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# Zooming their way through university: Which Big 5 traits facilitated students' adjustment to online courses during the COVID-19 pandemic

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ABSTRACT

Many students struggled with the abrupt transition to online classes required by the COVID-19 pandemic. The present research used a self-determination theory framework to examine the role of the Big 5 personality traits in university students' adaptation to online learning, measured by their quality of motivation, subjective well-being, self-efficacy, online engagement, and online satisfaction. A longitudinal study was conducted across the 2020 fall semester and included a total of 350 university students who answered surveys in September and December. Results showed that conscientiousness and openness to experience were associated with higher self-efficacy and with different forms of autonomous motivation for online learning. Conscientiousness was related to identified motivation, whereas openness to experience was related to intrinsic motivation. In contrast, neuroticism was related to increases in controlled motivation. Only openness to experience was strongly related to engagement with online learning and higher levels of subjective well-being. These findings suggest that openness to experience may be an adaptive trait for students' transition to online classes during these times of uncertainty.

## 1. Introduction

In March 2020, most North American university students were suddenly asked to leave their universities because of the rapid spread of the novel COVID-19 virus. In Québec, Canada, all students were informed that they would have one week to vacate the premises. A few days later, students were instructed that their semesters would continue, but that all classes and assessments would be conducted online, primarily via ZOOM, the work-sharing platform. The shift to online learning continued for Canadian universities in the fall of 2020. A key difference between in-class and online learning is that the latter's format allows students to engage with the material on their own time after the instructor has made it available online. Most institutions also changed their assessment format to focus more on written assignments than exams. Finally, a major difference is that online courses minimize direct social contact among students and with professors.

How have university students adapted to a full semester of online education? The way students reacted to these changes may depend on individual differences in personality traits. The format of many online courses requires greater self-regulatory skills because there is no longer a predictable schedule of classes to cue students and the use of assignments and essays for grading may require more planning than typical exams. The switch to online courses may necessitate considerable changes in how students go about organizing, reviewing class materials, and preparing for assignments, thus requiring a capacity to adopt a new approach better suited to an online format.

The Big 5 personality framework proposes that most individual differences in personality can be classified into five broad, empirically-developed domains that are independent of one another (John & Srivastava, 1999). The five traits are agreeableness, openness to experience, conscientiousness, extraversion, and neuroticism. Particularity relevant to online learning may be conscientiousness and openness to experience. Conscientiousness is defined as the tendency to be organized, reliable, and responsible (McCrae & John, 1992). Previous research indicates that conscientiousness is especially important for school performance (Judge & Ilies, 2002). Openness to experience is characterized as intellectual curiosity, the tendency to seek novel experiences, and the ability to adapt to change (Schmutte & Ryff, 1997). Scoring high on openness to experience is related to the desire to explore new things (McAdams, 2015). Previous research regarding in-class and online learning suggests that individuals higher in openness to experience can better adapt to changing situations (LePine, Colquitt, & Erez,

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2000). A classic meta-analysis of work outcomes by Barrick and Mount (1991) distinguished performance during the training period and then in the official job. Conscientiousness was positively related to performance across both periods whereas openness to experience was predictive of performance during the training period. Studies suggest that openness to experience may facilitate adapting to new forms of learning. For example, students higher on openness to experience were more likely to positively evaluate online courses (Keller & Karau, 2013) and paid more attention to the quality of online learning (Watjatrakul, 2016). Taken together, individual differences in conscientiousness and openness to experience may influence whether students flexibly adapted to the online learning format.

Due to significant lifestyle changes brought forth by the pandemic, students' mental health has been deteriorating at a faster rate than ever before (Chen et al., 2020). Given that personality traits influence how individuals behave and reason, it is not a surprise that traits also influence students' well-being. Extraversion, the trait captured by how outgoing and sociable a person is (McAdams, 2015), significantly impacts subjective well-being (Li, Lan, & Ju, 2015). However, the relationship between positive affect and extraversion may be dependent on external factors (Goryńska, Winiewski, & Zajenkowski, 2015). Thus, given the distinct context of social isolation accompanying the new education format, extraversion may not be linked with heightening well-being. Interestingly, openness to experience also largely correlates with positive affect (Steel, Schmidt, & Shultz, 2008) and personal growth (Anglim, Horwood, Smillie, Marrero, & Wood, 2020).

In general, neuroticism is related to higher levels of negative affect and consists of traits such as tension and anxiety (Eysenck & Eysenck, 1985). Individuals higher on neuroticism have the tendency towards stronger emotional reactions when confronted with stressors, and it is difficult for them to regain stability afterward (Eysenck & Eysenck, 2006). Given this and their propensity to perceive more stress in life (Pierkarska, 2020), students high on neuroticism may be the ones struggling the most with the ambivalent environment of online classes.

Self-determination theory (SDT; Ryan & Deci, 2017) is a useful framework to understand the motivational processes by which personality traits may influence the adaptation to online classes. SDT research indicates that the reasons individuals have for *why* they are engaging in behaviors will have important implications for whether that behavior will be adaptive. SDT describes a continuum of motivational types that vary in their perceived locus of causality from highly external to highly internal (Ryan & Deci, 2017). Individuals are thought to pursue activities for reasons ranging from more controlled (because they have-to) to more autonomous (because they want-to) (Ryan & Deci, 2017). Autonomous motivation consists of intrinsic, integrated, and identified motives (Ryan & Deci, 2017) and is seen as a self-initiated process in which one acts in a personally meaningful and volitional manner. *Intrinsic* motivation involves enacting a behavior for the pure interest and enjoyment of the activity itself (Holding & Koestner, 2021). *Integrated* motivation describes instances where the activity or task has been fully assimilated into one's sense of self and fits with one's core values. *Identified* motives explain instances where individuals recognize the importance or personal relevance of the task (Ryan and Deci, 2017). In contrast is *controlled* motivation, which involves external regulation and introjection (Ryan & Deci, 2017).

### 1.1. Present study

The present longitudinal study examined the role of the Big 5 personality traits in university students' adjustment to online learning in the fall of 2020. The Big 5 traits and self-efficacy for online classes were measured in September. Academic outcomes were measured at the end of the semester (December) and included engagement and satisfaction with online learning. Motivation and subjective well-being, conceptualized in terms of the valence of positive and negative affect combined with life satisfaction (Diener & Lucas, 1999) were assessed at both time points.

Based on previous research, we hypothesized that openness to experience would be the key personality trait to ease the transition to online learning since it is associated with an ability to adapt to change and seek new experiences (Schmutte & Ryff, 1997). Nevertheless, numerous studies have demonstrated that conscientiousness is important for various school outcomes (Judge & Ilies, 2002), and we expect this to spill over to the online academic environment as well (i.e. improved motivation and engagement in online learning). Next, even if extraversion is usually positively associated with well-being (Diener & Lucas, 1999), the social isolation brought forth by the pandemic may be particularly strenuous on those individuals since extraversion is considered a highly social trait (Barrick & Mount, 1991). Thus, we did not expect this trait to facilitate the adaptation to online learning. Finally, following precedent literature, we expected neuroticism to be associated with less positive outcomes (i.e., controlled motivation for learning and poorer satisfaction, engagement, and self-efficacy with online learning).

## 2. Method

### 2.1. Participants and procedure

Participants were 350 students (87.8% female; $M_{age} = 19.75$, $SD_{age} =$ 1,4) at a large university recruited through a voluntary extra-credit subject pool. The ethnic/cultural background of the sample was predominantly of European descent (56%) but included 29% Asian descent, 8% Middle Eastern descent, 2% Hispanic, 1% African descent, and 4% had another ethnic/cultural background. 61% of the participants were living with family during the semester, 25% with friends, and 14% alone. This study was approved by the University Research and Ethics Board.

All measures were taken through the online survey software Qualtrics. Questionnaires were administered in September and December. 167 participants (overall retention rate of 48%) completed the survey in December. The low retention rate was because the December survey was not for extra credit but rather for the opportunity to win a CAD$100 raffle.

### 2.2. Measures

#### 2.2.1. Subjective well-being (SWB)

SWB was measured using participants' reports of life satisfaction and positive to negative affect. The Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) is a 5-item scale that measures "global life satisfaction—an evaluative judgment of one's life as a whole" (Diener et al., 1985, p. 91). Participants rated items such as "The conditions of my life are excellent". Participants also completed a 9-item scale of affect (Emmons, 1992) which included four positive (e.g., joyful) and five negative (e.g., frustrated) items. To ensure that responses reflected participants' recent (rather than general) affect, participants were instructed to think about how they have felt over the past two weeks when responding. All items were rated on a scale from 1 (*not at all*) to 7 (*extremely*). All three scales were reliable, all $\alpha$'s $> 0.80$ at each assessment. To compute SWB, negative affect was reversed and all three components of SWB were standardized prior to calculating the mean.

#### 2.2.2. Big 5 personality traits

In September, participants completed the 44-item Big five inventory (BFI) to evaluate their position on the Big 5 traits: conscientiousness, extraversion, neuroticism, agreeableness, and openness to experience (John & Srivastava, 1999). Each item was rated based on how much participants felt that they reflected their own personality on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). For example, an item used to assess extraversion was "Is outgoing, sociable". The reliability for all Big 5 traits was adequate, $\alpha$'s $> 0.80$.

#### 2.2.3. Motivation for online classes

At both time points, students' motivation for online learning was assessed using a 5-item scale adapted from Sheldon & Kasser, 1998. Participants were asked to rate the extent to which they tried their hardest in their online classes for intrinsic ("Because of the fun and enjoyment which it provides you—the primary reason is simply your interest in the experience itself"), identified ("Because it represents who you are and reflects what you value most in life"), integrated ("Because it represents who you are and reflects what you value most in life"), introjected ("Because you would feel ashamed, guilty, or anxious if you didn't—you feel that you ought to attend online classes"), and extrinsic ("Because somebody else wants you to, or because you will get something from somebody if you do") reasons. These items were rated on a scale of 1 (*strongly disagree*) to 7 (*strongly agree*). The reliability for controlled motivation (introjected and extrinsic items) was α's > 0.57.

#### 2.2.4. Engagement in online classes

In September, self-efficacy was rated with the item "To what extent do you feel you have the skills and resources necessary to manage online education?". Online engagement was assessed in December with two items: "Did you enjoy online learning?" and "To what extent would you rate your level of engagement with course materials (i.e., listening/assisting to lectures, doing readings, etc.)?" The reliability for this scale was α's > 0.59. In December, satisfaction with online performance was measured by asking participants "To what extent were you satisfied with your academic performance this semester?" The same Likert scale was used to assess all items, each ranging from 1 (*not at all*) to 7 (*very much*).

## 3. Results

### 3.1. Analytic strategy

Correlations and hierarchical regressions were assessed with SPSS statistics software (Version 26). We conducted preliminary correlational analyses to understand the association between the Big 5 traits and students' adaptation to online learning. We hypothesized that the Big 5 traits of conscientiousness and openness to experience would be the most adaptive traits during this transition and that neuroticism would be the least adaptive. We also conducted preliminary analyses to inform the reader about the evolution of the main variables (Big 5 traits, motivation, SWB, self-efficacy, online engagement, and online satisfaction) throughout the study, via repeated measures within-subjects ANOVA and paired samples *t*-tests.

### 3.2. Preliminary analyses

Data screening found the variables of interest to be normally distributed, making the variables suitable for regression analyses. Preliminary analyses revealed no effects approaching significance (*p*'s > .20) for gender or age of participants on any of the dependent variables, thus we did not include these demographic factors in our main analyses.

Table 1 presents the means and standard deviations for all of the variables. Self-efficacy for online studies was rated relatively high. Identified motivation was rated more highly than intrinsic motivation, which was rated more highly than controlled motivation. SWB dropped from September to December.

Paired sample *t*-tests indicated that participants' motivation and SWB deteriorated over the semester. Intrinsic motivation declined from September ($M = 4.36$) to December ($M = 3.85$), $t\,(164) = 3.38$, $p < .001$. Identified motivation similarly declined from September ($M = 5.50$) to December ($M = 5.06$), $t\,(164) = 3.67$, $p < .001$. By contrast, controlled motivation increased dramatically over the semester, from September ($M = 3.50$) to December ($M = 4.10$), $t\,(164) = 4.96$, $p < .001$. SWB declined over the semester, from September ($M = 4.43$) to December ($M = 4.18$), $t\,(164) = 4.03$, $p < .001$.

**Table 1**
Means and standard deviations for all variables.

| | *N* | *M* | *SD* |
|---|---|---|---|
| BFI extraversion | 347 | 3.18 | 0.93 |
| BFI agreeableness | 347 | 3.82 | 0.67 |
| BFI neuroticism | 347 | 3.44 | 0.84 |
| BFI conscientiousness | 347 | 3.70 | 0.66 |
| BFI openness to experience | 347 | 3.54 | 0.62 |
| Self-efficacy online education | 346 | 5.34 | 1.38 |
| T1 intrinsic motivation | 345 | 4.32 | 1.84 |
| T2 intrinsic motivation | 165 | 3.85 | 1.64 |
| T1 control motivation | 346 | 3.37 | 1.65 |
| T2 control motivation | 165 | 4.10 | 1.28 |
| T1 identified motivation | 346 | 5.47 | 1.36 |
| T2 identified motivation | 165 | 5.06 | 1.21 |
| T1 SWB | 349 | 4.54 | 0.96 |
| T2 SWB | 165 | 4.18 | 0.97 |
| T2 online engagement | 164 | 4.30 | 1.67 |
| T2 online satisfaction | 164 | 4.87 | 1.37 |

### 3.3. Main analyses

Table 2 presents the results of multiple regression analyses in which each of the September online measures was regressed on the Big 5 traits, which were entered together.[1] The regression equations were significant yielding multiple *R*'s ranging from 0.29 to 0.34. Extroversion and agreeableness were unrelated to all dependent variables. Neuroticism was related to low self-efficacy and high levels of controlled motivation. By contrast, both conscientiousness and openness to experience were associated with high levels of self-efficacy and low levels of controlled motivation. Interestingly, conscientiousness and openness to experience were related to different forms of autonomous motivation, with conscientiousness linked with identified motivation whereas openness was linked with intrinsic motivation. These results confirm the hypothesis that conscientiousness and openness to experience are the two traits that predispose university students to respond better to online learning.

To examine longitudinal effects of the Big 5 traits, two hierarchical regression analyses were conducted in which December levels of online engagement and school satisfaction were regressed on baseline self-efficacy, entered first, and then the Big 5 traits entered together. The regression for school satisfaction was insignificant and none of the Big 5 traits were significantly associated. The regression for online engagement was significant, yielding a multiple 0.37, $F\,(6,157) = 3.82$, $p < .01$. Openness to experience was strongly related to higher levels of engagement with online studies over the semester, $b = 0.27$, $t = 3.51$, $p < .001$. The effects for the other traits did not approach significance, *p*'s > .20.

The impact of the Big 5 traits on changes in SWB over the semester was examined by regressing December SWB on baseline SWB followed by the Big 5 traits, entered together. The regression equation was significant, multiple $R = 0.70$, $F\,(6, 158) = 25.31$, $p < .05$. Only openness was significantly related to increases in SWB over the course of the semester, $b = 0.22$, $t = 2.84$, $p < .01$.

### 3.4. Supplemental analyses

The central analyses focused on the relations of the Big 5 traits to changes in engagement and SWB over the online semester. It is also important to consider, however, whether the Big 5 traits were linked to changes in the motivation for giving effort in online learning. To examine this, we calculated a residual change score for intrinsic, identified, and controlled motivation. We then regressed these change scores

[1] Our output and measures are available on OSF: https://osf.io/mwr2s/?view_only=cfdde8324fd0438cb4697999d33821ac.

**Table 2**
Regressions of September variables on Big 5 traits.

| | Self-efficacy | | Identified motivation | | Intrinsic motivation | | Controlled motivation | |
|---|---|---|---|---|---|---|---|---|
| | *b* | *t* | *b* | *t* | *b* | *t* | *b* | *t* |
| Extraversion | 0.03 | 0.53 | 0.01 | 0.09 | 0.01 | 0.09 | 0.02 | 0.32 |
| Agreeableness | 0.00 | 0.00 | 0.10 | 1.84 | 0.10 | 1.84 | −0.05 | −0.92 |
| Neuroticism | −.13* | −2.30 | 0.03 | 0.59 | 0.03 | 0.59 | .13* | 2.35 |
| Conscientiousness | .22** | 3.91 | .22* | 3.93 | 0.07 | 1.27 | −.21** | −3.72 |
| Openness to experience | .14** | 2.76 | 0.08 | 1.42 | .24** | 4.62 | −.10* | 1.98 |

** $p < .01$.
* $p < .05$.

on the three Big 5 traits that were significant predictors in our main analyses: openness to experience, conscientiousness, and neuroticism. The regressions revealed an association with a different trait for each outcome: openness to experience was significantly related to increased intrinsic motivation over the semester, $b = 0.15$, $t\,(162) = 1.97$, $p = .05$; conscientiousness was marginally related to increased identified motivation, $b = 0.12$, $t\,(162) = 1.87$, $p = .06$; and neuroticism was significantly related to increased controlled motivation, $b = 0.23$, $t\,(162) = 2.875$ $p < .01$. Note that these findings follow the pattern of the September cross-sectional correlations.

## 4. Discussion

The present study used an SDT framework to investigate how university students adapted to online classes, which were abruptly implemented due to the COVID-19 pandemic. Three major findings emerged. First, we found that only the Big 5 trait of conscientiousness was associated with identified motivation. Identified motivation is especially significant in activities that demand persistence, such as school achievement (Aelterman, Vansteenkiste, & Haerens, 2019; Koestner & Losier, 2002). Online education environments seem to have less structure than the classic classroom setting. Even with less supervision, those higher in conscientiousness may be behaving in a more goal-directed and organized manner. Thus, conscientiousness positively relating to measures of academic achievement is in line with previous research (Poropat, 2009). However, most interestingly, only openness to experience was related to intrinsic motivation. Intrinsic motivation reflects doing an activity for its own sake because it is inherently enjoyable and interesting (Ryan & Deci, 2020). Since openness to experiences is related to being more receptive to new approaches and experiences (McAdams, 2015) and that intrinsically motivated individuals curiously engage with their environments, they may take on greater interest in the unfamiliar methods of online learning. As such, openness to experience may ease the transition since they tend to be more intrinsically motivated. Finally, neuroticism was associated with an increase in controlled motivation. This is in line with previous research depicting that neuroticism negatively correlated with autonomous motivation (Levine, Holding, Milvayskaya, Powers, & Koestner, 2021). Controlled motivation has also been associated with anxiety towards school (Ryan & Connell, 1989). Thus, its relationship with neuroticism comes with no surprise, especially during the uneasy context of online classes. However, most importantly, the motivation results were found both at the beginning and the end of the online semester.

Second, our findings show that three of the Big 5 traits were associated with students' self-efficacy in September. Students who were low on neuroticism, or high on conscientiousness or openness to experience were more likely to report higher self-efficacy. Similar correlations have been found in the past (Şahin & Çetin, 2017; Stajkovic, Bandura, Locke, Lee, & Sergent, 2018). Furthermore, our results show that only openness to experience was a significant predictor for online engagement. This is in line with Sánchez-Cardona et al.'s (2012) study, which found that people high in openness to experience are more engaged with their studies when they are also high on self-efficacy. Our results reveal that this greater engagement may carry over to the online environment as well. Curiously, none of the Big 5 traits predicted students' satisfaction with their online classes. This may be because it was students' first time experiencing an entire semester through their screen or because they missed the social interactions occurring during in-class lectures.

Finally, only the trait of openness to experience resulted in higher levels of subjective well-being. This finding is atypical, for the traits usually associated with well-being are extroversion and neuroticism; extraversion being positively, and neuroticism negatively associated with subjective well-being (Diener & Lucas, 1999). Nevertheless, some characteristics of openness to experience have been associated with positive affect (Zajenkowski & Matthews, 2019). Since subjective well-being considers happiness to be indicated by peoples' affective and cognitive evaluations of their lives (Diener, 2000) and arises from what individuals do, feel, and think (Ryan & Huta, 2009), openness to experience may be related to greater well-being during the pandemic because it may have helped individuals adapt more easily to the changing circumstances. Our study depicts this in regard to an academic environment, but perhaps these individuals had an easier time adjusting across multiple life spheres (e.g., changing habits, lifestyle, etc.), which may have facilitated the increase in well-being.

### 4.1. Limitations and future directions

A few limitations need to be considered. First, our sample was narrowly drawn from students at a highly competitive university and was predominantly female and of European descent. This research should be replicated with a more diverse set of students to enhance the generalizability of our findings. Second, even if the current study is longitudinal, we are unable to make firm causal conclusions, which would require an experimental design. Third, we do not have data on how well students performed in their classes; further studies should consider studying the correlation between the Big 5 traits, their school performance, and their satisfaction with it. Although the benefits of openness to experience were demonstrated, we must recall that the transition to online learning was necessitated by the public health emergency of the COVID-19 pandemic. Perhaps a voluntary and more gradual transition might not place such emphasis on the flexibility that is associated with openness to experience.

### 4.2. Conclusion

The present study examined the role of the Big 5 personality traits in the transition to an online mode of learning in the context of a longitudinal study of university students over the fall semester. Our results suggest that openness to experience may be the most adaptive trait for the transition to online classes since it is strongly associated with self-efficacy, intrinsic motivation, online engagement, and higher subjective well-being.

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## CRediT authorship contribution statement

**Élodie C. Audet:** Conceptualization, Formal analysis, Writing – original draft. **Shelby L. Levine:** Supervision, Methodology, Writing – review & editing. **Ezelbahar Metin:** Data curation, Writing – original draft. **Sophie Koestner:** Investigation, Writing – original draft. **Stephanie Barcan:** Investigation, Writing – original draft.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2021.110969.

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