Worrying about the negative consequences of appearing imperfect to others (i.e., perfectionistic self-presentation) is conceptually related to social anxiety. Mackinnon, Battista, Sherry and Stewart (2014) tested whether perfectionistic self-presentation could predict social anxiety beyond several important covariates using a 21-day daily measurement approach. We sought to replicate Mackinnon et al.’s (2014) findings using the same daily diary methodology. Participants included 263 young adults (79.9% women; \(M_{\text{age}} = 21.4\)) who completed a series of questionnaires once per day for 21 days. Participants completed measures of perfectionistic self-presentation, perfectionism cognitions, social anxiety, depressed mood and socially prescribed perfectionism. Intraclass correlations suggested measures had both within-subjects and between-subjects variability. Confirmatory factor analyses supported the a-priori factor structures at both levels. Using multilevel structural equation modeling, we showed that perfectionistic self-presentation predicted social anxiety even when controlling for socially prescribed perfectionism, depressed mood and perfectionism cognitions at both levels, replicating Mackinnon et al (2014). Our replication suggests that perfectionistic self-presentation is an important predictor of daily social anxiety. Intervention efforts may wish to target perfectionistic self-presentation in order to better help treat those with social anxiety. Open data/methods: https://osf.io/ty2aj/.

Keywords: Perfectionism; nondisplay of imperfection; depressed mood; social anxiety; daily diary; replication

Social anxiety is defined by marked fear of social and performance situations where the individual will be evaluated by others (American Psychiatric Association, 2013). It is one of the most frequently diagnosed anxiety disorders and is associated with a higher risk of developing other anxiety disorders, substance-use disorders, and affective disorders (Fehm, Pelisso, Furmark, & Wittchen, 2005; Kessler, Chiu, Demler, & Walters, 2005). The self-presentation model of social anxiety suggests that social anxiety arises when individuals are driven to present a perfect impression to others, doubt that they will be able to achieve this high standard and thus imagine being negatively evaluated by others (Schlenker & Leary, 1982). This results in increased anxiety when both imagining and engaging in social interactions. Other models suggest cognitive factors play a major role in social anxiety; specifically, concealing imperfections and cognitions regarding self-doubt maintain social anxiety when activated in social situations (Clark, 2005). Taken together, these models suggest social anxiety may be driven by a self-presentational style that focuses on hiding perceived imperfections during social interactions. Mackinnon, Battista, Sherry, and Stewart (2014) conducted the first study investigating perfectionistic self-presentation and social anxiety using daily diary methodology. The purpose of the present study was to replicate their work using the same daily diary approach in a similar population.

Perfectionism and Social Anxiety
There are three facets that compose perfectionistic self-presentation: nondisplay of imperfection, perfectionistic self-promotion, and nondisclosure of imperfection (Hewitt et al., 2003). Perfectionistic self-promotion involves actively promoting and displaying one’s perfection in a self-aggrandizing style (e.g., “I try always to present a picture of perfection”) and nondisclosure of imperfection focuses on avoiding discussion of imperfections without placing emphasis on the consequences of such disclosures (e.g., “I should always keep my problems to myself”). Conversely, nondisplay of imperfection focuses on hiding one’s imperfections for fear of the potential negative consequences (e.g., “It would be awful if I made a fool of myself in front of others”). Thus, nondisplay of
imperfection is the closest match for the self-presentation model as it focuses on the negative consequences of displaying imperfect behaviour to others (Schlenker & Leary, 1982). Nondisplay of imperfection is elevated in people with social phobia relative to healthy controls ranging from 0 (no imperfection) to 4 (extremely). This scale displayed good between-subjects (α = 0.97) than other facets of perfectionistic self-presentation (Jain & Sudhir, 2002). Moreover, it predicts social anxiety in student samples when controlling for other perfectionism traits (Wallace et al., 1994; Mackinnon et al., 2014) – and consequently, the present study – chose to focus on nondisplay of imperfection, rather than the other facets of perfectionistic self-presentation. Negative mood states are negatively correlated with nondisplay of imperfection (Flett, Galfani-Pechenov, Molnar, Hewitt, & Goldstein, 2012; Mushquash & Sherry, 2012), and should therefore be controlled (Mackinnon et al., 2014). Without controlling for negative mood, the display of imperfection could theoretically be measuring negative affect more broadly, rather than perfectionism specifically. Thus, if measurement is confounded with depressed affect, the results observed would be spurious.

Hewitt and Flett (1991) proposed three facets of perfectionism that represent stable personality traits: self-oriented perfectionism (i.e., requiring perfection from the self), other-oriented perfectionism (i.e., requiring perfection from others), and socially prescribed perfectionism (i.e., perceiving others require perfectionism). Self-oriented perfectionism represents an interpersonal, public aspect of perfectionism and is subsequently associated with greater loneliness, shyness, and fear of negative evaluation (Flett, Hewitt, & De Rosa, 1996). Socially prescribed perfectionism is a robust predictor of social anxiety (Alden, Bieling, & Wallace, 1994; Antony, Purdon, Huta, & Swinson, 1998), as well as depressed mood (Flett et al., 1996). Conversely, self-oriented and other oriented perfectionism are not consistently related to social anxiety (Flett et al., 1996; Flett, Coulter, & Hewitt, 2012), and are thus not considered as covariates.

Perfectionism cognitions reflect more state-like personal perfectionistic themes and arise when individuals sense a discrepancy between their actual and ideal self (Flett, Hewitt, Blankstein, & Gray, 1998). These automatic thoughts tend to be related to dimensions of perfectionism and are conceptualized by Flett et al. (1998) as being more closely related to self-oriented perfectionism. However, some researchers argue that perfectionism cognitions are not a single domain, containing three distinct factors of perfectionism (i.e., perfectionistic strivings, perfectionistic demands, and perfectionistic concern; Stoeber, Körner, & Astwick, 2007). Other researchers have shown that perfectionism cognitions share a strong association with both self-oriented and socially prescribed perfectionism (Flett et al., 2012). Nonetheless, given the 3-dimend and 2-form model (Mackinnon et al., 2014) and their presented factor analytic results, we conceptualize perfectionism cognitions as unidimensional. Perfectionism cognitions are associated with increased depression, anxiety and avoidant social behaviors (Flett, Mastoritis, Hewitt, & Heisel, 2002), and over and above other measures of trait perfectionism (Flett, Hewitt, Whelan, & Martin, 2007).

Participants

Recruitment took place in Halifax Regional Municipality (HRM) and at Dalhousie University in Halifax, as well as in Montreal and Concordia University in Montreal. In order to participate, individuals had to: (a) be between the ages of 18 and 65; (b) have consumed at least 12 alcohol drinks in the past year; (c) not have internet access; (d) and have Facebook in the past year. Approximately 90% of participants were over 40 years of age, with about 10% over 65. Additionally, the majority of participants were female (79.8%). Participants self-reported their ethnicities as Caucasian (White 73.8%), Asian (7.7%), Hispanic (2.7%), African Canadian (Black 2.3%), Middle Eastern (11.1%), First Nations (0.8%), and Other (6.5%). Participants were reimbursed $12 CDN as compensation, if participants were psychology students they were asked to report on the past 24 hours. More specifically, the time frame for daily questionnaires was from 4 am one day to 4am the next day (e.g., “From 4 am Monday to 4am Tuesday”). Daily questionnaires took approximately 15 minutes to complete. If participants forgot to complete a set of questionnaires on a specific day, they could make it up by filling out two daily questionnaires the following day. Participants completed the baseline questionnaire referred to a specific time and date. Once 48 hours had passed, participants were no longer able to complete that day’s survey and received no compensation for that day. Participants were debriefed via email.

Participants were only compensated for each questionnaire they completed in order to reduce missing data (i.e., 42% of test-retest data). Questionnaires were only compensated for two daily questionnaires on a specific date (e.g., “From 4 am Monday to 4am Tuesday”). Participants were only compensated for each questionnaire they completed in order to reduce missing data (i.e., 42% of test-retest data). A detailed analysis of the above data analysis plan was preregistered at https://osf.io/5y2ia/., including all questionnaires used in the present study (as well as other questionnaires not analyzed in this paper) and their corresponding raw data.

Method

Open data and materials

Materials

Nondisplay of imperfection

Mackinnon et al. (2014) created a 3-item short form of perfectionism cognitions scale based on the strongest factor loadings from Hewitt et al.’s (2003) perfectionism cognitions. Items were rated on a scale from 0 (not at all) to 4 (all of the time). This scale displayed good between-subjects (α = 0.74) reliability in Mackinnon et al.’s (2014) study.

Socially prescribed perfectionism

The 16-item prescribed perfectionism scale (Conn, Enns, & Clara, 2002) is a 5-item subscale of Hewitt and Flett’s (1991) Multidimensional Perfectionism Scale. Items were rated on a scale from 1 (strongly disagree) to 7 (strongly agree) and could be summed if responses were 8 or higher. The majority of the sample was female (79.8%). Participants self-reported their ethnicities as Caucasian (White 73.8%), Asian (7.7%), Hispanic (2.7%), African Canadian (Black 2.3%), Middle Eastern (11.1%), First Nations (0.8%), and Other (6.5%). Participants were reimbursed $12 CDN as compensation.

Participants

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Participants were only compensated for each questionnaire they completed in order to reduce missing data (i.e., 42% of test-retest data). A detailed analysis of the above data analysis plan was preregistered at https://osf.io/5y2ia/., including all questionnaires used in the present study (as well as other questionnaires not analyzed in this paper) and their corresponding raw data.

Procedure

Ethics approval was obtained from Dalhousie University’s Social Sciences and Humanities Research Ethics Board and Concordia University’s Human Research Ethics Committee. Interested participants contacted our lab via email and were then sent an email with a link containing our consent form and baseline questionnaire. After like variables were controlled (Mackinnon et al., 2014), without controlling for perfectionism cognitions, the results observed would be spurious.

Hewitt and Flett (1991) proposed three facets of perfectionism that represent stable personality traits: self-oriented perfectionism (i.e., requiring perfection from the self), other-oriented perfectionism (i.e., requiring perfection from others), and socially prescribed perfectionism (i.e., perceiving others require perfectionism). Self-oriented perfectionism represents an interpersonal, public aspect of perfectionism and is subsequently associated with greater loneliness, shyness, and fear of negative evaluation (Flett, Hewitt, Blankstein, & Gray, 1998). These automatic thoughts tend to be related to dimensions of perfectionism and are conceptualized by Flett et al. (1998) as being more closely related to self-oriented perfectionism. However, some researchers argue that perfectionism cognitions are not a single domain, containing three distinct factors of perfectionism (i.e., perfectionistic strivings, perfectionistic demands, and perfectionistic concern; Stoeber, Körner, & Astwick, 2007). Other researchers have shown that perfectionism cognitions share a strong association with both self-oriented and socially prescribed perfectionism (Flett et al., 2012). Nonetheless, given the 3-dimend and 2-form model (Mackinnon et al., 2014) and their presented factor analytic results, we conceptualize perfectionism cognitions as unidimensional. Perfectionism cognitions are associated with increased depression, anxiety and avoidant social behaviors (Flett, Mastoritis, Hewitt, & Heisel, 2002), and over and above other measures of trait perfectionism (Flett, Hewitt, Whelan, & Martin, 2007).
registered our analysis plan to reduce researcher degrees of freedom in subsequent analyses; however, this study cannot be considered truly pre-registered, as the data analysis plan was created after the data were collected and the second author had accessed the data prior to the registration. However, the data analyst (the first author) did not view the data prior to analysis, and the hypotheses were not tested prior to registering the analysis strategy.

Intraclans correlations, omega reliabilities, multilevel confirmatory factor analysis and multilevel structural equation modeling were utilized to test our hypotheses. Compliance rates were assessed by examining proportions of missing data. Day of study was included as a covariate in our multilevel SEM analyses to meet the missing at random assumption, consistent with Mackinnon et al., (2014). ICCs were computed for each variable to determine whether multilevel modeling was warranted. ICCs indicate the percentage of variance available to be explained at the between-subjects level. ICCs larger than .05 are considered suitable for multilevel analysis (Preacher, Zypftr, & Zhang, 2010). Means and standard deviations were calculated on averaged total scores (i.e., averaging across all items) and reported at the between-subjects level by averaging each variable across the 21 days. Latent multilevel correlations were reported at the between-subjects and within-subjects level using Mplus 8.0. Within both the within- and between-subjects level, a five-factor structure was specified (see Figure 1). Five factors were selected based on Mackinnon et al.’s (2014) exploratory factor analysis (EFA) that used the same items as the present study for perfectionism cognitions, non-display of imperfection, social anxiety and depressed mood. Our analyses had an additional factor due to socially prescribed perfectionism being measured daily in the present study instead of at baseline only. A well-fitting model was defined by a confirmatory fit index (CFI) around .95, a root mean square of approximation (RMSEA) around .05, a standardized root mean square residual (SRMR) around .08, and factor loadings > .40 (Kline, 2005). We also reported the goodness-of-fit χ² statistic and the associated p-value; however, we relied exclusively on the fit indices above for determining model fit. Hypotheses were tested using multilevel SEM, with days (within-subjects) nested within people (between-subjects; see Figure 2). Within-subjects results allowed us to assess day-to-day variations, and between-subjects results assessed the overall relationship when variables were aggregated across the 21 days. The initial tested model had random intercepts and fixed slopes, to replicate Mackinnon et al.’s (2014) approach. However, random slopes models were tested in exploratory analyses. MLR estimation was utilized which allows for robust standard errors and does not assume normality, and missing data was handled using a full information maximum likelihood approach.

Changes from Proposed Analytic Plan

We intended to use MLR estimation in all models. However, when attempting to run the random slopes model with an MLR estimator we received an error message that there was not enough memory due a very large number of integration points (see Supplemental Materials for the output containing this error message). As a result, we utilized a Bayes estimator for our random slopes model as it is much more efficient than MLR estimation. Because we used an MLR estimator for our a priori fixed slopes model, this prevented us from completing planned nested model comparisons as our fixed and random models utilized different estimators. Thus, we present both models. We also retained a fully unstructured covariance matrix in the random slopes model, rather than removing non-significant variance and covariance components using priors and a sequential Bollen-Stine correction, as originally planned. This was an unanticipated consequence of needing to switch to a Bayes estimator, as only full variance-covariance blocks are allowed with the Bayes estimator in Mplus 8.0 (see Online Supplementary Material for the model that produced this error).

Finally, we ran additional unplanned exploratory analyses in order to investigate poor model fit. Specifically, after investigating the modification indices for our CFA, we ran an additional CFA and fixed slopes SEM model where we removed socially prescribed perfectionism item 1 from the scale. Also, based on a reviewer request we added McDonald’s noncentrality index (MNCI) as a fit index. A MNCI of around .90 defined a well-fitting model post-hoc (Hu & Bentler, 1999; McDonald, 1989). We also provide a test of cross-level metric invariance (i.e., are the factor loadings equal in magnitude at the within and between levels?) using procedures from Jak and Jorgensen (2017), similarly added due to a reviewer request. These analyses are clearly described as exploratory, rather than planned.

Differences Between the Original Study and the Replication

Our replication study differed from the original Mackinnon et al., (2014) study in a few important ways. Participants in the present study were recruited from Halifax Regional Municipality and Montreal where participants in Mackinnon et al.’s (2014) study were recruited from Halifax Regional Municipality only. Participants in the present study were also provided with online questionnaires instead of Palm Pilots. Socially prescribed perfectionism was
measured daily in the present replication study, instead of at baseline only. A multilevel FFA was calculated in the present study instead of a multilevel FFA because we had an a priori factor structure based on Mackinnon et al.’s (2014) findings. Instead of testing our hypotheses with a multilevel regression using averaged total scores in SPSS (IBM Corp, 2017), the present replication utilized multilevel SEM with latent variables using Mplus 8.0. Reliability estimates in the present study were calculated using the omega coefficient, and state- and trait-like variability was measured by calculating ICCs, instead of generalizability theory (Cranford et al., 2006). An exploratory analysis was conducted where random intercepts and random slopes were specified; however, our a-priori analysis specified random intercepts and fixed slopes, consistent with Mackinnon et al. (2014). Finally, socially prescribed perfectionism was entered as a multilevel predictor instead of as a between-subjects covariate, as it was measured daily.

Results

Power Analysis

We conducted a Monte Carlo simulation in Mplus 8.0 to assess statistical power. Because an analysis of this complexity has many parameters that are difficult to estimate in advance (i.e., slopes, factor loadings, covariances, variances, intercepts), we used data from the replication target (Mackinnon et al., 2014) to generate these parameters. Specifically, we ran a roughly equivalent multilevel SEM model in Mplus on the replication target’s data, saved the starting values, and input these values as the population parameters for the simulation. When we ran a simulation assuming N = 263, 80% usable days of data, 1% item-level missingness, and used 5000 repetitions. Thus, this is a post-hoc power analysis that uses population parameters from the replication target and a sample/cluster size from the present replication. Statistical power was as follows: perfectionistic self-presentation (within = 1.00, between = 0.99), perfectionism cognitions (within = .993, between = .950), and depressive affect (within = 1.00, between = .999), socially prescribed perfectionism (within = .240). Power was generally >99%; however, there was low power for socially prescribed perfectionism and between-subjects perfectionism cognitions slopes. Given that the primary hypothesis (H1) pertains to the perfectionistic self-presentation slope, this is unlikely to be problematic. Mplus files with full details on the simulation are located on this paper’s OSF page.

Protocol Compliance

There was no missing data for demographic variables given all participants were required to complete the baseline measures before beginning the daily measures. Participants completed on average 16.16 days (SD = 4.68) out of 20 days. One participant completed only the baseline measures and no daily measurements, two participants completed only one daily measurement and 67 participants completed all 20 daily questionnaires (range of 1 to 20). Participants completed on average 787 (SD = 4.93) make-up days (i.e., surveys that were 1 day late). Eleven participants completed zero make-up days, 17 completed one make-up day, and seven completed 19 make-up days (range of 0 to 19). It was possible to have a maximum of 5,260 data points (263 participants × 20 daily measurements). Of these, 1,009 were missing data (i.e., no data for the whole day). To be consistent with the replication target, we included day of study as an a priori predictor of missingness. However, a non-significant chi-square, χ²(19) = 25.06, p = .16, failed to confirm day as a predictor of missing data as it did in Mackinnon et al.’s (2014) study. We retained day in our models because it was a part of our a priori replication plan, but acknowledge that it unnecessary to do so. Given insightful comments from a reviewer, we recognize now that including day of study was also unnecessary in the replication target due to our misunderstanding of missing data terminology. That is, because day of study does not predict social anxiety, it does not meet the random assumption, even if it does predict missingness (Mattia, Floumney, & Byrne, 2018). Indeed, there is no theoretical reason for day of study to predict social anxiety in any systemic way, given that our sampling strategy had participants enter the study on essentially random days. We must also consider whether unobserved social anxiety scores predict missingness (i.e., on highly socially anxious days, do participants avoid completing the survey?). On one hand, this is plausible as avoidance is a common coping mechanism for anxiety. On the other, people high in social anxiety may also have potential negative social evaluation if they fail to comply to study protocols. These competing tendencies are liable to cancel each other out, resulting in a general tendency for unobserved social anxiety scores to be unrelated to missingness. Thus, we assume that data are missing completely at random; however, data could be missing not at random due to mechanisms we have not considered. If this is the case, our parameter estimates are likely to be biased. When data were missing at the item-level (<1%), a full information maximum likelihood approach was utilized.

Descriptive Statistics

Means, standard deviations, latent correlations and omega reliabilities can be found in Table 1. All variables were positively correlated with each other at the between-subjects level (r from .33 to .84). At the within-subjects level variables were positively correlated with each other with comparatively smaller effect sizes (r from 0.10 to 0.38), apart from perfectionism cognitions and depressed mood at the within-subjects level (r = .04). Relationships tended to be larger at the between-subjects level. Broadly speaking, this supports H2. Internal consistencies at the between-subjects level were: perfectionism cognitions (ICC = .77 to .78), socially prescribed perfectionism (ICC = .88 to .95), perfectionistic self-presentation (ICC = 1.00), social anxiety (ICC = .88 to .95), and perfectionism cognitions (ICC = .88 to .95). Power was generally >99%; however, there was low power for socially prescribed perfectionism and between-subjects perfectionism cognitions slopes. Given that the primary hypothesis (H1) pertains to the perfectionistic self-presentation slope, this is unlikely to be problematic. Mplus files with full details on the simulation are located on this paper’s OSF page.

Table 1: Latent correlations, reliability at between- and within-subjects levels, and means and standard deviations.

| Variable                  | 1     | 2     | 3     | 4     | 5     |
|---------------------------|-------|-------|-------|-------|-------|
| Social anxiety            |       |       |       |       |       |
| I worried about what other people thought of me | .72   | .96   | .99   | .57   |       |
| I was afraid other people noticed my shortcomings | .73   | .96   | .99   | .58   |       |
| I was afraid that others did not approve of me | .76   | .97   | .99   | .60   |       |
| I was worried that I would say or do the wrong things | .75   | .98   | .100  | .56   |       |
| When I was talking to someone, I was worried about what they were thinking of me | .70   | .96   | .99   | .58   |       |
| I felt uncomfortable and embarrassed when I was the center of attention | .56   | .79   | .99   | .60   |       |
| I found it hard to interact with people | .46   | .70   | .99   | .55   |       |
| Socially prescribed perfectionism |       |       |       |       |       |
| Success means that I must work even harder to please others | .54   | .68   | .85   | .72   |       |
| The better I do, the better I am expected to do | .58   | .80   | .90   | .74   |       |
| My family expects me to be perfect | .63   | .87   | .96   | .82   |       |
| People expect nothing less than perfection from me | .71   | .95   | .100  | .76   |       |
| People expect more from me than I am capable of giving | .59   | .85   | .94   | .76   |       |
| Nondisplay of imperfection |       |       |       |       |       |
| I expect to be perfect | .69   | .91   | .97   | .72   |       |
| I should be perfect | .73   | .91   | .95   | .73   |       |
| My work should be flawless | .62   | .83   | .93   | .70   |       |
| Depressed mood |       |       |       |       |       |
| Sad | .80   | .93   | .97   | .42   |       |
| Depressed | .84   | .96   | .100  | .50   |       |
| Blue | .77   | .90   | .98   | .43   |       |

Note: Between-subjects correlations are below the diagonal, and within-subjects correlations are above the diagonal. M = mean; SD = standard deviation. "p < .001.

Table 2: Standardized factor loadings and intraclass correlations.

| Variable                  | 95% CI standardized factor loadings | ICC    |
|---------------------------|-------------------------------------|--------|
| Social anxiety            | [0.72, 0.78]                        | 0.96   |
| Socially prescribed perfectionism | [0.73, 0.78] | 0.99   |
| Nondisplay of imperfection | [0.70, 0.77] | 0.96   |
| Depressed mood | [0.75, 0.80] | 0.98   |
| Perfectionism cognitions | [0.59, 0.70] | 0.97   |
| Mood                       | [0.62, 0.73] | 0.83   |

Note: All factor loadings statistically significant at p < .001.
variables were large [63–82], and moderate for social anxiety [55–75]. Given the small sample size, priori random intercepts and fixed slopes model are reported in Table 3. Given is no universally agreed upon benchmark to determine the strength of an unstandardized model coefficient (and the known difficulties comparing standardized coefficients in multilevel models to single-level models), we do not compare the magnitude of our results to established benchmarks (e.g., Funder & Ozer's (2019) small, medium, large, and very large), as we believe no such credible benchmarks exist for unstandardized multilevel coefficients. Nonetheless, the unstandardized slopes can be interpreted as 'a 1 point increase in X after adjusting for all other variables in the model,' which have substantive meaning. All 95% CIs reported below represent unstandardized regression slopes. Fit indices indicated that the model fit the data well.

### Planned Analyses

Results of our priori random intercepts and fixed slopes model are reported in Table 3. Given is no universally agreed upon benchmark to determine the strength of an unstandardized model coefficient (and the known difficulties comparing standardized coefficients in multilevel models to single-level models), we do not compare the magnitude of our results to established benchmarks (e.g., Funder & Ozer's (2019) small, medium, large, and very large), as we believe no such credible benchmarks exist for unstandardized multilevel coefficients. Nonetheless, the unstandardized slopes can be interpreted as 'a 1 point increase in X after adjusting for all other variables in the model,' which have substantive meaning. All 95% CIs reported below represent unstandardized regression slopes. Fit indices indicated that the model fit the data well, consistent with the measurement model, χ²(374) = 2,099, p < .001, CFI = .93, TLI = .93, RMSEA = .04, SRMR = .04, MNCI = .82. The within-subjects analysis examined state-like variance that varied across the 21 days of the study (i.e., do daily changes in X and Y vary?) Consistent with hypotheses comparing standardized coefficients in multilevel models to single-level models, we do not compare the magnitude of our results to established benchmarks (e.g., Funder & Ozer's (2019) small, medium, large, and very large), as we believe no such credible benchmarks exist for unstandardized multilevel coefficients. Nonetheless, the unstandardized slopes can be interpreted as 'a 1 point increase in X after adjusting for all other variables in the model,' which have substantive meaning. All 95% CIs reported below represent unstandardized regression slopes. Fit indices indicated that the model fit the data well.

### Table 3: Multilevel structural equation models.

| Fixed slopes model | B (SE) | 95% CI | B | τ | p |
|--------------------|-------|--------|--------|--------|--------|
| Within Subjects    |       |        |        |        |        |
| Socially prescribed perfectionism | 0.04 (0.02) | [−0.01, 0.08] | 0.131 | .04 |
| Perfectionism cognitions | 0.08 (0.03) | [0.01, 0.14] | 0.029 | .06 |
| Nondisplay of imperfection | 0.36 (0.03) | [0.30, 0.41] | <.001 | .48 |
| Depressed mood | 0.14 (0.02) | [0.10, 0.17] | <.001 | .17 |
| Day | 0.00 (0.00) | [−0.01, 0.00] | 0.481 | .02 |
| Between Subjects   |       |        |        |        |        |
| Socially prescribed perfectionism | −0.08 (0.04) | [−0.15, −0.003] | 0.042 | .11 |
| Perfectionism cognitions | 0.05 (0.04) | [−0.03, 0.14] | 0.23 | .06 |
| Nondisplay of imperfection | 0.40 (0.03) | [0.34, 0.47] | <.001 | .74 |
| Depressed mood | 0.37 (0.05) | [0.26, 0.47] | <.001 | .29 |

| Random slopes model | B (SE) | 95% CI | B | τ | p |
|--------------------|-------|--------|--------|--------|--------|
| Within Subjects    |       |        |        |        |        |
| Socially prescribed perfectionism | 0.07 (0.03) | [0.02, 0.12] | 0.003 | .07 |
| Perfectionism cognitions | 0.07 (0.05) | [−0.02, 0.16] | 0.062 | .05 |
| Nondisplay of imperfection | 0.32 (0.02) | [0.28, 0.37] | <.001 | .41 |
| Depressed mood | 0.13 (0.02) | [0.10, 0.16] | <.001 | .16 |
| Day | −0.02 (0.00) | [−0.01, 0.00] | 0.254 | .02 |
| Between Subjects   |       |        |        |        |        |
| Socially prescribed perfectionism | −0.09 (0.04) | [−0.16, −0.02] | 0.009 | .12 |
| Perfectionism cognitions | 0.08 (0.05) | [−0.01, 0.17] | 0.045 | .09 |
| Nondisplay of imperfection | 0.40 (0.03) | [0.34, 0.46] | <.001 | .75 |
| Depressed mood | 0.35 (0.05) | [0.25, 0.45] | <.001 | .28 |

Note. Day was measured at the within-subjects level only. Outcome = social anxiety; B = unstandardized path coefficients; SE = standard error; δ = posterior standard deviation; CI for fixed slopes model = confidence interval; CI for random slopes model = credibility interval; p for fixed slopes model = two-tailed p-value; p for random slopes model = one-tailed p-value; β = standardized path coefficients.

### Table 4: Present study results versus Mackinnon et al.'s (2014) study results.

| Present study's multilevel structural equation model results | Mackinnon et al.'s (2014) multilevel model results | p (SE) | 95% CI | B (SE) | τ | p |
|-----------------------------------------------------------|----------------------------------------------------|--------|--------|-------|--------|--------|
| Within Subjects                                           |                                                    |        |        |       |        |        |
| SPP                                                       | 0.04 (0.02)                                        | [−0.01, 0.08] | 0.131 | – | – |
| PC                                                        | 0.08 (0.03)                                        | [0.01, 0.14] | 0.029 | 0.11 (0.03) | – | <.001 |
| NoI                                                       | 0.36 (0.03)                                        | [0.30, 0.41] | <.001 | 0.16 (0.02) | – | <.001 |
| DM                                                        | 0.14 (0.02)                                        | [0.10, 0.17] | <.001 | 0.23 (0.03) | – | <.001 |
| Day                                                       | 0.00 (0.00)                                        | [−0.01, 0.00] | 0.481 | 0.00 (0.00) | – | >.05 |
| Between Subjects                                          |                                                    |        |        |       |        |        |
| SPP                                                       | −0.08 (0.04)                                       | [−0.15, −0.003] | 0.042 | 0.03 (0.02) | – | >.05 |
| PC                                                        | 0.05 (0.04)                                        | [−0.03, 0.14] | 0.23 | −0.04 (0.04) | – | <.001 |
| NoI                                                       | 0.40 (0.03)                                        | [0.34, 0.47] | <.001 | 0.24 (0.04) | – | <.001 |
| DM                                                        | 0.37 (0.05)                                        | [0.26, 0.47] | <.001 | 0.51 (0.10) | – | <.001 |

Note. Day was measured at the within-subjects level only in both studies. Mackinnon et al. (2014) measured socially prescribed perfection at baseline only and did not report exact p-values or 95% confidence intervals. Outcome = social anxiety; SPP = socially prescribed perfectionism; PC = perfectionism cognitions; NoI = nondisplay of imperfection; DM = depressed mood; B = unstandardized path coefficients; SE = standard error; CI = confidence interval; p = two-tailed p-value.
within-between subjects level; thus, we opted to omit one of the two perfectionism cognitions and socially prescribed perfectionism had a small and likely negligible effect on social anxiety and these results remained consistent across fixed and random slope models. This is partially consistent with Mackinnon et al.’s (2014) results, where only perfectionistic self-presentation predicted social anxiety at the between-subjects level. Missing data and a smaller sample size may have contributed to depressed mood being unrelated to social anxiety in Mackinnon et al.’s (2014) results, where only perfectionistic self-presentation played an important role in predicting social anxiety from day-to-day. Results support the notion that nondisplay of imperfection is an important predictor of social anxiety. Differences high in nondisplay of imperfection is preoccupied with a desire to appear perfect to others and fears the negative consequences of failing to do so. Individuals with social anxiety desire to appear perfect and hide their imperfections. We believe such failers will result in negative consequences (Schlenker & Leary, 1982). From a network analysis perspective on psychopathology, symptoms are viewed as emerging from complex interweaving of multiple factors. In our network, it appeared that questions became redundant when measured the construct only at baseline and not across levels (i.e., at the between and within levels). The shift in the parameter estimate was small (\(\Delta p = .03\)) and the width of the confidence interval (at most, a change of .03). Thus, the conclusions of the fixed slope analyses are corroborated: Nondisplay of imperfection and depressed mood are comparatively stronger predictors of social anxiety (relative to the other predictors), while perfectionism cognitions and socially prescribed perfectionism are comparitively weak predictors when controlling for all other variables in the model.

Discussion

Our aim was to replicate Mackinnon et al.’s (2014) study on perfectionistic self-presentation and social anxiety using a different sample. Given Prior to Mackinnon et al. (2018) work, little research had investigated these constructs longitudinally and it was unclear if perfectionistic self-presentation and perfectionism cognitions contained a trait-like component. Consistent with Mackinnon et al.’s (2014) findings, daily measures had elements of both trait-like stability across the 21 days of the study and state-like day-to-day variation. Perfectionism and perfectionistic self-presentation, perfectionism cognitions and socially prescribed perfectionism had a small and likely negligible effect on social anxiety in our model and may be a key personality feature of those who are socially anxious. At the within-subjects level, variables are interpreted as a relative measure of social anxiety (relative to the other predictors), while perfectionism cognitions and socially prescribed perfectionism are comparatively weak predictors when controlling for all other variables in the model. We obtained fixed slopes model fit indices were lower than expected (i.e., CFI = 0.94; TLI = 0.93), modification indices were examined in order to locate the source of model misfit. At the within-subjects level, there was a very large correlated error between socially prescribed perfection item 1 and perfection item 2. Fit indices indicated an improvement in model fit based on our criteria, \(\chi^2(335) = 1,437.96, p < .001, \text{CFI} = 0.96, \text{TLI} = 0.95, \text{RMSEA} = .03, \text{SRMR} = .04, \text{RMSEA}_{\text{nu} = .03}, \text{RMSEA}_{\text{nu} = .04}, \text{MNI} = .89\) (see Online Supplementary Material for a table of the results). The only notable modification index that the beta for between-subjects effect for socially prescribed perfectionism, which became non-significant, \(B = -0.06, 95\% CI [-0.15, .001]. Nonetheless, the shift in the parameter estimate was small (\(-0.03\)) and thus the shift in the estimate was minimal and not across days, providing no information on its daily factor structure (e.g., Dunkley, Zuroff, & Blankstein, 2006; Mushquash & Sherry, 2012; Mushquash & Sherry, 2013). Removing one of the temporal points resulted in improved model fit and resulted in minimal change in our fixed slopes model results. Future research may wish to investigate socially prescribed perfectionism daily in order to investigate its factor structure when measured repeatedly. Replicating Mackinnon et al.’s (2014) findings, perfectionistic self-presentation predicted social anxiety when controlling for socially prescribed perfectionism, perfectionism cognitions and depressed mood. The positive effect of socially-prescribed perfectionism at the between-subjects level, variables are interpreted as stable, trait-like variables (i.e., the construct is present but changes little across levels, and the factor loading for the construct is not invariant across levels, with loadings at the between-subjects level emerging as larger than the loadings at the within-subjects level).
I hope so but given hindsight bias, it is impossible to know if we should have done more. We are not sure if this study should be referred to as “preregistered,” recruiting a second blinded analyst and planning the analysis in advance was a net positive in terms of workflow efficiency and reducing human bias.

Limitations and Future Directions
Our study has important limitations. Our replication study included a different sample than the original Mackinnon et al.’s (2014) analytic strategy (e.g., utilizing multilevel SEM with latent variables as opposed to averaged total scores). Model fit for our CFA was also lower than expected due to large correlated errors at the within-subjects level for two items of our socially prescribed perfectionism scale. There was also some evidence these measures may not have metric invariance, since the factor loadings are larger at the between-subjects level (Jak & Jorgensen, 2017). However, subsequent exploratory analyses did suggest that this model misfit had little effect on the hypothesized slopes. Future research might examine socially prescribed perfectionism daily in order to determine whether the scale items are indeed redundant when measured daily. In order to more closely replicate Mackinnon et al.’s (2014) results, we did not utilize lagged variables and thus potential directionality could not be determined (i.e., nondisplay of imperfection did not temporally precede social anxiety in this analysis). We also did not incorporate other perfectionism variables that were measured, such as self-identified and other-oriented perfectionism. Future researchers might utilize our open-access dataset to examine other analytic strategies or to include other variables of interest. Generalizability to other demographics may be limited given that many participants are white, female, undergraduate emerging adult drinkers. Future research might investigate these relationships with a clinical sample of individuals diagnosed with a perfectionism disorder. Finally, we relied on self-report measures in the present study which are prone to social desirability biases. This may be especially true for those high in perfectionistic self-presentation and they may be less motivated to answer untruthfully in order to present the most idealistic version of themselves. Future research might use informant reports and self-reports in order to obtain an accurate estimation of perfectionism, negative mood states and social anxiety.

Conclusions
The results of our study demonstrated that perfectionistic self-presentation predicts social anxiety, replicating Mackinnon et al.’s (2014) main findings with similar daily diary methodology. Moreover, we improved upon Mackinnon et al.’s (2014) method by measuring social prescribed perfectionism daily along with depressed mood and perfectionism cognitions. We were also able to utilize rigorous multilevel SEM analyses to reach similar conclusions. This work improves upon past cross-sectional investigations of perfectionistic self-presentation and suggests that nondisplay of imperfection and perfectionism cognitions do indeed possess both state-like and trait-like components (Mackinnon et al., 2014). We believe that utilizing daily diary measures research ability and to understand how perfectionism operates from day-to-day and subsequently leads to negative mood states such as social anxiety. Understanding perfectionism in this way may lead to better intervention efforts targeted at the daily processes that directly relate to social anxiety.

Data Accessibility Statement
All participant data and analysis scripts can be found on this project’s page on the Open Science Framework website (https://osf.io/ty2aj/).

Notes
One research paper has been published utilizing this dataset. It explored the links between two perfectionism facets (perfectionism cognitions and nondisplay of imperfection), drinking motives, and alcohol-related problems (Mackinnon, Ray, Firth, & O’Connor, 2019).

Time Series
This is different than Mackinnon et al.’s (2014) criteria, which required that participants consume alcohol at least four times in the past month. A list of items for all measures located in Table 2. Multilevel level. A cognitive perspective on social phobia. W. Crozier, & L. E. Alden (Eds.), The essential handbook of social anxiety for clinicians (pp. 193–218). New York: Wiley.

Additional Files
The additional files for this article can be found as follows:
- Table S1. Descriptive statistics and Cohens’ d statistics comparing Nova Scotia and Quebec. DOI: https://doi.org/10.1525/collabra.257.s1
- Table S2. Multilevel structural equation model. DOI: https://doi.org/10.1525/collabra.257.s2

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Competing Interests
The authors have no competing interests to declare.

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- Contributed to conception and design: Sean P. Mackinnon
- Contributed to acquisition of data: Sean P Mackinnon
- Contributed to analysis and interpretation of data: Ivy-Lee L. Kehayes, Sean P. Mackinnon
- Drafted and/or revised this article: Ivy-Lee L. Kehayes, Sean P. Mackinnon
- Approved the submitted version for publication: Ivy-Lee L. Kehayes, Sean P. Mackinnon

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**Peer review comments**

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