Anxiety Symptom Severity and Implicit and Explicit Self-As-Anxious Associations in a Large Online Sample of U.S. Adults: Trends From 2011 to 2022

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Abstract

Some studies suggest a rise in anxiety prevalence and severity over the past decade, particularly among emerging adults, while others report stable rates. This preregistered study examines trends in anxiety symptom severity and explicit (self-reported) and implicit (using the Brief Implicit Association Test) associations about the self as anxious vs. calm. Using continuous cross-sectional data from 99,973 U.S. adults who visited the Project Implicit Health website between 2011-2022, we compared trends in anxiety outcomes between emerging adults (age 18-25) and adults age 26+, including during the COVID-19 pandemic. Contrary to hypotheses, average anxiety severity, and strength of implicit/explicit self-as-anxious associations did not spike at the start of the pandemic, and rates of change did not significantly differ by age from 2011-2020, except for explicit, non-relative self-as-anxious ratings. Instead, anxiety mostly remained stable, with emerging adults exhibiting consistently higher anxiety symptom severity and stronger implicit/explicit self-as-anxious associations than adults age 26+.

Keywords: anxiety, implicit associations, online, temporal trends, COVID-19

Anxiety Symptom Severity and Implicit and Explicit Self-As-Anxious Associations in a Large Online Sample of U.S. Adults: Trends From 2011 to 2022

Anxiety is one of the most common forms of psychopathology (Kessler et al., 2012). Anxiety disorders have an estimated point prevalence of 4% globally (Javaid et al., 2023), and some U.S. prevalence estimates are considerably higher (e.g., 19% one-year prevalence for U.S. adults; Harvard Medical School, 2007). Project Implicit Health, a partner-website to Project Implicit, is an online study platform that has been continuously collecting data since 2011 on self-reported anxiety symptoms and the degree to which individuals implicitly and explicitly associate themselves (vs. others) with being anxious (vs. calm). The present preregistered study investigated trends in responses to these anxiety measures over time, with a focus on differences between emerging adults (age 18-25) and adults age 26+, and on trends tied to the COVID-19 pandemic. This study used what we term a continuous cross-sectional design, a variant of a repeated cross-sectional (i.e., "pseudo-longitudinal") design. Repeated cross-sectional designs typically involve measuring unique samples of participants at prespecified time intervals, whereas in the present study, participants completed the study at any point in time, and time was analyzed as a continuous variable. While the current data are cross-sectional, the very large sample size and long duration of continuous data collection provide a unique window into anxiety symptoms and self-concept over the past decade among individuals who were interested to learn more about their implicit associations tied to anxiety.

Trends in Anxiety Among U.S. Adults Prior to COVID-19

Few studies of the U.S. population have assessed anxiety trends over time, particularly in the years immediately preceding the COVID-19 pandemic. Those studies that have assessed anxiety trends have provided mixed evidence regarding changes in anxiety. For example, the first large-scale field survey of mental health in the U.S., The National Comorbidity Survey, found no significant changes in the prevalence of mental disorders in general (data were not separated by specific diagnoses) between 1990-1992 and 2001-2003 among individuals age 15-54 (Kessler et al., 2005). A more recent annual cross-sectional survey, The National Survey on Drug Use and Health, found that the prevalence of anxiety among adults increased slightly, from approximately 5% to 7%, between 2008 and 2018 among adults age 18+ (Goodwin et al., 2020). Contrary to this finding, however, an analysis of the World Health Organization's Global Burden of Disease Dataset (which includes data from individuals of all ages) found that age-corrected prevalence and incidence of anxiety disorders were stable from 1990 to 2019 in the U.S. (Javaid et al., 2023). In sum, extant epidemiological research indicates that, in the U.S. adult population, overall levels of anxiety may have either been static *or* slightly increasing over time during the 2010s. Further research is necessary to provide clarity on these mixed findings.

While findings are mixed regarding changes in anxiety prevalence in the U.S. adult population *as a whole* prior to COVID-19, there is converging evidence of increasing anxiety prevalence among *emerging adults* (age 18-25 years) prior to COVID-19. The aforementioned National Survey on Drug Use and Health found that whereas anxiety prevalence increased from only 5% to 7% for the adult sample as a whole from 2008 to 2018, prevalence increased from 8% to 15% among adults age 18-25 (Goodwin et al., 2020). Consistent with these findings, an analysis of two large national datasets on college student health found that the percentage of students reporting overwhelming anxiety in the past 12 months increased from 51% in 2007 to 64% in 2018 (Duffy et al., 2019). In sum, there is converging epidemiological evidence that prior to COVID-19, anxiety prevalence was increasing more among emerging adults than among other adults. Proposed explanations for this trend vary. Some scholars implicate the rise of smartphones and social media (e.g., Haidt, 2024; c.f., Odgers & Jensen, 2020), while other explanations include increasing worries about climate change among young people (Hickman et al., 2021), increased academic pressures and expectations (Acharya et al., 2018), and financial insecurity due to increasing cost-of-living and tuition costs (Broadbent et al., 2023; McGorry et al., 2024).

Trends in Anxiety Among U.S. Adults During the COVID-19 Pandemic

Compared to the decade prior, there is relatively more research on population-level changes in anxiety early in the COVID-19 pandemic. Systematic reviews of epidemiological studies indicate that the global prevalence of anxiety increased in the early months of the pandemic (Aknin et al., 2022; Santabárbara et al., 2021), and that anxiety disorder prevalence increased during 2020 as a whole (Santomauro et al., 2021). Nevertheless, other studies have found that despite a sharp increase in anxiety among U.S. adults in March-April 2020, the average severity of psychological distress and anxiety returned to a pre-pandemic baseline around June 2020 (Daly & Robinson, 2021; Shuster et al., 2021; Twenge & Joiner, 2020). Regarding differences by age, a systematic review of epidemiological studies found that anxiety prevalence was higher for people younger than 35 vs. people 35+ during the initial months of the pandemic (Wang et al., 2020). Additionally, while anxiety levels declined from April 2020 to August 2022 among adults age 40+, some evidence suggests the decline was less pronounced for adults 18-39, widening the gap in anxiety symptom levels that existed at the start of the pandemic (Collier Villaume et al., 2023). By contrast, another study of U.S. adults age 18-64 found that age had no effect on the decline in anxiety after the initial COVID-19 spike (Shuster et al., 2021).

In sum, epidemiological evidence indicates that the severity of anxiety symptoms among U.S. adults increased shortly after the start of the COVID-19 pandemic and returned to a pre-pandemic baseline a few months later for most people. Among younger (vs. older) adults, anxiety prevalence was higher in the early months of the pandemic (potentially suggesting a greater initial spike in anxiety among younger adults) and may have returned to baseline more slowly (if at all), though evidence is mixed regarding this point. From a public health perspective, having a clear picture of whether and how anxiety is changing is crucial for monitoring the population's mental health, particularly around difficult historical events such as the COVID-19 pandemic. If websites such as Project Implicit Health, which passively collect data 24/7 at a lower cost than full-scale epidemiological programs, can detect large-scale trends in mental health symptoms, they may hold promise as efficient tools to monitor mental health (despite not providing a fully representative sample). Further, because prior mixed findings may stem from differences in how anxiety was measured (e.g., single-item scales vs. multi-item symptom severity measures vs. prevalence estimates inferred from a combination of measurement approaches), the current study may help clarify anxiety trends in the population and prior mixed findings, given we measure anxiety in different ways (i.e., a multi-item symptom severity measure and implicit and explicit measures of self-as-anxious associations) within the same dataset.

Implicit and Explicit Anxiety Associations

Beyond anxiety symptoms, it is important to understand anxiety-related cognitive processes, given theoretical models of anxiety (e.g., Beck et al., 1985; Beck & Clark, 1997; Peschard & Philippot, 2016) and empirical work (e.g., Chen et al., 2020; Herrera et al., 2017; Van Bockstaele et al., 2014) suggest that these processes play a central role in maintaining dysfunctional levels of anxiety. In particular, there is substantial evidence that *implicit associations*—representations in memory that are difficult to consciously control—are relevant to many forms of psychopathology, including anxiety (see Roefs et al., 2011 and Teachman et al., 2019 for reviews). For example, individuals with spider phobia symptoms tend to have relatively stronger implicit associations between spiders and negatively valenced concepts (e.g., danger, afraid) than individuals without a spider phobia, and these implicit associations weaken following treatment when spider fear is reduced (Teachman & Woody, 2003). Further, implicit associations between *self-concept* and psychopathology (e.g., associations between oneself and being anxious) predict the severity of mental health symptoms above and beyond explicit self-concept report (e.g., directly asking individuals the extent to which they think of themselves as anxious; Werntz et al., 2016). It is worth noting, however, that there is still some debate around the use of implicit associations in psychological research, including critiques of the structural validity of the measures (e.g., Fiedler et al., 2006).

Implicit associations are typically measured via reaction-time-based computer tasks such as the Implicit Association Test (IAT; Greenwald et al., 1998), which compares individuals' speed when classifying words or images into different superordinate categories while these categories are paired in opposing ways across two critical sorting conditions (e.g., pairings that associate the self as anxious in one condition vs. the self as calm in the other condition). Speed of classification is presumed to represent relative association strengths of the different category pairings (e.g., strength of associating the self with anxious vs. associating the self with calm). An IAT measuring the strength of implicit self-as-anxious associations was first proposed by Egloff and Schmukle (2002) and demonstrated predictive validity (with respect to experimenter-rated anxiety) above and beyond explicit self-report measures.

Explicit associations are representations in memory that are accessible via conscious, deliberate reflection about the concepts. A meta-analysis of 126 studies found that explicit associations are reliably (though not strongly) correlated with implicit associations, with a mean *r* of .24 (Hofmann et al., 2005). Additionally, a previous Project Implicit Health study demonstrated that self-concept-related explicit associations in mental health domains (e.g., the degree to which individuals self-report identifying as anxious or as sad) are modestly positively correlated with implicit associations (r = .16 to .32 depending on the domain), and that symptom severity is positively correlated with implicit associations (r = .10 to .35) and explicit associations (r=.41 to .57; Werntz et al., 2016). Notably, in studies estimating population-level changes in implicit and explicit associations over time, at least for social attitudes and suicide-related cognitions, the strengths of implicit and explicit associations tend to change in the same direction over time (Charlesworth & Banaji, 2019, 2022; Freichel & O'Shea, 2023). However, to our knowledge, no research has investigated large-scale changes in anxiety-related implicit or explicit associations over time.

Given prior research that implicit and explicit associations are correlated with one another and with symptom severity, it is plausible that implicit and explicit self-as-anxious associations have been following similar trajectories to population-level anxiety estimates in the previous decades; that is, increasing more for emerging adults prior to COVID-19 and spiking more at the start of the COVID-19 pandemic, particularly for emerging adults. However, the anxiety BIAT and its accompanying semantic differential task on Project Implicit Health are measures of the perception of oneself *relative to others*[1] as anxious (vs. calm), meaning that an increase in believing that *others* are anxious alongside a commensurate increase in one's

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[1] Unlike the IAT, the BIAT does not explicitly label the "Others" category, but it presents stimuli representing the Others category so is still priming that relative comparison.

perception of self as anxious would theoretically keep (relative) implicit and explicit association scores the same. Relevant to this fact, during the COVID-19 pandemic, media coverage and nation-wide discussion of mental illness increased (e.g., on social media; El-Gayar et al., 2021), likely influencing public perceptions of others as anxious. Therefore, we might hypothesize that in the present study's sample, we will observe either a spike *or* no change in self-as-anxious relative implicit and explicit associations at the start of the COVD-19 pandemic. To help evaluate this possibility, while not initially preregistered, we also separately examined change in non-relative self-as-anxious and others-as-anxious explicit ratings in our exploratory analyses.[2]

Overview and Hypotheses

The present study investigated continuous cross-sectional changes in average anxiety symptom severity and strength of implicit and explicit self (vs. others) as anxious (vs. calm) associations among U.S. participants who completed an Anxiety BIAT between June 2011 and October 2022. We did so with two sets of preregistered analyses. First, in a confirmatory framework, we tested a series of hypothesized trends informed by the broader epidemiological literature, including changes in anxiety estimates tied to the COVID-19 pandemic. Second, in an exploratory framework, we used generalized additive models to uncover any patterns over time not predicted a priori. Across analyses, we investigated differences between emerging (age 18-25) adults vs. adults age 26+, given empirical evidence that anxiety rates are different and likely changing at different rates between these age groups (Duffy et al., 2019; Goodwin et al., 2020;

[2] We do not examine the equivalent non-relative implicit single category associations given the recommended scoring of our implicit association measure does not allow us to tease apart the unique patterns for associations with the self, separate from associations with others.

Twenge et al., 2019).[3] Preregistration of these analyses and data/analysis scripts are at https://osf.io/2u65n and https://osf.io/34sz2 respectively.

Pre-COVID-19 Hypotheses

Given the repeated finding across epidemiological studies that anxiety prevalence was increasing primarily among emerging adults vs. among adults age 26+ in the years preceding the COVID-19 pandemic, we hypothesize that the rate of continuous cross-sectional change in average anxiety symptom severity and implicit and explicit self-as-anxious association strength was greater for adults age 18-25 years vs. adults age 26+ years from the beginning of data collection (June 2011) to the start of the COVID-19 pandemic. For the present study, we define the pandemic as beginning in the U.S. on March 13, 2020, the day the pandemic was declared a national emergency in the U.S.

COVID-19 Hypotheses

We hypothesize that average anxiety symptom severity increased immediately (i.e., spiked) following the start of the COVID-19 pandemic (March 13, 2020) and spiked more so for adults 18-25 years old vs. adults age 26+ years. We additionally hypothesize that average anxiety symptom severity decreased after an initial spike, returning to baseline around June 2020. We hypothesize a less rapid (continuous cross-sectional) decrease in symptoms for adults 18-25 years (vs. 26+ years) old, though we recognize prior literature was mixed on this point. Regarding the strength of implicit and explicit associations at the start of the COVID-19 pandemic, we have competing hypotheses. To the extent that implicit and explicit self (vs. others) as anxious (vs. calm) associations follow the same pattern as anxiety symptom severity,

[3] These age cutoffs were chosen to match those used in prior epidemiological work characterizing age differences in anxiety trends among the U.S. adult population (Goodwin et al., 2020; Twenge et al., 2019). However, we acknowledge that there were other reasonable choices for age cutoffs.

we hypothesize that the average strengths of both implicit and explicit associations increased immediately following the start of the COVID-19 pandemic. However, to the extent that increased nation-wide attention on mental illness during the COVID-19 pandemic influenced U.S. adults to perceive *both* themselves and others as comparably more anxious than they were prior to the pandemic, we hypothesize that average strength of both implicit and explicit associations did not change following the start of the COVID-19 pandemic.

Exploratory Analyses of Entire Study Period

Given that much of the extant epidemiological data informing our hypotheses were collected at relatively infrequent intervals (e.g., annually), our continuously collected data may capture large-scale fluctuations in average anxiety levels not found in prior research. For example, various U.S. events in the past tumultuous decade (e.g., presidential elections, racial violence, COVID-19 surges) may have caused brief fluctuations in average anxiety levels that the present study is uniquely positioned to detect. To this end, we additionally examine trends in anxiety severity and implicit and explicit associations with exploratory, generalized additive models to determine whether unexpected patterns emerge. Further—though not preregistered—given implicit and explicit association strengths capture conceptions of the self *relative to other people* as anxious, we explore trends in non-relative self-as-anxious and others-as-anxious explicit ratings separately, to understand whether patterns in implicit and explicit associations may be driven by changing perceptions of the self as anxious, others as anxious, or both.

Method

Participants

A total of 204,051 individuals in the U.S. provided informed consent for the study between June 9, 2011, and October 5, 2022, from which 99,973 were analyzed. Participants were retained for analyses if they indicated they resided in the U.S., reported an age of 18+ years,[4] and had data for at least one outcome measure (i.e., anxiety symptom severity, implicit association strength, or explicit association strength) after data cleaning (see below for information on missing data handling). We chose to focus on U.S. participants for two reasons. First, the large majority of individuals who completed the study were from the U.S., so we are best positioned to make some generalizations to the U.S. population (though this is necessarily limited as it is not a representative sample and individuals self-selected to participate). Second, the COVID-19 pandemic affected every country differently and at different times, so focusing on data from a particular country allows us to make more specific hypotheses regarding changes in our dependent variables during the COVID-19 pandemic, although we of course recognize the wide variability of COVID-19 impacts even within the United States.

The study was hosted on the Project Implicit Mental Health website from June 2011 to August 2019. In August 2019, Project Implicit Mental Health expanded to Project Implicit Health and added online studies across mental *and* physical health domains—the study was hosted on Project Implicit Health from August 2019 onwards. Participants selected between studies that focused on different mental/physical health domains (e.g., anxiety, depression, exercise). In August 2019, a question asking what brought participants to the website was added, allowing us to better characterize motivations for participating. Among the 15% of participants in the sample who answered the question, 76% reported completing the study as part of an assignment for school, 12% reported completing the study as part of an assignment for work, 4% heard about the site from a friend or co-worker, and 9% found the site for some other reason (e.g., news article, internet search on related topic). The sample was predominantly female

[4] Participants with missing or impossible age values (i.e., ages greater than the oldest verified human lifespan, 122 years) were also removed.

(76%), and White (68%). Additionally, 15% identified as Hispanic or Latino. The mean age was 27.00 years (*SD* = 10.81). Detailed demographic information on the sample is shown in Table 1. Overall, the sample was slightly less racially and ethnically diverse than the U.S. population based on the 2020 Census and had more formal education on average than the general U.S. population (United States Census Bureau, 2021a, 2021b). Average anxiety symptom severity of the sample was in the "moderate" range (*M* = 5.33, *SD* = 4.36; S. H. Lovibond, 1995).

Measures

Anxiety Symptom Severity

Anxiety symptom severity was measured via the 7-item anxiety subscale of the Depression, Anxiety, and Stress Scale-21 item version (DASS-21; Lovibond & Lovibond, 1995), a self-report measure of the frequency of anxiety symptoms over the past seven days. Participants rated the extent to which each of 7 statements applies to them on a Likert scale from 0 ("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"). Total anxiety subscale scores range from 0 to 21, with higher scores reflecting more severe anxiety symptoms over the past week. Internal consistency for this measure was good (Cronbach's alpha = 0.84, 95% CI = [0.84, 0.84]).

Strength of Implicit Self (vs. Others) as Anxious (vs. Calm) Associations

The strength of implicit associations between the self (vs. others) and anxious (vs. calm) was measured with the anxiety BIAT (BIAT development: Sriram & Greenwald, 2009; Anxiety BIAT: Werntz et al., 2016). The task consisted of two classification conditions, one in which the category labels "anxious" and "me" appeared together at the top of the screen, and one in which "calm" and "me" appeared together instead. Words related to "anxious," "calm," "me," and the background category "others" (which never appears on the screen as a category label) were displayed one at a time in the middle of the screen. Participants were instructed to press the "i" key if the stimulus belonged to one of the displayed categories and the "e" key if the word did not fit in the displayed categories. The time in milliseconds to classify stimuli across the two conditions was compared. Faster responses in the "anxious" and "me" condition compared to the "calm" and "me" condition reflect a stronger implicit association between the self and anxious (vs. calm). Importantly, because the stimuli included "me" and "others"-related words, the anxiety BIAT is a relative measure of the strength of implicit self-as-anxious (vs. calm) associations, *compared to other people* as anxious (vs. calm). After cleaning response data based on errors and extreme response latencies (see below) the anxiety BIAT was scored by taking the difference in response latency between the "calm" paired with "me" condition and the "anxious" paired with "me" condition, and then dividing that by the pooled standard deviation across all trials, in line with recommendations by Greenwald and colleagues (Greenwald et al., 2003; Nosek et al., 2014). Higher scores reflect stronger implicit self (vs. others) as anxious (vs. calm) associations. BIATs have been shown to have similar psychometric properties to IATs (Sriram & Greenwald, 2009), and the anxiety BIAT uniquely predicts self-reported anxiety symptoms even after controlling for explicit anxiety associations (Werntz et al., 2016).

Strength of Explicit Self (vs. Others) as Anxious (vs. Calm) Associations

To measure the relative strength of explicit self (vs. others) as anxious (vs. calm) associations, participants were asked to provide ratings along dimensions that match the anxiety BIAT's opposing categories, "calm" and "anxious" (i.e., *semantic differential task*; Greenwald et al., 1998; Ranganath & Nosek, 2008). Specifically, participants were asked "To what extent do you think of yourself as anxious or calm?" and "To what extent do you think of others as anxious or calm?" on scales from 1 ("Extremely anxious") to 9 ("Extremely calm"). The strength of explicit associations was calculated by subtracting the response to the question regarding "self" from the question regarding "others." Scores range from -8 to 8, with higher scores reflecting stronger self-as-anxious explicit associations, matching the directional valence of the implicit score. The "self" and "others" Likert scale ratings were also examined separately in secondary analyses (that were not preregistered, unlike the difference score, which was preregistered). For these secondary analyses, Likert scale ratings were reversed scored to match the directional valence of other measures, such that higher scores reflect higher non-relative explicit self-/others-as-anxious ratings.

Procedure

After selecting the study from the website, participants completed an electronic informed consent, which included information about the upcoming tasks (e.g., "This study examines attitudes, preferences, and beliefs related to mental health issues"). After signing the consent form, participants completed the following in randomized order: demographic questionnaire, anxiety BIAT, and anxiety symptom severity questionnaire, immediately followed by the semantic differential task. Affiliated institutional review boards approved all study procedures or ceded approval. Participation was voluntary, and no monetary compensation was provided to participants. Participants who reached the end of the study received individualized feedback based on their BIAT responses.

Plan for Analyses

We took two steps in all models to enhance our ability to generalize to the U.S. population. First, as is common in epidemiological research (e.g., Angrisani et al., 2019), we generated sampling weights for all participants based on how under/overrepresented their demographic characteristics are in the present sample compared to 2020 U.S. Census distributions (United States Census Bureau, 2021b). Sampling weights were generated using the *anesrake* package in R (Pasek & Pasek, 2018). This step artificially/statistically makes the sample more reflective of the U.S. population by up-weighting participants with sociodemographic characteristics *under*represented in the present data compared to the U.S. population and down-weighting participants with sociodemographic characteristics *over*represented in the present data compared to the U.S. population.[5] Weighting was conducted based on the following variables: race, ethnicity, sex, and age. Weights were generated for each year in generalized additive models and across the entire study period for all other models (see below). Second, in all models, potential effects of *changing* sample demographic characteristics over time were controlled for statistically. This step ensures that—for example—if the sample has a higher percentage of participants in one year vs. another from a demographic group that is more anxious on average (e.g., women tend on average to have higher rates of anxiety than men), we are controlling for that effect, so observed changes over time are not simply due to changes in the sample composition. In models that controlled for this effect via adding sociodemographic variables as covariates (i.e., the regression and SEM models), age was included as a predictor (similar to the other covariates) but was interpreted as an effect of interest. In the COVID-19 confirmatory analyses, the categorical sociodemographic covariates were recoded into two levels per variable, to reduce the number of parameters estimated (see Supplement section S1 for the exact recoding scheme).

In all models, time was re-coded as the number of years (including decimals) since the start of data collection (June 9, 2011) and analyzed as a continuous variable. Finally, the within-year distributions of our dependent variables (i.e., anxiety symptom severity and strength of

[5] Applying sampling weights does not make these findings as generalizable as full-scale epidemiological projects, given our sample consists of self-selected visitors to our study website.

implicit and explicit associations) were visually inspected to determine if and how fluctuations in the dependent variables over time were associated with changes in the shape of the distribution over time (e.g., whether a higher mean in a given year reflects a small percentage of the sample having extremely high scores vs. many people in the sample being slightly higher than people had been the previous year). The analytic plan and hypotheses were preregistered prior to data collection (https://osf.io/2u65n), and data and analysis scripts are publicly available (https://osf.io/34sz2/). See section S1.1 of the supplement for deviations from the preregistration.

Outlier and Missing Data Handling

For participants who completed at least 80% of the DASS-21 anxiety subscale items, missing items were imputed using the mean of available items. If participants completed fewer than 80% of DASS-21 items, their total DASS-21 anxiety subscale score was not computed. DASS-21 anxiety subscale scores are not available from January 13, 2012, to April 1, 2013 due to the website temporarily switching to a different symptom severity self-report measure during this period.

BIAT data were examined for exclusion following the scoring algorithm described by Nosek et al. (2014). Trials on which participants responded too slowly (>10,000 ms) were removed. Additionally, D scores were not computed for participants who responded too quickly (<300 ms) on more than 10% of overall trials, or for participants who made errors on greater than 30% of trials overall. D scores were also not computed for participants with data missing on one or more blocks of the IAT. Due to a website malfunction, raw response times were not recorded from November 17, 2021, to the end of the study period, October 5, 2022, so BIAT scores could not be calculated with the Nosek et al. algorithm for this period. Instead, D score estimates generated by the system (to display to participants) were used for this period. The "system-generated" D scores are highly correlated with and similar to D scores calculated based on the Nosek et al. scoring algorithm among participants for whom both scores are available (r = .95; raw M difference = 0.0090).

If a participant completed only one item of the explicit association measure, we could not calculate a relative score and therefore removed them from that variable. See supplemental Table S1 for missingness rates by outcome.

Pre-COVID-19 Confirmatory Analyses

We used linear regression models fit using the *stats* R package to test the moderating role of age (18-25 vs. 26+) on the rate of continuous cross-sectional change in anxiety symptom severity, strength of implicit associations, and strength of explicit associations (using a separate model for each dependent variable). Time, age, sociodemographic covariates, and Time × Age interaction were entered as predictors. The Time × Age interaction was the primary effect of interest. We additionally planned to probe for the simple effect of time on anxiety symptom severity at each level of age (18-25 vs. 26+) if the interaction term was significant. Additionally, to account for potential effects of changing sample sociodemographic characteristics over time, we entered all available sociodemographic variables as covariates in each model: sex assigned at birth, gender, race, ethnicity, educational attainment, subjective socio-economic status, relationship status, country of citizenship, and what brought the person to the website. Only main effects (i.e., not interactions) of covariates were added in the models. Data from the beginning of data collection (June 9, 2011) to just prior to COVID-19 being declared a national emergency (March 12, 2020), was analyzed.

COVID-19 Confirmatory Analyses

Hypothesized patterns in dependent variables during the COVID-19 period were tested with regression models (using a separate model for each dependent variable) fit in a structural equation modelling (SEM) framework using the *OpenMx* R package (Neale et al., 2016). We fit a single linear function with free intercept and slope that cut through the entire data collection period. To test the hypothesized spike and subsequent return to baseline, we fit an additional exponential function to the model from the beginning of the COVID-19 pandemic (March 13, 2020) to present. We computed a dummy variable for each participant (written below as $postcovid$) specifying whether they completed the study prior to March 13, 2020 (0) or on or after March 13, 2020 (1). See below for exact model specification and Figure 1 for a path diagram depicting how the model was implemented in an SEM framework. Note that eq_2 represents the distance between the single linear function and the exponential function at March 13, 2020, b_5 represents how quickly the exponential function decays, t represents time, a represents age (0 = 18-25 years, 1 = 26+ years), and c_t represents the date March 13, 2020. The magnitude of the spike is specified by the b_3 term, the difference in spike magnitudes by age is specified by the b_4 term, and whether the outcome returned to baseline is determined by the eq_2 term. In the final model, the b_5 term was constrained to be -1 to aid parameter estimation. As with the pre-COVID-19 models, we entered all available sociodemographic variables as covariates in each model.

$$Y = b_0 + b_1 t + b_2 a + \left(eq_2 + (b_3 + b_4 a) * e^{b_5(t-c_t)}\right) postcovid + covariates$$

Exploratory Analyses of Entire Study Period

Generalized additive models (GAMs) used for exploratory analyses were fit using the *mgcv* R package (Wood, 2001). GAMs derive smooth predictor functions during model estimation. Therefore, they allow for exploring linear or non-linear patterns that might be missed by parametric models. A separate model was constructed for each dependent variable, and each model included a thin-plate spline for time by age (18-25 years vs. 26+ years). GAM predictions were then generated and plotted. Interpretations of the GAMs were based on visual inspection of these plots. Given the plots exist in a two-dimensional space, had we entered sociodemographic variables as covariates as in the confirmatory models, these covariates would have necessarily been held constant such that the plots would have only depicted trends for participants with a pre-specified combination of demographic characteristics. As such, to control for potential effects of changing sample sociodemographic characteristics over time in the GAMs, the above-described weighting procedure was conducted within each calendar year of data collection (vs. for the entire sample), and these adjusted sample weights were entered into each GAM.

Results

Pre-COVID-19 Confirmatory Analyses

As shown in Table 2, the linear regression models revealed that, unexpectedly, rates of continuous cross-sectional change in average anxiety symptom severity and strength of implicit and explicit self (vs. others) as anxious (vs. calm) associations did *not* differ by age between June 2011 and March 2020. Note that while *rate of change over time* in anxiety outcomes did not significantly differ by age, as described below in the results of the exploratory analyses, mean levels of anxiety outcomes were still generally higher among emerging adults vs. adults age 26+.

Follow-up models that dropped the non-significant Time × Age interaction term revealed that, for average strength of implicit and explicit associations, rates of continuous cross-sectional change across the entire sample were nonsignificant between June 2011 and March 2020. For average anxiety symptom severity, however, the rate of continuous cross-sectional change across the entire sample was unexpectedly *negative* between June 2011 and March 2020, indicating that average anxiety symptom severity decreased slightly by year during this period.

It is worth noting that *without covariates*, rates of change in anxiety symptom severity and strength of implicit associations were statistically significantly *positive*. This indicates that changing sociodemographic characteristics of the sample is influencing anxiety outcomes over time, and that the primary models presented in the main text are adjusting for this effect. For model estimates without covariates, see Table S2. The sample getting gradually younger over time (see Table S3) is likely contributing to this phenomenon.[6]

COVID-19 Confirmatory Analyses

As shown in Table 3, the structural equation models revealed no difference by age in spike magnitude for average anxiety symptom severity (i.e., the b_4 parameter was non-significant), and overall, there was not a significant spike in average anxiety symptom severity corresponding with the start of the COVID-19 pandemic (i.e., the b_3 parameter was non-significant). Additionally, the average anxiety symptom severity equilibrium point after March 2020 was not significantly different from the overall linear function fit to the entire data collection period (i.e., *eq2* term was non-significant), suggesting the post-pandemic baseline was not different from before the pandemic. Similarly, spike magnitudes did not differ by age for implicit or explicit associations, and overall, there were no significant spikes in average strength of implicit or explicit associations. Because there were no observed spikes at the start of the COVID-19 pandemic, we were not able to test the hypothesis regarding differential rate of return to baseline by age. The equilibrium point after March 2020 was slightly higher than the overall linear function fit to the entire data collection period for average strength of explicit associations

[6] Observing different trends based on whether changing sample age is statistically controlled for has occurred in prior epidemiological research (e.g., Javaid et al., 2023).

(i.e., *eq2* term was positive), but not for average strength of implicit associations (i.e., *eq2* term was non-significant).[7] See Table S4 for all model parameter estimates, and Table S5 for parameter estimates when not including covariates.

Exploratory Analyses of Entire Study Period

Results of the generalized additive models are displayed in Figure 2. Consistent with the confirmatory models, exploratory GAMs did not reveal spikes in anxiety symptom severity or implicit or explicit associations corresponding with the start of the COVID-19 pandemic. Overall, exploratory models revealed that there was little change in average anxiety symptom severity and strengths of implicit and explicit associations during the study period among both adults age 18-25 and adults age 26+. Additionally, across all models but one, mean scores were slightly higher among adults age 18-25 (vs. adults age 26+) at nearly all points in time. Consistent with this result, collapsing across the entire study period, mean anxiety symptom severity was in the "moderate" range for adults age 18-25 (M = 6.07, SD = 4.47) and the "mild" range for adults age 26+ (M = 4.08, SD = 3.85; S. H. Lovibond, 1995). Only among explicit others-as-anxious ratings were mean scores generally higher among adults age 26+ (vs. adults age 18-25). The exploratory models did reveal several trends that were not tested for in the confirmatory models. However, these trends are only clear after substantially zooming in the ranges of the y-axes of model plots. As such, observed fluctuations in these models may not be clinically meaningful.

Regarding anxiety symptom severity, there were small peaks in average scores in late 2018 followed by gradual decreases until mid-2020 for both age groups (age 18-25 and age 26+ years). Regarding strength of implicit associations, average scores appear to have been

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[7] We do not report fit statistics (e.g., RMSEA, CFI), because these are regression models, which are by definition saturated.

increasing slightly since 2018 for both age groups, with no noticeable change in trajectory during the COVID-19 pandemic. Regarding strength of explicit self (vs. others) as anxious (vs. calm) associations, while no immediate spike was observed at the start of the COVID-19 pandemic, March 2020 appeared to be an inflection point after which average explicit anxiety associations began to increase among adults age 26+ years. In other words, while average strength of explicit associations was not *immediately* higher at the start of the COVID-19 pandemic (as was tested for in the confirmatory models), for adults age 26+, average strength of explicit associations began increasing over time starting in March 2020 (whereas it was decreasing over time prior).

Models that separately predicted non-relative self-as-anxious and others-as-anxious explicit ratings revealed that this gradual increase in strength of explicit associations among adults age 26+ was driven more by increasing strength of non-relative self-as-anxious ratings. The strength of non-relative others-as-anxious ratings appeared unchanged at the start of the COVID-19 pandemic in this age group. Additionally, non-relative self-as-anxious explicit ratings appear to be increasing linearly from 2011 to 2022 among adults age 18-25 (whereas there is less of a clear pattern for change in non-relative others-as-anxious explicit ratings).

Exploratory models accounted for only a small amount of variance in outcomes (i.e., from R^2 = 0.5% to 4.0%). Visual inspection of the distributions of outcome variables by year did not reveal observable changes in distribution shape corresponding with fluctuations observed in the GAMs (see Figure S1), suggesting that observed mean-level trends likely reflect many participants increasing/decreasing slightly rather than a small subset of the sample increasing/decreasing drastically.

Discussion

The present study characterized trends in average anxiety symptom severity and implicit and explicit self-as-anxious associations among U.S. participants who completed the Anxiety BIAT between 2011 and 2022. Contrary to hypotheses, there was no difference between emerging adults vs. adults age 26+ in the rates of change over time in anxiety symptom severity and strength of implicit and explicit self-as-anxious associations from June 2011 to March 2020. Across the entire sample, unexpectedly, anxiety symptom severity *decreased* slightly by year during this same period (when including demographic covariates). Regarding trends around the COVID-19 pandemic, contrary to hypotheses, average anxiety severity did *not* spike at the beginning of the pandemic, and there was no difference in spike size between age groups. Similarly, no spikes in the strength of implicit or explicit self-as-anxious associations were observed at the start of the COVID-19 pandemic. Follow-up exploratory models revealed that all outcomes remained fairly static across the study period (except for explicit, non-relative self-as-anxious ratings gradually increasing among emerging adults), and mean levels of anxiety severity and implicit and explicit self-as-anxious associations were higher among emerging adults (vs. adults age 26+) at nearly all timepoints.

Pre-COVID-19 Confirmatory Findings

Contrary to hypotheses, we observed no significant differences in rate of change in anxiety symptom severity or strength of relative implicit or explicit self-as-anxious associations between emerging adults vs. adults age 26+ from June 2011 to March 2020. Why might our findings contradict other findings in the literature, which report greater increases in anxiety levels among younger vs. older adults in the 2010s (Duffy et al., 2019; Goodwin et al., 2020; Twenge et al., 2019)? It could be that our measure of anxiety symptoms, the DASS-21 anxiety subscale, is too different from those used in prior research. Indeed, epidemiological studies of anxiety during this time period tend to infer anxiety prevalence from a single item (e.g., "How frequently did you feel nervous in the past few weeks?"). To the authors' knowledge, one large U.S. epidemiological program, the National Health Interview Survey, assesses anxiety with a multi-item self-report scale like the DASS-21. However, this anxiety measure was added in 2019, so data on changes over time are not yet available (Zablotsky et al., 2022). Thus, we may be arriving at a different answer than did prior work because the present study is among the first to ask if anxiety level (measured with a multi-item self-report symptom severity questionnaire) was increasing at a faster rate for emerging (vs. older) adults during the 2010s. Consistent with this possibility, we found that emerging adults increasingly reported thinking of themselves as anxious when assessed with the single-item self-as-anxious explicit association measure (though the rate of increase was very small). This raises interesting questions about how anxiety self-concept is experienced differently from specific anxiety symptoms, such as a racing heart.

Given rate of change in our main anxiety outcomes did not significantly differ by age prior to the COVID-19 pandemic, we then tested for (continuous cross-sectional) changes over time in anxiety outcomes across the entire sample. We did not have a specific hypothesis regarding change over time for the whole sample in part due to mixed prior findings reporting either an unchanged (Javaid et al., 2023) or slightly increasing anxiety prevalence (Goodwin et al., 2020) among the general U.S. adult population. Contrary to these findings, we found that average anxiety symptom severity decreased slightly by year from 2011 to 2020 (with covariates included), whereas no significant change over time was observed for strength of implicit or explicit self-as-anxious associations. This unexpected finding could again be because we measured anxiety severity with a multi-item symptom scale while the epidemiological literature generally uses a single question. Alternatively, this finding could be due to aspects of our unselected sample changing over time in ways not accounted for by our sociodemographic covariates. For example, it could be that earlier participants—when the Project Implicit Health website was less popular—were more likely to find the website due to seeking out research or resources on anxiety because this was relevant to them, whereas later participants may have been more likely to complete the study due to a course or work assignment given the website's increased popularity as a learning resource. A shift in the sample like this could "artificially" produce a decrease in anxiety severity like that found here. Importantly, we included a covariate measuring how the individual found the website to control for the sample potentially changing in this way, but this may not have been successful because this question was not added until 2019.

COVID-19 Confirmatory Findings

Contrary to findings in the broader literature (Daly & Robinson, 2021, 2022; Shuster et al., 2021; Twenge & Joiner, 2020), we did not find hypothesized spikes in anxiety symptom severity corresponding with the start of the COVID-19 pandemic in the U.S. As such, we were not positioned to test whether the magnitude of the spikes or rate of return to baseline differed by age. As before, the absence of this immediate increase in anxiety at the start of the pandemic in this sample could be attributed to our sample being self-selected *or* our measurement approach being too different from prior work to capture this effect. Regarding the sample, aspects of the present study's participants could be different from the general U.S. population in ways not measured, such that the present study's participants were not as affected by the stresses of the COVID-19 pandemic as the general U.S. population. For example, it could be that our sample had on average higher income and greater access to quality healthcare than the general U.S. population. These characteristics are related to but likely not entirely captured by our single-item subjective socioeconomic status variable. Prior studies indicate that COVID-19 exacerbated mental health disparities, such that socially advantaged groups such as those with higher income experienced smaller mental health impacts than socially disadvantaged groups (Jaspal & Breakwell, 2022; Purtle, 2020).

Alternatively, it could be that some dimensions of anxiety *did* spike in our sample, but that the DASS-21 anxiety subscale did not capture unique manifestations of anxiety during the COVID-19 pandemic. Indeed, three items on the DASS-21 capture acute physiological symptoms of anxiety (e.g., "I experienced breathing difficulty [e.g., excessively rapid breathing, breathlessness in the absence of physical exertion]"), which may have been experienced less frequently as a function of encountering fewer everyday stressors (e.g., stressful social situations) than before lockdowns. Similarly, the item about social embarrassment ("I was worried about situations in which I might panic and make a fool of myself") may not have been endorsed more highly during the pandemic given individuals in the U.S. were presumably having fewer social interactions during lockdowns. Finally, the item capturing subjective emotional experience of anxiety ("I felt scared without any good reason") may not have been highly endorsed among someone experiencing COVID-19-related anxiety, because fear may have been perceived as existing for a good reason during the pandemic.

Regarding strength of implicit and explicit self-as-anxious associations at the start of the COVID-19 pandemic, we had competing hypotheses: (1) that scores would spike, consistent with our predictions for anxiety symptom severity, or (2) that we would see no spike, given perceptions of others as anxious may be spiking alongside perceptions of self as anxious. Consistent with our second hypothesis, we observed no spike in strength of implicit or explicit self (vs. others) as anxious (vs. calm) associations. However, contrary to our assumption that this would be because self- and others-as-anxious perceptions *both* spiked, when we separated explicit ratings, we observed no spike for either outcome at the start of the COVID-19 pandemic. This suggests that individuals did not perceive themselves (vs. others) as more anxious at the beginning of the COVID-19 pandemic, either implicitly or explicitly.

Exploratory Findings Across the Study Period

Consistent with the null findings from the confirmatory tests, the clearest takeaway from the exploratory findings is that most anxiety outcomes remained fairly static from 2011 to 2022. Additionally, mean levels of anxiety severity and implicit and explicit self-as-anxious associations were higher among emerging adults (vs. adults age 26+) at nearly all timepoints across the study period. This finding is consistent with evidence that anxiety prevalence is higher in emerging adults than in adults past their mid-twenties (Remes et al., 2016) and that anxiety disorder onset is typically during adolescence to early adulthood (Lijster et al., 2017).

We are hesitant to make strong claims about other trends in the exploratory analyses, given the models explained little of the variance in outcomes, and effects may be too small to be clinically meaningful. However, we offer a few tentative interpretations. Among both emerging adults and adults age 26+, exploratory analyses revealed small peaks in average anxiety symptom severity around late 2018 followed by gradual decreases until mid-2020. It could be that these peaks in anxiety reflect elevated anxiety around the November 2018 midterm election in the U.S. Indeed, previous Project Implicit studies indicate that participants of these studies tend to lean liberal (e.g., Connor et al., 2019), and the 2018 midterm election was likely a stressor for this population given it decided whether the Republican party would retain control over both the Senate and House of Representatives during President Trump’s term. However, this interpretation should be made with caution, given similar peaks were not observed around the

2016 and 2020 elections, which presumably would have been similarly (if not more) stressful for this population.

Regarding explicit associations, despite there being no immediate spike at the start of COVID-19, among adults age 26+, strength of explicit associations did appear to start gradually increasing at the start of the COVID-19 pandemic. The model separating explicit self- vs. other-ratings suggests that this gradual increase is driven more by increasing non-relative perceptions of the self as anxious, as opposed to decreasing non-relative perceptions of others as anxious. This trend could reflect that adults age 26+ experienced stressors tied to the pandemic that became more challenging with time, such as job insecurity and home/familial/caretaking responsibilities, that were more pronounced than they were for the emerging adult participants who were predominantly in college.

Limitations

Importantly, though the present study had a large sample size and statistical steps were taken to improve generalizability, the present study had a self-selected sample, so results should be interpreted with caution. As previously mentioned, it is possible that changes in sample characteristics not captured by the sociodemographic variables contributed to the observed trends. Additionally, the demographics of our sample differed in some significant ways from the U.S. population, as our sample was younger, more female, and more highly educated. This was corrected for statistically by down-weighting participants with demographic characteristics overrepresented in the sample and up-weighting those with demographic characteristics underrepresented, but it would be preferable if the sample were representative without these reweighting procedures. Finally, as mentioned, data in this study are cross-sectional, and longitudinal data is generally better positioned to study within-person theories (e.g., stress during the COVID-19 pandemic increasing anxiety within individuals).

Conclusion

The present study examined trends in anxiety symptom severity and implicit and explicit self-as-anxious associations in a large continuous cross-sectional sample of U.S. adults who visited the Project Implicit Health website between June 2011 and October 2022. The study is the first to our knowledge to investigate how anxiety-related implicit and explicit associations may be changing over time in the U.S. population and extends prior epidemiological work with a high level of granularity given continuous data collection. We found that, unexpectedly, there was no significant difference between emerging and age 26+ adults in the rates of continuous cross-sectional change in anxiety symptom severity, strength of implicit associations, and strength of explicit associations. Further, we did not observe expected spikes in average anxiety symptom severity corresponding with the start of the COVID-19 pandemic. Instead, we found that anxiety outcomes were fairly static during this time period, except for non-relative self-as-anxious ratings in emerging adults, which appeared to be gradually increasing through the study period. Additionally, all anxiety outcomes were generally higher among emerging adults vs. adults age 26+. While public research websites such as Project Implicit Health hold promise as an adjunct to epidemiological programs for monitoring population-level mental health, future research is necessary to learn how to mitigate issues related to selection bias and measurement.

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Table 1

Participant Demographic Characteristics

Characteristic	*n*	%
Age (years)		
18-25	62,646	62.7
26+	37,327	37.3
Gender		
Female	76,056	76.1
Male	22,980	23.0
Non-Binary or Other[a]	385	0.4
Prefer not to answer	552	0.6
Sex assigned at birth		
Female	24,481	24.5
Male	6,032	6.0
Other	39	0.0
Prefer not to answer	691	0.7
Data not available[b]	68,730	68.7
Race		
White/European origin	67,889	67.9
Black/African origin	8,178	8.2
Multiracial	5,665	5.7
East Asian	3,432	3.4
South Asian	2,705	2.7
American Indian/Alaska Native	633	0.6
Native Hawaiian/Pacific Islander	591	0.6
Other or Unknown	8,307	8.3
Prefer not to answer	2,573	2.6
Ethnicity		
Not Hispanic or Latino	78,468	78.5
Hispanic or Latino	14,835	14.8
Unknown	5,104	5.1
Prefer not to answer	1,566	1.6
Educational Attainment[c]		
High school graduate or less	15,889	15.9
Some college or Associate's/Bachelor's degree	63,033	63.1
Some graduate school or advanced degree	18,694	18.7
Prefer not to answer	2,357	2.4

Note. $N = 99{,}973$. Participants were on average 27.00 years old ($SD = 10.81$).
[a]"Non-Binary or Other" was added as an option in August 2019.
[b]Sex assigned at birth was added as a question separate from gender in August 2019, so values for participants prior to August 2019 were not captured.
[c]Response options were combined to save space.

Table 2

Effects of Time-by-Age Interaction and Time on Outcomes from June 2011 to March 2020 Controlling for Changes in Sociodemographic Characteristics

Predictor	Model[a]	*b* (*SE*)	95% CI[b]	*df*	*t*	*p*
			Anxiety Symptom Severity			
Time × Age	Interaction Model	-1.51 (0.82)	[-3.13, 0.10]	3,583	-1.83	.067
Time	Main Effects Model	-0.96 (0.32)	[-1.59, -0.32]	3,584	-2.97	.003**
Age	Main Effects Model	-1.21 (0.18)	[-1.56, -0.85]	3,584	-6.70	<.001***
			Implicit Association Strength			
Time × Age	Interaction Model	-0.11 (0.10)	[-0.32, 0.10]	3,151	-1.05	.294
Time	Main Effects Model	-0.07 (0.04)	[-0.15, 0.01]	3,152	-1.61	.107
Age	Main Effects Model	-0.12 (0.02)	[-0.17, -0.08]	3,152	-5.38	<.001***
			Explicit Association Strength			
Time × Age	Interaction Model	0.56 (0.62)	[-0.64, 1.77]	3,574	0.92	.360
Time	Main Effects Model	-0.28 (0.24)	[-0.75, 0.20]	3,575	-1.15	. 251
Age	Main Effects Model	-0.27 (0.13)	[-0.53, -0.01]	3,575	-2.01	.045*

Note. Effects of predictors on outcomes were estimated with linear regression models with available sociodemographic variables entered as covariates and raking-generated sampling weights based on 2020 Census demographics applied. Age was coded as 0 = 18-25 years, 1 = 26+ years.

[a]Main effects of Time and Age were estimated in separate models that did not include Time × Age interaction.

[b]95% CIs were computed assuming normality.

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

Table 3

COVID-19 Confirmatory Model Parameter Estimates

Parameter	Estimate (*SE*)	95% CI[a]
Anxiety Symptom Severity[b] (*df* = 955,570)		
Intercept (b_0)	7.83 (0.22)	**[7.40, 8.27]**
Time (b_1)	-0.00 (0.01)	[-0.02, 0.02]
Age (b_2)	-1.26 (0.11)	**[-1.47, -1.05]**
COVID-19 Spike Magnitude (b_3)	-0.07 (0.69)	[-1.43, 1.28]
Age difference in COVID-19 Spike Magnitude (b_4)	-0.07 (0.69)	[-1.43, 1.28]
Difference in Equilibrium Point After (vs. Before) March 13, 2020 (eq2)	-0.22 (0.99)	[-2.17, 1.73]
Implicit Association Strength (*df* = 964,136)		
Intercept (b_0)	-0.12 (0.01)	**[-0.15, -0.09]**
Time (b_1)	0.00 (0.00)	**[0.00, 0.01]**
Age (b_2)	-0.10 (0.01)	**[-0.11, -0.09]**
COVID-19 Spike Magnitude (b_3)	-0.07 (0.16)	[-0.38, 0.24]
Age difference in COVID-19 Spike Magnitude (b_4)	-0.07 (0.16)	[-0.38, 0.24]
Difference in Equilibrium Point After (vs. Before) March 13, 2020 (eq2)	0.32 (0.22)	[-0.11, 0.75]
Explicit Association Strength (*df* = 985,201)		
Intercept (b_0)	1.94 (0.06)	**[1.83, 2.05]**
Time (b_1)	0.00 (0.00)	[-0.01, 0.01]
Age (b_2)	-0.38 (0.03)	**[-0.43, -0.33]**
COVID-19 Spike Magnitude (b_3)	-0.15 (0.25)	[-0.65, 0.34]
Age difference in COVID-19 Spike Magnitude (b_4)	-0.15 (0.25)	[-0.65, 0.34]
Difference in Equilibrium Point After (vs. Before) March 13, 2020 (eq2)	0.58 (0.26)	**[0.07, 1.09]**

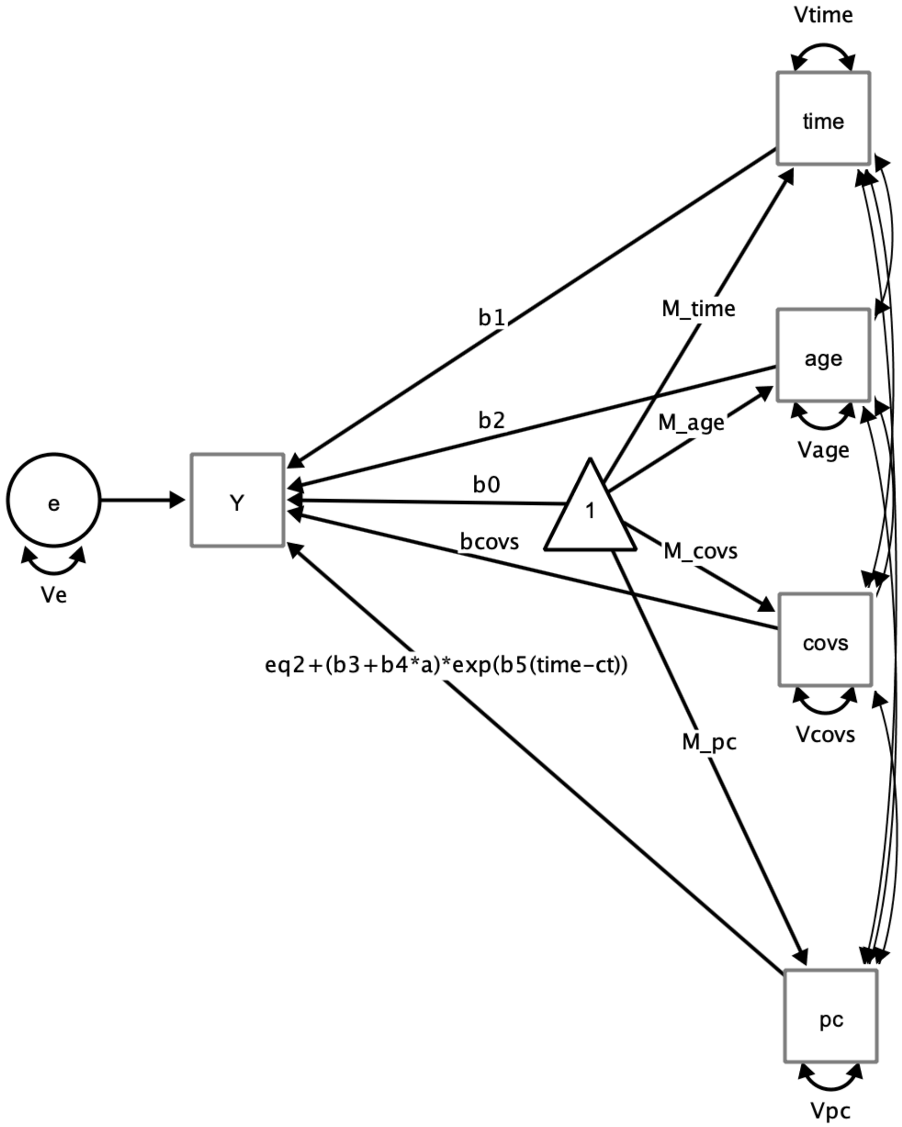
Note. Parameters were estimated with structural equation models with available sociodemographic variables entered as covariates and raking-generated sampling weights based on 2020 Census demographics applied. Parameters estimates represent terms in the following expression: $Y = b_0 + b_1 t + b_2 a + \left(eq_2 + (b_3 + b_4 a) * e^{b_5(t-c_t)}\right) postcovid + covariates$, with b_5 fixed at -1.

[a]95% CIs were computed assuming normality.

[b]Sex assigned at birth was *not* included as a covariate in this model due to its inclusion causing errors in estimating parameters.

Figure 1

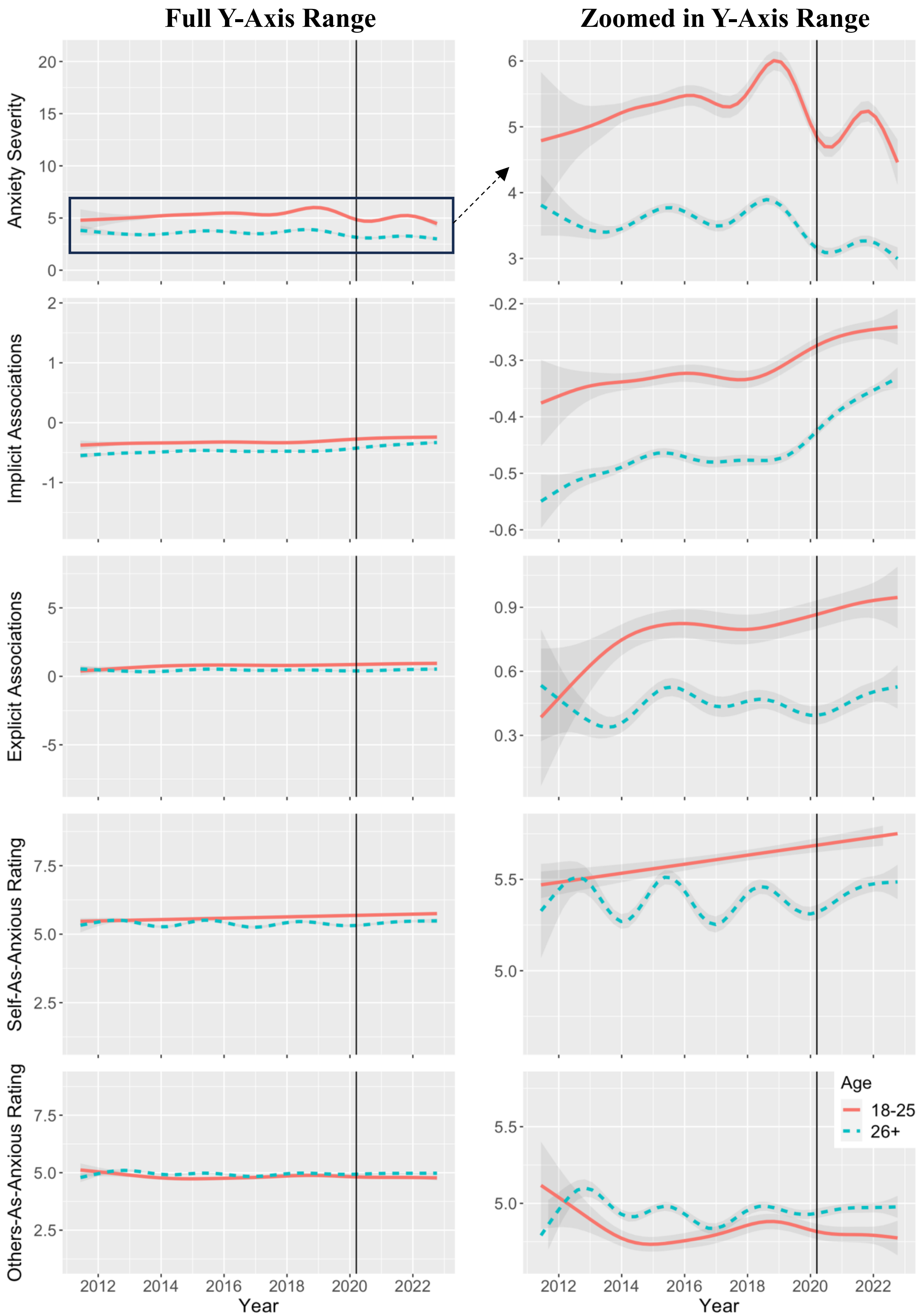
Path Diagram of COVID-19 Confirmatory Models



Note. "Covs" represents the sociodemographic variable covariates, which were included separately in the model but not differentiated here. "Pc" represents the dummy variable specifying whether participant completed the study prior to March 2020 (0), or after March 2020 (1). "Y" represents the outcome variable (i.e., anxiety symptom severity, strength of implicit associations, or strength of explicit associations).

Figure 2

Results of Exploratory Models Predicting Each Anxiety Outcome Across the Entire Study Period



Note. Vertical black lines indicate March 13, 2020.