mindfulness be described as a multifaceted construct, and if so, how should its facets be described? Most current descriptions of mindfulness are multidimensional, as in DBT (Segal et al., 2012), which describes six categories: three associated with asking what do individuals do who are aware (observe, describe, and participate) and three associated with asking how do individuals act when they become aware (nonjudgmental, one-mindful, and effective) (Baer et al., 2006).

1.2.1. How mindfulness affects learning
Mindfulness assists learning on a number of levels. First, it can turn learning into an active and productive process that engages the learner’s mental effort, and volitional and meta-cognitive non-automated processes. This is fundamentally what forms effective academic learning (Bochun, 2011; Salomon & Globerson, 1987). Second, mindfulness helps reduce the gap between potential learning capacity and exploiting that capacity. We see that learners tend to utilize only a small part of their learning capacity. This gap has been empirically measured and is defined as the zone of proximal development. Mindfulness improves the individual’s ability to express their learning capacity and improves their learning performance (Salomon & Globerson, 1987). Mindfulness also promotes learning because it makes the learner receptive to knowledge and new experiences. A person who is open to new information will naturally be a more effective learner (K. W. Brown & Ryan, 2003).

Mindfulness has also been studied in education. The literature shows studies of the association between mindfulness and intelligence (J. Brown & Langer, 1991), mindfulness and awareness (Germer, 2004), mindfulness and metacognition (Wells, 2002), and others. Mindfulness training is a recently developed field, in which mindfulness is taught and practiced with an emphasis on improving attention and concentration abilities. Early evidence has shown that mindfulness training can improve concentration and ability to focus attention on specific stimuli and develop the positive aspects of being open to experience. Mindfulness training also generates a state of consciousness that is stably attentive to “here and now” stimuli, and undistracted by associative thinking about past or future.

The effect of mindfulness on learning is also exploited in educational settings. For example, teachers have described attempts to teach and develop mindfulness in their students. Practicing mindfulness in class often involves paying attention to breathing and experiential learning opportunities which allow students to consciously use their senses and their thinking (Bochun, 2011). A recently published paper found that practicing mindfulness improved awareness of the present and reduced inattention and hyperactivity in college students with learning disabilities (Gabriely et al., 2020). Another recent study found that practicing mindfulness significantly reduced self-pity and improved self-efficacy in college students. The researchers in that study concluded that practicing mindfulness in a learning setting may increase students’ well-being (Taylor et al., 2020).
1.3. Cognitive load and cognitive load theory

Cognitive load is a state in which a learning task requires too many cognitive and working memory resources (Redifer et al., 2019). Cognitive load theory (CLT) describes the state induced in learners who are given complex cognitive learning assignments and who are overloaded by multiple elements of information and their interactions which must all be processed simultaneously (Leppink et al., 2014). CLT describes three types of cognitive overload: intrinsic, extraneous, and germane. Intrinsic cognitive overload is induced when several elements must be processed by working memory concurrently to build a schema (i.e., degree of interactivity of the information elements). The interactivity of an element depends on the complexity of the material being learned and the learner’s expertise (Gerjets & Scheiter, 2003; Leppink et al., 2014).

Extraneous cognitive load is also known as ineffective cognitive load. It is due to teaching methods which require the learner to engage in memory activity that is not directly related to constructing a schema and is not automated (Leppink et al., 2014; Sweller, 1994). Moreover, intrinsic cognitive load resulting from informational element interactivity and from extraneous cognitive load due to teaching method design may ultimately deplete the cognitive resources available in working memory for building schemas and automaticity (Sweller, 1994).

Germane cognitive load is the result of useful cognitive processes (i.e. Abstraction and expansion of information) that are promoted by a directed cognitive effort (Gerjets & Scheiter, 2003; Leppink et al., 2014). When cognitive load takes up fewer working memory resources, the learner can spare more mental effort to processes that are not directly related to learning (i.e. building schemas). Although such processes may actually increase cognitive load, as it is germane it contributes to the learning process rather than hampering it (Artino, 2008; Sweller et al., 1998).

The literature describes additional types of cognitive load: Load generated during thinking processes: CLT assumes a cognitive architecture composed of a limited working memory and independent processing units for verbal, visual, spatial, and auditory information which interact with a relatively unlimited long-term memory (Paas et al., 2003). Schemas are constructed in working memory but are stored in long-term memory. Consequently, when learning new material, a person must be an active participant and activate appropriate portions of information in working memory before that information can be stored in long-term memory (Sweller et al., 1998). The ease with which information can be processed in working memory is cardinaly important and has an effect on cognitive load.

Working memory is actively linked to cognitive load. According to Sweller et al. (Sweller et al., 1998), a person is only aware of information that is held and is being processed in working memory, but not of the large volume of information stored in long-term memory. Also, when faced with new information, working memory has very limited capacity, and has limited ability to cope with new information. For example, new information processed by working memory is erased within 15–30 seconds unless the person makes an effort to memorize it. Also, when information must be processed as well as stored, a person will only be able to manage two or three items of information at a time, depending on the type of processing that is required (Artino, 2008).

Long-term memory is also linked to cognitive load. But unlike working memory, long-term memory has a practically unlimited ability to effectively address familiar material that was stored there before and it is also able to store multiple schemas that have varying degrees of automation (Chandler & Sweller, 1991).

Information that is stored in long-term memory is organized in specific knowledge structures known as schemas (Artino, 2008). Schema elements are arranged by method of use which makes it easier to access the schema later when a person is required to perform tasks associated with these elements (Sweller et al., 1998). This means that from the point of view of CLT, human expertise derives from knowledge stored in these schemas and not from the ability to engage in thinking about many elements that are not organized in long-term memory (Van Dyne et al., 2002).
Cognitive load due to information overload: The rapid inflation in information and how it is applied in the age of multichannel communication is posing a challenge to humanity. People experience information overload when the information input is greater than their processing capacity. As a result of this overload they will have difficulty processing the information effectively without distraction. Under such conditions, people make more mistakes, and the information they are able to elicit is relatively limited (Edmunds & Morris, 2000). Information overload also creates psychological stress which occurs when the demands of the environment exceed a person's capacity to cope with them effectively (Misra & Stokols, 2011). Studies which address the role of time in understanding information overload have shown that overload occurs when the amount of time the decision maker needs to process the information is significantly greater than the time available. This results in a material decline in decision quality (Hahn et al., 1992), possibly by increasing the time needed to make a decision and intensifying confusion about it (Malhotra et al., 1982).

However, before searching for the association between cognitive load and information overload, it is imperative to distinguish between the two. While information overload means loss of information due to the limited capacity of sensory and working memory, cognitive load usually refers to information storage and retrieval processes. Cognitive load occurs when a person experiences difficulty transferring information from working memory to long-term memory or an inability to connect new information to existing knowledge (Chen et al., 2012). According to Sweller et al. (1998), both information overload and cognitive load can occur in any learning process-in cognitive and in meta-cognitive processes-and both have a negative effect on learning. When cognitive and meta-cognitive processes do not take their normal course, the individual will have difficulty constructing knowledge. This leads us to define cognitive load as the load experienced by the learner while learning content, and information overload as the background noise preventing the learner from learning the desired content (Chen et al., 2012). It moreover seems that information overload is a precondition for cognitive load, although there seems to be some overlap between the two when considering working memory. Another difference is that information overload includes sensory memory which is part of CLT.

1.4. How psychological availability and mindfulness are associated with cognitive overload in students with and without learning disabilities
A review of the literature shows that both mindfulness and psychological availability have a positive effect on well-being also in individuals with learning disabilities.

Learning disability is generally defined as a learner’s inability to learn a specific academic skill as fast and as correctly as expected by age, education opportunities, and overall cognitive ability (Learner & Johns, 2009). Although there are several accepted definitions by health organizations and authorities, a clear definition of learning disability is still a matter of controversy (Hostutler et al., 2018). For example, the ICD-10 stresses that the learning difficulty is not due to absence of opportunity, nor is it solely due to intellectual disability, brain injury or trauma. It also adds that specific learning disabilities are not due to poor instruction or poor vision (World Health Organization, 2016). The DSM-V defines specific learning disabilities as learning difficulties that emerge at an early age, persist despite targeted intervention, and are reflected in significantly lower skills than expected by age. The DSM-V notes that learning disabilities are not caused by mental, neurological, or psychological disorders, nor are they due to language-related disabilities (APA, 2013).

Research in this field has shown that both environmental and genetic factors play a role in the development of learning disabilities. Accordingly, diagnosis of learning disabilities can be based on different definitions. Despite this, there are generally four diagnostic categories: exceptionally low academic achievements, mismatch between ability and achievements, low (or no) response to intervention and instructions, identifiable weakness in a specific learning skill (e.g., basic reading skill is impaired despite average IQ) (Hostutler et al., 2018).
As noted earlier, psychological availability is a term borrowed from workplace relations and is defined as a psychological-emotional state which affects an individual’s ability to be cognitively available to work (Kahn, 1990). Studies have found that positive emotions expand the individual’s focus of attention (Carver, 2003). A positive emotional state reflects the absence of any problem requiring attention, and this allows the person to be emotionally and mentally available. Accordingly, negative emotions have a fatiguing effect and positive emotions have an energizing effect on psychological resources which can improve mental abilities and a person’s ability to apply an appropriate perspective (Danner-Vlaardingerbroek et al., 2010). It seems, therefore, that psychological availability is associated with a positive emotional state which in persons with learning disabilities produces a state of being emotionally and mentally receptive to their surroundings and to themselves. This outcome reflects the link between psychological availability and mindfulness. Also thoughts and concerns for the past or future may distract a person from the present (Kabat-Zinn, 2003). By refocusing a person on the present, mindfulness can relieve these preoccupations and even prevent them from arising (Ruedy & Schweitzer, 2010). Such ruminations, which as noted earlier derive from negative thoughts and concerns, are directly related to psychological availability. Indeed, a positive emotional state, being a state of psychological availability, may direct the person to a state of focused awareness (i.e. mindfulness), with the goal of achieving increased sensitivity to a specific experience (Germer, 2004). Indeed, awareness and mindfulness are necessary even to read these very words.

It is possible that mindfulness and psychological availability can be used to reduce cognitive load and that both students with and without learning disabilities can benefit from this reduction.

1.5. Research hypotheses

(1) There is a significant difference in psychological availability between students with and without learning disabilities. Psychological availability in students with learning disabilities is lower than in students without learning disabilities.

(2) There is a significant difference in mindfulness between students with and without learning disabilities. Mindfulness in students with learning disabilities is lower than in students without learning disabilities.

(3) There is a significant difference in cognitive load between students with and without learning disabilities. Cognitive load in students with learning disabilities is higher than in students without learning disabilities.

(4) There is a negative association between an individual’s psychological availability and mindfulness and their cognitive load in both study groups, such that the higher the psychological availability, the lower the cognitive load (see Figure 1).

Figure 1. Cognitive load and mindfulness in relation to self-efficacy.
2. Method

2.1. Participants

The study population consists of 120 Israeli college students, 57 men (47.5%) and 63 women (52.5%). Ages ranged from 19 to 44 (average 27.49 years SD = 6.92), 87 undergraduates (72.5%) and 33 graduate students (27.5%). In addition, 30 students (25%) reported low socioeconomic status, 69 students (57.5%) reported medium, and 21 students (17.5%) reported high socioeconomic status.

Participants were assigned to two groups based on existing learning disability screenings and diagnoses: one group included 60 students with learning disabilities (average age 25.22, SD 4.1) and the other group included 60 students without learning disabilities (average age 28.61, SD 4.32).

2.2. Research instruments

Data were collected using several instruments: demographics, psychological availability, mindfulness, and cognitive load questionnaires.

Demographics survey of the following variables: gender, personal status, age, academic year and discipline of study, existing diagnoses, socioeconomic status, high school diploma grades, standard aptitude test score.

Psychological availability scale: a self-reported questionnaire with 13 items rated on a 6-point Likert scale. Five of the items were taken from an instrument by May et al. (May et al., 2004) originally designed to assess psychological availability in the workplace, and adapted by Kashi-Rosenbaum (2011) for school children. The remaining eight items were created for the Kashy-Rosenbaum study to increase the structural validity of the scale (extraction). They are derived from Kahn’s (Kahn, 1990) definition of conscious psychological availability. The present study has adapted this scale for college students by administering it to individuals outside the study and conducting two rounds of revisions to ensure that the questionnaire statements were completely clear. Participants were presented with statements about their learning behaviors and their feelings in class. They were asked to indicate on a scale of 1 (not at all) to 6 (all the time) how often they feel this way or behave in the manner described. For example: “I can think clearly when I am studying”.

Students were scored on overall psychological availability by their average score on all 13 items. A higher score reflected a higher degree of psychological availability. The Cronbach’s alpha test indicated reliability of .955.

Based on a review of the literature and an analysis of the factors, two measures were designed: (1) cognitive psychological availability measured by questions 2, 4, 6, 7, 8, 9, 10, 11, 12, 13 (for example, “I find it difficult to remain attentive and concentrated in class”, and “I tend to quickly forget what I learned in class”), Cronbach’s alpha reliability was .929; (2) emotional psychological availability measured by questions 1 3 5 (for example, “I express my emotions about my studies”, “I feel that I am using my full capabilities to cope with academic requirements”, Cronbach’s alpha reliability was .939.

Mindfulness Attention Awareness Scale (MAAS): The MAAS designed by K. W. Brown and Ryan (2003) measures an individual’s general dispositional attentiveness and awareness of the moment under everyday conditions (e.g., “I find myself doing things without paying attention”; “I break or spill things because of carelessness, not paying attention, or thinking of something else.”). This scale correlates positively with openness to experience, emotional intelligence, and well-being, and negatively with uncontrolled thinking and social anxiety that are not related to self-regulation. The adult MAAS scale was translated into Hebrew by Peretz (2007). Participants in the present study were presented with 15 statements about everyday activities and their feelings about mindfulness and were asked to indicate on a scale of 1 (not at all) to 6 (all the time) how often they feel this way or
behave in the manner described. For example: “I find it difficult to stay focused on what’s happening in the present”, “I find myself doing things without paying attention”.

Students were scored on overall mindfulness by their average score on all 15 items. A higher score reflected a higher degree of mindfulness when learning. The Cronbach’s alpha test indicated reliability of .930.

In view of the literature and an analysis of the factors, two measures were designed: (1) active mindfulness reflected in items 1, 2, 4, 5, 6, 7, 8, 9, 10, 14. For example, “I rush through activities without being really attentive to them”, “I tend not to notice feelings of physical tension or discomfort until they really grab my attention”, Cronbach’s alpha reliability was .895; (2) passive mindfulness reflected in items 3, 11, 12, 13, 15 (for example, “I find myself preoccupied with the future or the past”, “I find myself listening to someone with one ear, doing something else at the same time”, Cronbach’s alpha reliability was .825.

Cognitive load scale: A 6-item self-reported questionnaire rated on a 6-point Likert scale. This scale, originally designed by Windell (2006) in English, was translated into Hebrew and the translation finetuned based on feedback received regarding statements that had not been well-understood. Participants were asked to consider academically demanding courses that they are enrolled in and describe their perceived cognitive load using statements related to their academic assignments and the feeling of cognitive load they generate. Students were asked to indicate on a scale of 1 (low cognitive load) to 6 (high cognitive load) how often they feel this way or behave in the manner described in the statement. For example: “Performing the learning assignments in this course requires a mental effort”, “The course assignments were irritating, made me feel passive, insecure, angry”. The Cronbach’s alpha test indicated reliability of .878.

2.3. Research process
Questionnaires were administered to university students, of which some had previously undergone didactic diagnosis, were diagnosed with learning disabilities, and are consequently entitled to accommodations. The remaining students did not report learning disability diagnoses. The questionnaires were administered in a fixed order, starting with the demographics survey and followed by the psychological availability, mindfulness, and cognitive load questionnaires, in that order. Students were told that their questionnaires would be anonymous and that there is no single correct answer to any of the statements. They were asked to select the response that best reflects their position or opinion about each statement.

2.4. Data processing
The research variables were described using averages and standard deviation, the research arms were compared using t-tests for independent samples, and associations between the study variables were tested using Pearson correlations.

3. Findings
The descriptive statistics of the study’s main variables were calculated in a preliminary analysis. Table 1 shows the averages and standard deviations for the two groups in the sample.

The average scores shown in Table 1 indicate high psychological availability (M = 5.23, SD = 0.34), high overall mindfulness (M = 5.21, SD 0.29), and low overall cognitive load (M = 1.97, SD 0.39) in the entire sample.

3.1. Comparing psychological availability in the two research groups
An independent-samples t-test was performed to determine whether there was any difference in psychological availability between students with and without learning disabilities. Table 2 shows average psychological availability, standard deviation, and t values by research group.
As seen in Table 2, the results confirm the hypothesis that students with learning disabilities are significantly less psychologically available than students without learning disabilities.

### 3.1.1. Comparing mindfulness in the two research groups

An independent-samples t-test was performed to determine whether there was any difference in mindfulness between students with and without learning disabilities. Table 3 shows average mindfulness, standard deviation, and t values by research group.

As seen in Table 3, the results confirm the hypothesis that mindfulness is significantly lower in students with learning disabilities compared with students without learning disabilities.

### 3.1.2. Comparing cognitive load in the two research groups

An independent-samples t-test was performed to determine whether there was any difference in cognitive load between students with and without learning disabilities. Table 4 shows average cognitive load, standard deviation, and t values by research group.

As seen in Table 4, the results confirm the hypothesis that cognitive load in students with learning disabilities is significantly higher than in students without learning disabilities.

### Table 1. Study variables in the study population, averages and standard deviation (N = 120)

| Study population   | M       | SD     |
|--------------------|---------|--------|
| Age (years)        | 27.49   | 6.92   |
| Matriculation score| 79.68   | 9.58   |
| Psychometric score | 68.15   | 9.93   |
| General psychological Availability | 5.23   | 0.34   |
| Cognitive psychological Availability | 5.23   | 0.33   |
| Emotional psychological Availability | 5.24   | 0.40   |
| General level of mindfulness | 5.21   | 0.29   |
| Active mindfulness | 5.21   | 0.29   |
| Passive mindfulness | 5.21   | 0.31   |
| Cognitive load    | 1.97    | 0.39   |

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

*Score range 1–6

### Table 2. Average psychological availability, with standard deviation and t values (N = 120)

|                      | With learning disabilities (n = 60) | Without learning disabilities (n = 60) |
|----------------------|------------------------------------|--------------------------------------|
|                      | M       | SD     | M       | SD     | t(58)    |
| Psychological availability | 5.19   | 0.27   | 5.27   | 0.40   | -1.31**  |
| Cognitive psychological availability | 5.19 | 0.26   | 5.27   | 0.39   | -1.44**  |
| Emotional psychological availability | 5.21 | 0.37   | 5.27   | 0.43   | -0.89**  |

*p < .05, **p < .01, ***p < .001
3.1.3. Are psychological availability, mindfulness, and cognitive load related?

Pearson correlations were calculated for psychological availability, mindfulness, and cognitive overload scores to determine whether the variables are significantly correlated. Table 5 shows correlations between psychological availability, mindfulness and cognitive overload in the two groups.

As shown in Table 5 for the group of students with learning disabilities, there was no significant correlation between psychological availability, mindfulness, and cognitive load. However, in the group without learning disabilities, there was a clear negative correlation between mindfulness and cognitive load, and a significant negative correlation between psychological availability, mindfulness, and cognitive load.

4. Discussion and conclusions

The goal of the present study was to test whether psychological availability and mindfulness are associated with cognitive load in students with and without learning disabilities. To do so, average scores and linear patterns of associations between these variables were tested.
4.1. **Comparing psychological availability in the two research groups**

According to the first hypothesis, a significant difference in psychological availability between students with and without learning disabilities can be expected. Thus, psychological availability in students with learning disabilities should be lower than in students without learning disabilities. This study's findings confirm this hypothesis and are in agreement with previous studies which have shown that students with learning disabilities score lower psychological availability than students without learning disabilities.

The literature indicates a positive association between self-confidence and psychological availability. For a person to express themselves in a social context, they must feel sufficiently confident in themselves and in their abilities (Carver, 2003), but this level of confidence is often absent in people with learning disabilities (Kristeller & Hallett, 1999). Psychological availability is also part of personal engagement with the present environment, and both affect level of energy and motivation to invest significant long-term effort (Kahn, 1990).

4.1.1. **Comparing mindfulness in the two research groups**

The second hypothesis assumed that mindfulness in students with learning disabilities is lower than in students without learning disabilities. This study's findings confirm this hypothesis and are in agreement with previous studies which have shown that students with learning disabilities are less mindful than students without learning disabilities.

The literature has shown that mindfulness affects learning. This knowledge is applied in educational settings and in the past decade, teacher training has grown to include mindfulness and attention techniques and hundreds of teachers are now trained to apply these methods in the classroom. These techniques, adjusted to the school subject in which they will be used, are applied by teachers to enrich and promote learning in class (Bochun, 2011). Some recently published papers report that practicing mindfulness improved awareness of the present and reduced inattention and hyperactivity in college students with learning disabilities (Gabriely et al., 2020).

4.1.2. **Comparing cognitive load in the two research groups**

The third hypothesis assumed that cognitive load in students with learning disabilities is higher than in students without learning disabilities. This study’s findings confirm the third hypothesis and are in agreement with previous studies which have shown that students with learning disabilities experience higher cognitive load than students without learning disabilities.

Studies in this area have shown that information load can cause stress, dissatisfaction, and poor health meaning that an increase in the complexity of an assignment has a direct effect on mental load which can cause information overload (Edmunds & Morris, 2000). This is because high volumes of information create background noise which individuals with learning disabilities are unable to filter out. When overloaded with information such persons have difficulty processing information effectively without distraction. Under such conditions, a person with learning disabilities makes more mistakes, and the information they are able to elicit is relatively limited (Edmunds & Morris, 2000). Studies which address the role of time in understanding information overload have shown that overload occurs when the amount of time the decision maker needs to process the information is significantly greater than the actual time available. This results in a material decline in decision quality both in normally developed individuals and in challenged individuals (Hahn et al., 1992), possibly by increasing the time needed to make a decision and intensifying confusion about it (Malhotra et al., 1982).

4.1.3. **Association between psychological availability, mindfulness, and cognitive load**

The fourth hypothesis assumed a negative association between psychological availability, mindfulness, and cognitive load in the two groups such that the higher the psychological availability, the lower the cognitive load. The present study confirmed this hypothesis in the population without learning disabilities only.
Psychological availability and mindfulness are interrelated and both are best kept at a positive stable state. Psychological availability is a psychological-emotional state which affects the individual’s cognitive availability to learn and perform cognitive tasks. As noted, the cognitive capacity of working memory is limited, so if a learning task requires too much capacity learning will be hampered (Kahn, 1990). Mindfulness is a state of attention and awareness to both context and content of information and it can relieve anxiety and even prevent its development (Kaveh, 2011). People with learning disabilities often contend with disorder and lack of planning which make it almost impossible for them to be psychologically available and mindful. This ultimately causes psychological and cognitive overload and feelings of inadequacy and disinterest in success. As noted, mindfulness and psychological availability can be used to reduce cognitive load and assist persons contending with these challenges to focus their awareness and relieve load.

4.1.4. Conclusions and pedagogical implications
This study has both a theoretical and a practical side. On the theoretical side, this study may contribute to existing theories about the structural links between cognitive and emotional psychological availability, active and passive mindfulness, and cognitive load in students with learning disabilities compared with students without learning disabilities. This will hopefully expand scientific dialog about teaching students with learning disabilities.

In practice, this study’s findings point to a supporting role of cognitive availability and mindfulness in reducing cognitive load and improving student’s ability to grasp the material being studied. Teachers can be guided to develop these skills in their students as part of their lesson plans. Intervention programs developed specifically for learning-disabled college students should concentrate on teaching cognitive and psychological availability using a task-oriented approach that will reduce cognitive load and improve students’ academic achievements. Moreover, by raising awareness of this among educators, and directing them to construct lesson plans that incorporate methods for improving mindfulness and psychological availability and reducing cognitive load, student achievements and emotional state can be improved.

It is therefore important to train and mentor both teaching students as well as working teachers in the practice of suitable instruction methods, specifically in how to break down content into smaller units and how to convey the content at the pace and frequency suited to students’ individual abilities. By adapting their teaching in this way, teachers can help students maintain psychological availability and a reasonable level of mindfulness and cognitive load, which can be expected to have a beneficial effect on learning abilities and achievements.

4.2. Study limitations and suggested future studies
As in many studies of this type, this study has a number of limitations. It explored associations between psychological availability, mindfulness, and cognitive overload, in the two groups (college students with and without learning disabilities). But it would be interesting to learn more about the associations between additional variables such as control center, self-image, meta-cognitive knowledge, self-efficacy, and others. It is important to explore the link between psychological availability and cognitive load—which have a cognitive aspect—and the behaviorally-expressed mindfulness in additional student populations of other ages. This may ultimately explain the nature of the relation between measures of behavior (mindfulness) and perceptions (psychological availability and cognitive load).

As the present study is a correlative study and does not show causation, future research should apply an experimental paradigm to establish causation. Finally, this study principally applied quantitative methods. Future research should incorporate qualitative methods, such as interviews with students and teachers, which would provide a broader perspective and validate the present study’s findings regarding the link between psychological availability, mindfulness, and cognitive load.
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