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Online Learning for Students with Learning Disabilities and Their Typical Peers: The Association between Basic Psychological Needs and Outcomes

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For some students, online learning, particularly as it relates to the COVID-19 pandemic, can have negative implications for self-efficacy, fatigue, and burnout. One way to combat these negative outcomes is for institutions to support students' basic psychological needs (BPNs) of autonomy, relatedness, and competence. However, online learning may also frustrate students' BPNs, particularly if they have a learning disability (LD). The purpose of the current study was to investigate the satisfaction and frustration of BPNs in relation to self-efficacy, fatigue, and burnout for students with and without LD. We surveyed postsecondary students about their courses online and examined differences between students with LD and their typical peers. We also examined BPN satisfaction and frustration as predictors of self-efficacy, fatigue, and burnout. Recommendations are provided from a universal design for learning perspective. Moreover, limitations and future research directions are discussed.

INTRODUCTION

Researchers have confirmed that the initial shift to online learning in response to the COVID-19 pandemic impacted university students in terms of their motivation and well-being (e.g., Cantarero et al., 2020; Daniels et al., 2021). This shift may have been even more severe for students with learning disabilities (LD), who regularly reported challenges with online learning prior to the pandemic (Habib et al., 2012; Hollins & Foley, 2013; Simoncelli & Hinson, 2008). According to the Learning Disabilities Association of Canada (LDAC, 2015), learning disabilities refer to "a number of disorders which may affect the acquisition, organization, retention, understanding or use of verbal or nonverbal information." Moreover, LD is generally categorized into the following areas, oral language, reading, written language and mathematics. As such, these challenges can impact students with LD in their postsecondary studies.

Neither instructors nor students at postsecondary institutions were fully prepared for the sudden shift to online learning at the beginning of the pandemic—in the middle of the winter 2020 semester (January to April). However, the same was not true for the fall 2020 semester (September to December), as the shift to online learning occurred before the beginning of term (e.g., Brown, 2020). As such, students likely had expectations for instructors to prepare and deliver quality online learning amidst the ongoing pandemic (Lederman, 2020).

We rarely turn to motivation theories as pedagogical approaches, but they indeed offer many recommendations (Linnenbrink-Garcia et al., 2016) for creating supportive learning environments regardless of course content, class size, and delivery mode. As such, they are an appropriate lens through which to view the unexpected challenges presented by the pandemic. According to self-determination theory (SDT; Ryan & Deci, 2017), on the one hand, instructors who create environments that meet students' basic psychological needs of autonomy, competence, and relatedness tend to support student well-being. On the other hand, SDT also acknowledges that active frustration of the basic psychological needs has consequences for student well-being.

The purpose of this study was to examine how basic psychological-need satisfaction and frustration related to the perceived self-efficacy, fatigue, and burnout experienced by students with and without LD while learning online during the COVID-19 pandemic.

Theoretical Framework

Self-determination theory (Ryan & Deci, 2017) is a broad theoretical framework for examining human motivation. In this study, we applied the subtheory of basic psychological needs (BPNs) to learning online during the COVID-19 pandemic. According to BPN theory, three needs are essential for an individual's well-being—autonomy, relatedness, and

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LEARNING DISABILITIES RESEARCH & PRACTICE

competence—and they can either be supported or frustrated by the learning environment (Ryan & Deci, 2017). Autonomy satisfaction is defined as feeling that one's actions are aligned with one's own choices or interests. Alternatively, when one's need for autonomy is frustrated, one might experience pressure or feel pushed to behave in a certain way (Vansteenkiste et al., 2020). When the BPN of competence is satisfied, one can feel capable when engaging in activities whereas when it is frustrated one may feel inept or helpless. Finally, in terms of relatedness, when an individual's sense of relatedness is satisfied, they feel a sense of belonging to others around them; however, if it is frustrated, they may experience social isolation or exclusion (Vansteenkiste et al., 2020).

Research has demonstrated the importance of BPN satisfaction for supporting human well-being (Ryan & Deci, 2000, 2017), including during the COVID-19 pandemic. For example, Cantarero et al. (2020) found that higher levels of perceived satisfaction of the BPNs even amongst restrictions at the beginning of the pandemic were associated with higher levels of well-being. Similarly, Vermote et al. (2021) determined that during the COVID-19 pandemic need satisfaction related positively to the outcomes of life satisfaction and sleep quality but related negatively to depressive and anxiety symptoms. Need frustration had the opposite relationships with these outcome variables.

Learning during the COVID-19 Pandemic

According to a crowdsourcing survey conducted by Statistics Canada (2020), 26% of postsecondary students had some courses cancelled or postponed due to COVID-19, and 63% were very or extremely concerned about how the pandemic would affect their grades. Daniels et al. (2021) found that students felt lower behavioral, emotional, and cognitive engagement in their courses when they switched to online learning. Moreover, students felt less successful and more concerned with other students cheating in their classes online. Overall, Patterson et al. (2021) noted that the pandemic presented and intensified a variety of stressors for postsecondary students such as academic uncertainties, economic and financial worries, social isolation, misinformation about the pandemic in the media, and reduced access to mental health services.

Despite these negative outcomes, research on BPN satisfaction reveals a buffering for students at the start of the pandemic. For example, in a survey of university students in Austria and Finland, Holzer et al. (2021) found that competence was the strongest predictor of positive emotions. Moreover, competence and autonomy predicted intrinsic learning motivation in both countries while relatedness was also a significant predictor in Finland. Similar research by Teuber et al. (2021) noted that students who expressed higher levels of competence satisfaction reported lower intentions to drop out and lower depression, while satisfaction of relatedness was positively associated with life satisfaction.

These studies have at least two omissions that we addressed in this study. First, theoretically, the studies did not include measures of need frustration, which may be particularly important to examine in an unchosen online learning environment. Second, they did not focus on the experience of students with LD.

Students with Learning Disabilities

While all students had to adjust to online learning during the pandemic, this adjustment may have been more difficult for students with LD. Prior to the pandemic, these students described difficulties with online learning such as navigating online learning platforms (Burgstahler, 2015; Ficten et al., 2009), reduced accommodations (Simoncelli & Hinson, 2008), and increased distractions (Habib et al., 2012; Hollins & Foley, 2013). Further, in a study focused on postsecondary students with LD and their learning during the COVID-19 pandemic, the researchers (Goegan et al., 2022) found that students with LD acknowledged both positive (e.g., being able to control their learning space) and negative (e.g., challenges group work and connecting with instructors) experiences. The current research expanded on these preliminary qualitative findings and examined the learning of students with LD according to SDT.

Student Outcomes

Many researchers are interested in the impact of COVID-19 and continued online learning on students' grades (e.g., Kofoed et al., 2021), but we focused on indicators of student well-being that are often related to grades, including self-efficacy, fatigue, and burnout.

Self-Efficacy

According to Wood and Bandura (1989), perceived self-efficacy refers to "beliefs in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (p. 407). So far, it seems that self-efficacy has not been impacted by remote learning. For example, Talsma et al. (2021) tested for differences between two cohorts of students who took a psychology course before the COVID-19 pandemic and during restrictions and found they had similar self-efficacy belief scores. Roldan and Reina (2021) examined students' gains in self-efficacy before and after taking a compulsory course and compared individuals who took the course in a face-to-face format before the pandemic and online during the pandemic; again, no differences between groups were found. The authors concluded that "teaching strategies that encourage student participation and reflections on learning increase student SE, regardless of the teaching format" (p. 1).

None of these projects involved students identified as having an LD. However, Cataudella et al. (2021) recently conducted a review of online learning environments and their impact on students with LD, including their self-efficacy. They summarized that online learning can both reduce accessibility for students with LD, resulting in low self-efficacy, and help students develop self-regulation skills

and associated efficacy beliefs. Considering self-efficacy within the context of SDT, BPN satisfaction should be positively associated with self-efficacy, whereas frustration should be negatively associated. These effects may be more pronounced for students with LD.

Student Fatigue and Burnout

A popularized term in the media right now is *COVID fatigue* or *pandemic fatigue*, wherein individuals experience feelings of restlessness, irritability, lack of motivation, and difficulty concentrating on tasks (Cline, 2020) as a result of the prolonged implementation of restrictions. Burnout has also become more prevalent among students during the pandemic (Di Sabatino, 2021; Edwardson, 2021). Although the World Health Organization (WHO, 2019) describes burnout as a phenomenon in the occupational context, many parallels can be seen in the education context, particularly in postsecondary environments where students are preparing for their future careers and education is in many ways their "job."

Aristovnik et al. (2020) found that among students in North America, 54.7% indicated that their workload had become larger or significantly larger as a result of the transition to online learning, making fatigue and burnout more likely. Additionally, student dropout rates are on the rise (Kakuchi, 2021), with 40% of university students "seriously considering" dropping out due to the challenges introduced to their learning during COVID-19 pandemic (Gyebi-Ababio, 2021).

It is especially important to look at fatigue and burnout for students with LD, because these students already identify an increased workload compared to their peers within postsecondary education (Denhart, 2008). For example, Ben-Naim et al. (2017) found that college students with LD reported higher levels of tiredness than their non-LD peers even before COVID-19. As a possible indication of burnout, students with LD are less likely to complete their postsecondary education than their peers (Cortiella & Horowitz, 2014) and when taking online courses, they are less likely to complete their online modules (Richardson, 2010). Although the results have not been linked to burnout specifically, such a link is plausible and may be mitigated or exacerbated by BPN satisfaction or frustration.

The Current Study

Utilizing SDT as our theoretical model (Ryan & Deci, 2017), we examined associations between students' BPNs during online learning and self-reported outcomes of self-efficacy, fatigue, and burnout. This investigation is both timely and important as universities have a mixture of online and in-person learning scheduled for upcoming semesters (Thevenot, 2021), and online learning is becoming more prevalent in general (Adam, 2020). As such, our two research questions were as follows: (a) Are there group differences between students with LD and their non-LD peers on measures of BPN satisfaction and frustration, self-efficacy, fatigue, and burnout? And (b) Do the satisfaction and frustration of students BPNs in online learning during the COVID-19 pandemic predict students' self-efficacy, fatigue, and burnout?

METHOD

We used a single-administration correlational design survey to collect students' appraisals of their BPNs, self-efficacy, fatigue, and burnout during the fall 2020 semester, when students learned almost exclusively online and continued to manage the stressors associated with the COVID-19 pandemic. Ethics approval was obtained from the Human Ethics Research Office at the researchers' university.

Procedures

In mid-November of 2020, we posted a link to our questionnaire on various social media platforms to recruit postsecondary students in Western Canada for the study. Specifically, we posted information about the study on Reddit and Facebook as they both have designated spaces for students from specific postsecondary institutions. Moreover, a research assistant created a list of universities, colleges, and institutions in Western Canada and asked these schools to distribute information about the survey to their students through undergraduate listserves.

Schools that agreed provided information via email to their students about the study, with a link to the questionnaire. Once students clicked the link, they were provided with an information letter that outlined the details of the study and listed contact information for the researchers in case they had any questions. Students were asked to answer all questions "thinking about one required course you are taking in the fall 2020 semester." Consent was implied by the completion of the questionnaire, which required 10-15 minutes to complete.

Participants

A total of 283 postsecondary students accessed the survey. We reduced the sample according to two inclusion criteria: undergraduate students ($n = 249$) completing an online synchronous ($n = 110$) or asynchronous class ($n = 114$). In the final sample, 44 students identified as having an LD and 180 students did not. Descriptive information for the final sample is presented in Table 1. Participants came from a variety of departments, including Arts, Business, Education, Engineering, Kinesiology, Nursing, Science, and Social Sciences.

Measures

Descriptive Measures

We asked the students to indicate their gender, age, ethnicity, year in their program, and department. Students self-identified as having a LD. They also indicated class size

TABLE 1
Frequency of Sample Characteristics

Characteristic	*Students with LD* (n = *44*)	*Non-LD Students* (n = *180*)
Age	18–46 years ($M = 24.21$)	18–40 years ($M = 20.64$)
Gender		
Women	27 (65%)	147 (82%)
Men	9 (22%)	24 (13%)
Nonbinary	5 (12%)	8 (4%)
Year in postsecondary		
1st	7 (16%)	33 (18%)
2nd	12 (27%)	52 (29%)
3rd	10 (23%)	42 (9%)
4th	6 (14%)	37 (21%)
5th+	9 (20%)	16 (9%)
Class size		
5–25	3 (6%)	29 (16%)
26–50	14 (32%)	44 (24%)
51–99	14 (32%)	27 (15%)
100+	13 (30%)	80 (44%)
Delivery format		
Synchronous (1)	21 (48%)	89 (49%)
Asynchronous (2)	23 (52%)	91 (51%)

and categorized the delivery format as online synchronous or asynchronous.[1]

Basic Psychological Needs

We used Chen et al.'s (2015) scale to measure autonomy, competence, and relatedness from both satisfaction and frustration perspectives resulting in six subscales: (a) autonomy satisfaction, (b) autonomy frustration, (c) competence satisfaction, (d) competence frustration, (e) relatedness satisfaction, and (f) relatedness frustration. Each subscale consisted of four items, for a total of 24 items. Students responded to each item on a 5-point Likert scale, ranging from 1 (completely untrue) to 5 (completely true). Sample items, means, and coefficient alphas for each subscale separately for students with LD and non-LD students are included in Table 2.

Criterion Measures

Self-efficacy. Self-efficacy was assessed using a general self-efficacy scale (Chen et al., 2001). We included all eight items of this scale and presented students with the stem "To what extent do you agree with the following statements?" Students responded to each item on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Scores on each scale were summed and averaged, with higher scores indicating more self-efficacy.

Fatigue. Fatigue was assessed using a scale from the Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF; Stein et al., 2004). We included the six items from the general fatigue scale, which was selected to obtain an overall sense of students' fatigue rather than components of fatigue (e.g., mental, physical). Moreover, by selecting only the general scale, we were able to keep the questionnaire short to encourage participant completion. Students responded to each item on a 5-point Likert scale from 0 (not at all) to 4 (extremely). Scores were summed and averaged, with higher scores indicating more fatigue.

Burnout. Burnout was assessed using a modified scale from the Copenhagen Burnout Inventory (Kristensen et al., 2005). The seven items from the work-related burnout scale were reframed to examine school burnout. For example, the item "Do you feel worn out at the end of the *working* day?" became "Do you feel worn out at the end of the *school* day?" (italics added for emphasis). This subscale was selected because it allowed the researchers to examine burnout specific to the school setting rather than other settings that might have been causing participants to feel burnout. Again, only one subscale was utilized to keep the questionnaire short. Students responded to each item on a 5-point Likert-type

TABLE 2
Descriptive Statistics

	Students with LD			*Non-LD Students*				
Variable	*α*	M	SD	*α*	M	SD	*Sample item*	t-*Value*
BPN autonomy Sat.	.81	3.06	.98	.81	3.44	.77	I feel that my decisions reflect what I really want.	–2.73**
BPN relatedness Sat.	.88	3.67	1.00	.89	3.95	.85	I feel close and connected with other people who are important to me.	–1.92
BPN competence Sat.	.89	3.04	1.05	.87	3.51	.82	I feel competent to achieve my goals.	–3.18**
BPN autonomy Frus.	.82	3.77	.96	.84	3.40	.96	Most of the things I do feel like "I have to."	2.28*
BPN relatedness Frus.	.75	2.56	1.01	.87	2.25	1.01	I feel excluded from the group I want to belong to.	1.83
BPN competence Frus.	.88	4.15	.95	.88	3.31	1.09	I feel insecure about my abilities.	4.69***
Self-efficacy	.92	3.09	.97	.92	3.51	.77	I will be able to successfully overcome many challenges.	–3.04**
Fatigue	.93	3.10	.86	.95	2.49	1.12	I feel fatigued.	3.37***
Burnout	.77	65.28	19.64	.84	53.89	20.96	Do you feel worn out at the end of the school day?	3.23**

BPN, basic psychological need; Sat., satisfaction; Frus., frustration.
*$p < .05$.
**$p < .01$.
***$p < .001$.

TABLE 3
Correlations between Study Variables—Students with LD below the Diagonal, Students without LD Above

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1. Class size	_	.19*	–.45***	–.02	–.05	–.04	–.04	–.04	.02	–.07	.01	–.03
2. Delivery format	.08	_	–.06	.03	–.07	.03	–.07	–.11	–.03	.03	.02	–.04
3. Year	–.16	.07	_	–.03	.07	.07	–.01	.09	–.04	.04	–.02	.07
4. BPN autonomy Sat.	–.25	.02	–.02	_	–.56***	.50***	–.42***	.61***	–.55***	–.30***	–.40***	.56***
5. BPN autonomy Frus.	.16	.23	.09	–.22	_	–.32***	.41***	–.37***	.57***	.52***	.58***	–.33***
6. BPN relatedness Sat.	–.16	.13	.13	.30*	–.39*	_	–.73***	.54***	–.49***	–.19*	–.19*	.47***
7. BPN relatedness Frus.	.26	.03	–.10	–.03	.52***	–.46**	_	–.46***	.52***	.28***	.31***	–.42***
8. BPN competence Sat.	–.26	.09	.19	.66***	–.17	.49***	–.12	_	–.61***	–.27***	–.29***	.79***
9. BPN competence Frus.	.29	–.14	.04	–.39**	.37*	–.30*	.49***	.50***	_	.44***	.47***	–.54***
10. Fatigue (general)	.43**	.37*	–.04	–.24	.58***	–.41**	.46**	–.43**	.55***	_	.75***	–.23**
11. Burnout	.16	.21	.05	–.58***	.54***	–.46**	.24	–.60***	.38*	.47**	_	–.27***
12. Self-efficacy	–.35*	.01	.22	.63***	–.27	.46**	–.01	.72***	–.36*	–.42**	–.47**	_

Note. Delivery format: 1 = synchronous, 2 = asynchronous.
*$p < .05$.
**$p < .01$.
***$p < .001$.
BPN, basic psychological need; Sat., satisfaction; Frus., frustration.

scale. For the first three items, the scale increments were: 0—to a very low degree, 25—to a low degree, 50—Somewhat, 75—to a high degree, and 100—to a very high degree. For the remaining four items, the scale increments were: 0—never/almost never, 25—seldom, 50—sometimes, 75—often, and 100—always. Scores were summed and averaged, with higher scores indicating more burnout.

Rationale for Analysis

We conducted our analyses in three stages. First, as preliminary analyses we examined the descriptive statistics, including reliabilities and correlations of all subscales separately for students with LD and non-LD students. Second, we ran independent samples *t*-tests to examine group differences on the BPN scales and the outcome variables. Third, we used regression analyses to test the relationship between BPN satisfaction and frustration and the three outcome variables of self-efficacy, fatigue, and burnout in each group.

RESULTS

Preliminary Analyses

The reliability analyses for all scales for all students are provided separately in Table 2. Cronbach's alphas ranged from .81 to .89 for both groups on the BPNs satisfaction items, and from .75 to .88 for the students with LD and from .84 to .88 for the non-LD group on the BPNs frustration items. On all other subscales, Cronbach's alphas ranged from .77 to .95, suggesting good internal consistency (Nunnally, 1978).

The correlations for all study variables are provided in Table 3, several of which provide evidence of validity. Correlations within the BPN satisfaction and BPN frustration scales were positive whereas correlations between a satisfaction and frustration scale were negatively correlated. Burnout and fatigue were positively correlated, and both negatively correlated with self-efficacy across groups. Class size and delivery format were positively correlated with fatigue and negatively correlated with self-efficacy for students with LD but not for students without LD and thus were included in the regression analyses. Year in their program was not significantly correlated with any of the BPNs scales or criterion variables for either group.

Independent Samples *t*-Tests

Results of the independent samples *t*-tests are provided in Table 2. As illustrated, students with LD reported significantly less autonomy and competence satisfaction and more autonomy and competence frustration than their peers without LD. The two groups did not differ on relatedness, however. Finally, students with LD reported less self-efficacy and more fatigue and burnout than their peers.

Regression Analyses

The direction and significance of results for self-efficacy were the same for students with and without LD, they are only presented once (see Table 4). None of the background variables entered in Step 1 significantly predicted self-efficacy. At Step 2, autonomy satisfaction and competence satisfaction significantly and positively predicted self-efficacy, $F(5, 37) = 14.45$, $p < .001$ for students with LD and $F(5, 172) = 60.42$, $p < .001$ for non-LD students. At Step 3, the addition of the BPN frustration items did not result in a significant increase in explained variance for either group.

In terms of fatigue, for students with LD, in Step 1 class size and delivery format both significantly and positively predicted fatigue, $F(2, 39) = 8.22$, $p = .001$, such that larger classes and asynchronous delivery were more

TABLE 4
Regression Analyses for Self-Efficacy

	Students with LD			*Non-LD Students*		
	Step 1	*Step 2*	*Step 3*	*Step 1*	*Step 2*	*Step 3*
1. Class size	–.36	–.16	–.19	–.01	.01	.01
2. Delivery format	.05	–.01	–.01	–.04	.02	.02
3. BPN autonomy satisfaction		.27*	.20		.13*	.14*
4. BPN relatedness satisfaction		.16	.23		.02	–.03
5. BPN competence satisfaction		.47**	.43**		.70***	.68***
6. BPN autonomy frustration			–.14			.05
7. BPN relatedness frustration			.26			–.07
8. BPN competence frustration			–.07			–.05
Adjusted R^2	.08	.61*	.62	–.01	.62*	.62

Note. Delivery format: 1 = synchronous, 2 = asynchronous.
*$p < .05$.
**$p < .01$.
***$p < .001$.
BPN, basic psychological need.

TABLE 5
Regression Analyses for Fatigue

	Students with LD			*Non-LD Students*		
	Step 1	*Step 2*	*Step 3*	*Step 1*	*Step 2*	*Step 3*
1. Class size	.37**	.29*	.24*	–.07	–.07	–.05
2. Delivery format	.35*	.41**	.34**	.03	.02	.06
3. BPN autonomy satisfaction		.14	.25		–.23*	.05
4. BPN relatedness satisfaction		–.28*	–.15		–.01	.07
5. BPN competence satisfaction		–.31	–.25		–.12	–.01
6. BPN autonomy frustration			.31*			.42***
7. BPN relatedness frustration			–.04			.05
8. BPN competence frustration			.34*			.23*
Adjusted R^2	.26*	.42*	.61*	–.01	.08*	.28*

Note. Delivery format: 1 = synchronous, 2 = asynchronous.
*$p < .05$.
**$p < .01$.
***$p < .001$.
BPN, basic psychological need.

fatiguing for students (see Table 5). These effects remained significant with the addition of BPN variables. At Step 2, relationship satisfaction negatively predicted fatigue, $F(5, 36) = 6.88$, $p < .001$. At Step 3, relationship satisfaction was no longer a significant predictor; instead, autonomy frustration and competence frustration significantly and positively predicted fatigue, $F(8, 33) = 9.11$, $p < .001$. For the non-LD students, no variables entered in Step 1 were significant predictors of fatigue, $F(2, 173) = .38$, $p = .69$. At Step 2, autonomy satisfaction was significant and negatively predicted fatigue, $F(5, 170) = 4.17$, $p = .001$. Autonomy satisfaction did not remain significant at Step 3; instead, as was the case for the students with LD, autonomy and competence frustration were both significant positive predictors of fatigue, $F(8, 167) = 9.62$, $p < .001$.

None of the variables entered in Step 1 of the regression significantly predicted burnout for either students with, $F(2, 39) = 1.52$, $p = .23$, or without LD, $F(2, 172) = .03$, $p = .97$ (see Table 6). For students with LD, at Step 2, class delivery became a significant and positive predictor of burnout along with autonomy satisfaction, $F(5, 36) = 7.98$, $p < .001$. No other variables entered in Step 2 were statistically significant predictors even though the beta weights were quite similar—a fluctuation that can likely be attributed to the relatively small sample size of the group of students with LD. At Step 3, the addition of the BPN frustration items did not result in a significant increase in explained variance, $R^2 \Delta = .08$, $p = .09$, suggesting that frustration of BPN did not meaningfully explain more of the variance in burnout for students with LD. For non-LD students, at Step 2, autonomy satisfaction was a significant negative predictor of burnout, $F(5, 169) = 6.63$, $p < .001$. However, at Step 3, the effect of autonomy satisfaction was taken over by autonomy frustration and competence frustration as significant positive predictors of burnout, $F(8, 166) = 12.67$, $p < .001$.

TABLE 6
Regression Analyses for Burnout

	Students with LD			*Non-LD Students*		
	Step 1	*Step 2*	*Step 3*	*Step 1*	*Step 2*	*Step 3*
1. Class size	.13	–.04	–.06	.01	–.01	.02
2. Delivery format	.23	.30*	.22	.02	.01	.06
3. BPN autonomy satisfaction		–.31*	–.23		–.37***	–.10
4. BPN relatedness satisfaction		–.24	–.14		.05	.18
5. BPN competence satisfaction		–.31	–.33		–.09	.03
6. BPN autonomy frustration			.36			.41***
7. BPN relatedness frustration			–.09			.14
8. BPN competence frustration			.03			.21*
Adjusted R^2	.03	.46*	.52	–.01	.14*	.35*

Note. Delivery format: 1 = synchronous, 2 = asynchronous.
*$p < .05$.
**$p < .01$.
***$p < .001$.
BPN, basic psychological need.

DISCUSSION

We examined students' BPN satisfaction and frustration related to their perceived self-efficacy, fatigue, and burnout while learning online during the COVID-19 pandemic. We discuss how our results advance the field in three specific ways. First, we found that students with LD differed from their non-LD peers on nearly all constructs measured in this study. Second, despite these mean differences, the predictive relationship between BPN satisfaction and frustration was very similar between the two groups of students. Third, class size and delivery format impacted the fatigue of students with LD in a way that BPN satisfaction could not buffer.

Mean-Level Differences

On all variables except satisfaction and frustration of relatedness, the two groups of students differed at the mean level. In terms of BPNs, students with LD reported less autonomy and competence satisfaction and more frustration than their non-LD peers. Similarly, students with LD reported lower levels of self-efficacy and higher levels of fatigue and burnout than their non-LD peers.

These results are largely in keeping with the extant literature showing that postsecondary students with LD struggle more than their non-LD peers on a wide range of indicators of motivation and well-being, including fatigue and academic self-efficacy (Ben-Naim et al., 2017), as well as expectations, procrastination, negative emotions, lack of self-confidence/doubt, and stress and anxiety (e.g., Baird et al., 2009; Hen & Goroshit, 2014; Sparks & Lovett, 2009). In terms of BPN precisely, Idan and Margalit (2014) showed that high school students with LD report lower levels of satisfaction of autonomy, competence, and relatedness than their non-LD peers. In our sample, relatedness did not differ between groups. This finding requires further research because social integration has been shown to differentially impact the satisfaction of students with LD in postsecondary education relative to their non-LD peers (Goegan & Daniels, 2019).

Relationships between BPNs and Outcomes

Despite these mean-level differences, in many ways the predictive relationships between need satisfaction and frustration and the three outcomes of self-efficacy, fatigue, and burnout were more similar than different. This is important because it means that the function of need satisfaction and frustration is largely the same for students with LD as for typically developing students, allowing need satisfaction to be considered appropriate from a universal design perspective (CAST, 2018).

For both groups, autonomy and competence satisfaction positively predicted self-efficacy, explaining almost two-thirds of the variance. Moreover, need frustration was not associated with self-efficacy in the regression analyses, suggesting that self-efficacy is less sensitive to instances where BPNs are frustrated. One explanation could be that self-efficacy emerges from experiences of competence (e.g., mastery) and that such experiences may be closely linked to competence and autonomy as basic psychological needs. Furthermore, psychology generally agrees that "bad is stronger than good" (Baumeister et al., 2001), so our finding that need satisfaction cannot withstand the downfall of need frustration in terms of supporting self-efficacy fits this broader schema.

For students with LD, satisfaction of relatedness was negatively associated with fatigue whereas for students without LD satisfaction autonomy served this protective function. Regardless, once need frustration was entered into the model, the protective element of need satisfaction was overtaken by the cost of frustration of autonomy and competence. A similar pattern emerged for burnout: Both groups of students were protected by autonomy satisfaction, but the effect was lost for students without LD when need frustration was entered. In this case again, it was frustration of autonomy and competence that were positively associated with

burnout. Perhaps due to the small sample size of students with LD, Step 3 of the burnout model did not result in a significant increase to the variance explained, although the pattern of coefficients is the same as for non-LD students. Oram et al. (2020) argued the importance of measuring frustration of BPN for postsecondary students with LD, or in their sample specifically attention deficit-hyperactivity disorder (ADHD), "[b]ecause the university setting may be an even more directive, critical, or rejecting social context than grade school, [meaning] it is possible that the needs of these students are not only left unfulfilled, but frustrated" (p. 142). Indeed, these authors found that the positive association between ADHD symptomatology and amotivation fully mediated frustration of the basic psychological needs. Our results confirm this position and show that the effects of frustration can nullify the benefits of need satisfaction for both students with and without LD.

Class Size and Delivery Format

Although the primary focus of this research was on satisfaction and frustration of BPN, it is important to note the substantial association between class size and delivery format on fatigue for students with LD. This finding was unique for students with LD, and thus stands out as an important implication for this group. As mentioned, students with LD have historically reported greater difficulties with online learning (e.g., Burgstahler, 2015; Habib et al., 2012; Hollins & Foley, 2013). Likewise, emerging research on online learning during the pandemic indicates these struggles have been somewhat exacerbated alongside increased workload (Goegan et al., 2022).

Our results suggest that satisfaction of BPNs is not sufficient to compensate for the fatigue students with LD experience in larger classes and in classes taught asynchronously online. In other words, institutions need to attend to structural issues related to online learning such as class size because the initiatives of instructors appear insufficient to compensate for large and asynchronous classes for students with LD. Indeed, researchers have long questioned the quality of online instruction for large class sizes (e.g., Parker, 2003; Sorensen, 2014), with some instructors suggesting the ideal online class size is about 19 students (Orellana, 2009). In the present study, 60% of participants reported on a class that they noted had more than 50 students, far exceeding the recommended size. Massive open online courses (MOOCs) are an exception to the preference for small courses online; they are designed to target a different set of learners and continue to suffer problems related to engagement (Daniels et al., 2016). As COVID-19 restrictions are eased, administrators will need to consider the impact of large online courses for students with LD and not minimize the fatigue associated with online learning for this group.

Implications

The results from this study have important implications for both theory and practice. In terms of theory, our research examined both satisfaction and frustration of BPNs and in so doing highlighted the importance of considering both of these components when examining students' experiences. For example, in several instances, the positive effect of need satisfaction was undone by the negative effects of need frustration. Insomuch as frustration has been understudied relative to need satisfaction (Oram et al., 2020), previous results may be misspecified and overrepresenting the benefits of need satisfaction. We encourage future research to consider both satisfaction and frustration when examining BPNs. Additionally, although researchers often discuss all three BPNs, neither satisfaction nor frustration of relatedness significantly predicted any of the outcome variables. This is surprising, as early research examining BPNs during the pandemic noted the importance of relatedness (see Holzer et al., 2021; Teuber et al., 2021). The decision to treat BPNs as individual unique needs or to combine them into a general score of need satisfaction is an important one that likely needs further consideration particularly in light of the experiences of students with LD.

In terms of practice, first, administrators need to take seriously the fatigue associated with large classes and asynchronous online learning reported by students with LD. Although smaller class sizes and in-person learning are financial decisions from an administrative perspective, the results of our study show that the consequences of these delivery decisions have unique negative implications for students with LD. Although beyond the scope of this study, the compounded effects of fatigue could have deleterious effects on the performance and well-being of students with LD (Palmer, 2013).

Second, instructors need to be at least as aware of instructional decisions that may frustrate students' BPN as instructional decisions they take to support BPN. To that end, instructors could look to universal design for learning (UDL; CAST, 2018), which provides a framework to "improve and optimize teaching and learning for all people." For example, one of the key components of UDL includes multiple means of engagement, such as "optimize individual choice and autonomy" in both instruction (Radil, 2017) and assessment (Goegan et al., 2022). Further, from a BPN lens, SDT uses the construct of structure to articulate the balance required to ensure that choice is supportive and not frustrating. For example, rather than allowing students the choice of any topic, which may overwhelm students, instructors can provide choice from a set list of topics. For additional information on implementing UDL at the postsecondary level, refer to Cumming and Rose (2021), who compiled a current review of the literature, and The Center for Universal Design at the University of Washington (2022), which provides several resources and recommendations. As another recommendation, Daniels, Pelletier et al. (2021) suggest a shift from "due dates" to "grading dates," whereby instructors negotiate deadlines with students and only take in assignments when they will be scored. According to the authors, such a shift maximizes students' time to work effortfully on their assignment thereby supporting autonomy and competence while simultaneously minimizing the time between completion and feedback, likely thereby minimizing frustration.

Third, the practices of various service providers on campuses, such as accessibility services, counseling services, or peer tutoring, can further support the BPN of students broadly, and students with LD, in particular. For example, accessibility service might recommend a reduced course load as an accommodation for students who are experienced increased fatigue due to online learning to support their need for competence. While a reduced course load is already a possible accommodation for some students with LD (Fullarton & Duquette, 2016), it would be advantageous to examine the scope of this accommodation to ensure students are properly supported. Additionally, counseling services should provide a range of online services to support the needs of students who may be experiencing increased stress and anxiety as a result of learning online during the pandemic (Nath, 2021). Finally, peer tutoring supports could provide resources to students on how to navigate online learning or workshops on strategies for attending courses online that students can access as needed to support their autonomy and competence during online learning.

Limitations and Directions for Future Research

The results presented here should be considered in light of two limitations. First, we recruited a convenience sample of university students from Western Canada through social media platforms and institutional listservs. Not only does this impact the generalizability of our findings, but response biases may also be present in our sample of students, all of whom had the capacity and desire to complete a survey about online learning during the COVID-19 pandemic. We are unable to ascertain if this sample was functioning better or worse than peers who did not choose to complete the study. Additionally, the sample of students with LD was somewhat small, which may have led to an instability in the coefficients in the regression analyses. Although there is benefit to comparing students with and without LD, future research may need to be more intentional in recruiting large samples of students with LD to ensure sufficient power at that level of analysis. It would also be advantageous to examine potential comorbid diagnoses with LD such as depression, anxiety, or ADHD, which may have impacted participants' responses. Moreover, additional questions concerning students' LD diagnosis, such as information about their specific learning challenges, may have provided additional context for the results. In addition, it would be beneficial to collect some type of institutional measure of academic performance to consider alongside well-being measures.

Second, we used a correlational design that can be susceptible to problems with multicollinearity when analyzed by regression analysis (Tabachnick & Fidell, 2013). Although we examined all study variables for evidence of multicollinearity and were not concerned, longitudinal research would be more robust in terms of design and would also allow the compounded effects of fatigue to be monitored. Similarly cross-lagged panel designs would also increase the understanding of the ordering of influence of need satisfaction and frustration. We intentionally entered the BPN satisfaction items before the BPN frustration items to examine the additive effect of frustration. However, from a theory perspective SDT is somewhat silent on the priority of satisfaction relative to frustration. On a general level, Baumeister et al. (2001) found that there is a greater impact of bad events over good ones and this would indeed be true in our current results. Future research should intentionally disentangle the order effects and explore if they are different for students with and without LD.

Conclusion

The results of this study demonstrate that postsecondary students with LD differ from their typical peers in terms of satisfaction and frustration of their BPNs for competence and autonomy when learning online. Students with LD also reported less self-efficacy, more fatigue, and more burnout—outcomes that can make it more difficult to persist in postsecondary education even under the best of conditions, not to mention a pandemic. Moreover, with the exception of self-efficacy, which had positive associations with need satisfaction, frustration of autonomy and competence appeared to exert a stronger influence than need satisfaction at least during online learning in the pandemic.

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NOTE

1. Students were able to indicate if their course was in-person or blended delivery; however, students in such classes were excluded from the study to focus on students learning exclusively online.

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