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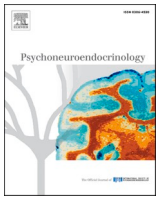

Lifetime heterosexist victimization and diurnal cortisol predict depression trajectories among sexual and gender minority emerging adults

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ABSTRACT

Heterosexist victimization constitutes a severe source of social stress with enduring effects on mental health and the adrenocortical functioning of lesbian, gay, bisexual, transgender, and queer (LGTBQ) emerging adults. However, it is unknown what roles lower or higher diurnal cortisol at waking (cortisol intercepts) and less variable fluctuations ("flatter" slopes) play in the links between heterosexist victimization and depressive symptoms. In accordance with diathesis-stress, allostatic load, and biological embedding perspectives, we examined whether cortisol intercepts and slopes moderated or mediated the predictive associations of heterosexist victimization with depressive symptoms over 24-months. Heterosexist victimization was expected to predict depressive symptoms most strongly for LGBTQ emerging adults with flatter cortisol slopes (i.e., moderation), and cortisol intercepts and slopes were expected to indirectly link heterosexist victimization with depressive symptoms (i.e., mediation). Latinx and White LGBTQ emerging adults (N = 97; ages 18–29, M = 23.91 years, SD = 2.63) provided saliva samples and questionnaire responses during a four-day testing protocol at baseline; two additional assessments of depressive symptoms were completed 9- and 24-months later. Cortisol intercepts and slopes moderated associations of heterosexist victimization with both contemporaneous and prospective depressive symptoms. Heterosexist victimization was positively associated with contemporaneous depressive symptoms and decreases in depressive symptoms over two years when LGBTQ emerging adults also had steeper cortisol slopes. Heterosexist discrimination was associated with increases in depressive symptoms prospectively among participants with lower cortisol intercepts. There was no evidence for mediation. Thus, patterns of diurnal adrenocortical functioning may distinguish between LGBTQ emerging adults who are more prone to acute versus prolonged depressive symptoms when they experience heterosexist victimization.

1. Introduction

Lesbian, gay, bisexual, transgender, and queer (LGBTQ) emerging adults experience heterosexist discrimination and victimization from others because of their minortized social group memberships. In accordance with the minority stress model (Meyer, 2003), heterosexist discrimination, enacted via victimization, is initiated and perpetuated by stigmatizing heterosexist ideologies (i.e., the assumption that heterosexuality is the norm or superior to non-heterosexual sexual orientations; (Graham et al., 2011; Parra and Hastings, 2018). Experiences of heterosexist victimization constitute severe forms of social stress that compromise LGBTQ health (Flentje et al., 2020; Hatzenbuehler and Pachankis, 2016; Lick et al., 2013, 2013). Consistent with this, LGBTQ emerging adults have higher rates of depressive symptoms and depression diagnosis than their heterosexual counterparts (Haas et al., 2010; King et al., 2008; Marshal et al., 2011, 2013).

The LGBTQ community is vibrantly diverse in its social group composition, including people of color (POC; i.e., non-homogenous White individuals such as Latinx). Multiple social and structural oppressive forces determine LGBTQ people of color's (LGBTQ-POC) mental and physical health (Hastings et al., 2022; Hatzenbuehler et al., 2013; Hatzenbuehler and Pachankis, 2016; Henderson et al., 2022; Link and Phelan, 1995) and interact uniquely at the intersections of their minoritized non-heterosexual and non-White status (Balsam et al., 2011;

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Bowleg, 2008; Cyrus, 2017; DeBlaere et al., 2010; Meyer, 2010; Parent et al., 2013; Parra and Hastings, 2018). Within LGBTQ communities, LGBTQ-POC report elevated depressive and other psychological distress symptoms (Balsam et al., 2011; Boyd et al., 2021; Consolacion et al., 2004; Díaz et al., 2001; Madera et al., 2017; Mallory and Russell, 2021; Meyer et al., 2008; Ramirez and Paz Galupo, 2019). Despite increased depressive symptomatology found in LGBTQ-POC population samples, most biopsychosocial studies that consider the roles of neurobiology in LGBTQ people's experiences and mental health have rarely applied an intersectionality lens (Parra and Hastings, 2018). This lack of intersectionality perspective (Crenshaw, 1989) prevents a comprehensive contextualization of the lived experiences (Crenshaw, 1991) and mental health (Bowleg, 2012) of persons holding multiple interconnected minoritized social group memberships. Applying an intersectionality approach, which originates from Black feminist theory (Combahee River Collective, 1977; Hancock, 2016), could help to identify, examine, and describe the effects of oppressive discriminatory experiences on adrenocortical diurnal patterning of LGBTQ-POC people (Parra and Hastings, 2018, 2020), as well as bringing attention to the heterogeneity of these associations both within (intracetegorical) and between (intercategorical) multiply minoritized populations (McCall, 2005). However, whether heterosexist victimization affects mental health as a function of adrenocortical diurnal patterning in racially or ethnically diverse groups of LGBTQ emerging adults is unknown and warrants further empirical investigation.

The diathesis-stress model of depression is a classic theoretical framework for examining individual differences in the etiology of depressive symptoms (Beck, 1967; Robins and Block, 1989) and aids with identifying *who* is at most risk for developing depressive symptoms. Specifically, this diathesis-stress model posits that the effects of stressor exposure on depressive symptoms are dependent on an individual's stress sensitivity (diathesis) for depression risk, including biological sensitivity to stressful life circumstances (Monroe and Simons, 1991). Two key hypothalamic-pituitary-adrenal (HPA) axis biomarkers of stress sensitivity are elevated and reduced diurnal cortisol levels, as evidenced by higher or lower waking cortisol, respectfully, paired with less variable patterns of cortisol secretion over the day (Colich et al., 2015; LeMoult et al., 2015; Owens et al., 2019; Schuler et al., 2017; Shapero et al., 2019). Heightened or diminished diurnal HPA axis activity, sometimes termed hypercortisolism and hypocortisolism, respectively, are associated with depressive symptoms (Villaume et al., 2023). Thus, consideration of diurnal cortisol as a diathesis, or a moderator, can inform for *whom* within the LGBTQ community experiences of discrimination or victimization are most likely to pose risks for depressive symptoms. However, whether this is similarly true for the diverse constituents of the LGBTQ community, including LGBTQ-POC, is uncertain. Similarly, whether heterosexist victimization and diurnal adrenocortical fluctuations conjointly predict subsequent development of future depressive symptoms is unknown.

In addition to acting as a diathesis, there is a second way in which diurnal cortisol patterns have been associated with stressful experiences and depressive symptoms. Repeated activation of the HPA axis due to conditions of chronic stress can lead to "wear and tear" of the HPA axis, an indicator of allostatic load, evidenced in "flattened" diurnal cortisol patterns that can have neurotoxic effects (Juster et al., 2010; McEwen, 1998; McEwen and Stellar, 1993). There are glucocorticoid and mineralocorticoid receptors for cortisol within multiple neural systems associated with arousal, emotion regulation, and assessments of threat or lack of safety (Juster et al., 2010; McEwen, 2007; Slavich, 2020). Sustained low flat (i.e., hypocortisolism) or high flat (i.e., hypercortisolism) diurnal cortisol patterns may adversely impact the functioning of these systems, conferring risk for mental health problems (Adam et al., 2017) including a greater likelihood for depressive symptoms (Adam and Kumari, 2009; Doane et al., 2013; Hoyt et al., 2021). Hypercortisolism has been found to explain the link between experiences of heterosexist victimization with depressive symptoms among LGBTQ emerging adults (Parra et al., 2016). Thus, the application of an allostatic load perspective may help to explain *how* flatter diurnal cortisol patterns indirectly link stressor exposure to depressive symptoms. This premise is consistent with theories of biological embedding (Shonkoff et al., 2009) and embodiment (Krieger, 2012), which posit that high-flat or low-flat diurnal cortisol patterns function as biological mechanisms, or mediators, in the etiology of depressive symptomology and various health disparities.

Thus, the goal of this study was to examine whether patterns of diurnal salivary cortisol influence the predictive relations of heterosexist victimization with contemporaneous and future depressive symptoms in LGBTQ-Latinx and LGBTQ-White emerging adults. Specifically, we aimed to utilize diurnal cortisol patterns in order to identify *who* is at greater risk for depressive symptoms in the context of heterosexist victimization, and *how* experiences of heterosexist victimization convey their effects on the depressive symptomology of ethnically and racially diverse LGBTQ emerging adults.

1.1. Minority stress, intersectionality, and depressive symptoms during emerging adulthood

LGBTQ persons are at greater risk of current and lifetime depressive symptomatology than heterosexual persons (King et al., 2008; Marshal et al., 2011), with disparities in depressive symptoms being stable across emerging adulthood (ages 18-29) (Marshal et al., 2013). Emerging adulthood is a developmental period characterized by sexual identity exploration and formation (Morgan, 2013; Patterson, 2008), heightened rejection sensitivity (Feinstein, 2020), and increased risk for psychopathology persisting across the life span (de Girolamo et al., 2012). During emerging adulthood, individuals increasingly orient toward peers, seeking to individuate themselves and shape their identity (Arnett, 2011; Tanner and Arnett, 2016). If LGBTQ emerging adults experience negative reactions from their peers or others, they may come to view aspects of their own identity negatively or as devalued by others, contributing to a more global negative self-view as reflected in depressive symptoms (Hall, 2018; Newcomb and Mustanski, 2010).

Indeed, heterosexist victimization by peers or others outside the home is associated with increased depressive symptoms among LGBTQ adolescents and emerging adults concurrently (Price-Feeney et al., 2018), and prospectively (Birkett et al., 2009; Earnshaw et al., 2017). For example, among GB male emerging adults, increases in heterosexist discrimination were associated with increases in depressive symptoms annually over eight years (Pachankis et al., 2018).

Among LGBTQ-POC and LGBTQ-White samples in cross-sectional studies, LGBTQ-Latinx adults often report more depressive symptoms than LGBTQ-White participants (Kertzner et al., 2009), although this has not been observed in all studies (Vargas et al., 2021). Within Latinx national samples, LGBTQ-Latinx adults report more mental health problems, including depressive symptoms, relative to heterosexual or straight Latinx adults (Martinez et al., 2017). Prospective studies show greater increases in depressive symptoms from adolescence through emerging adulthood among LGBTQ-Latinx individuals relative to LGBTQ- White, Black/African American, American Indian/Native American, Asian, Pacific Islander, and other non-Latinx persons (Marshal et al., 2013). Studies using intersectionality perspectives show that these depressive symptom trajectories coincide with LGBTQ-POC experiences of intersectional minority stressors (Layland et al., 2025), and that heterosexist discrimination also uniquely manifests in greater depressive symptoms over time among LGBTQ-Latinx adolescents when compared to LGBTQ-Black adolescents (Mallory and Russell, 2021). Similarly, experiences of heterosexist discrimination are known to predict greater depressive symptoms within LGBTQ-Latinx emerging adult and adult samples (Díaz et al., 2001; DiGuiseppi et al., 2021).

Scholars emphasize the critical need for the application of intersectionality perspectives in multiply minoritized population health research (Bowleg, 2012). This is particularly important because

LGBTQ-POC are more likely to face poverty, food and housing insecurity, and hate violence, including homicide, relative to their LGBTQ-White counterparts (Albelda et al., 2009; Ecker et al., 2019; Gibb et al., 2021; Hastings et al., 2022; Parra et al., 2022; Ramirez et al., 2018; Wilson et al., 2020). Despite greater incidence of depressive symptoms both contemporaneously and prospectively among LGBTQ-Latinx groups (e.g., DiGuiseppi et al., 2021; Layland et al., 2025; Mallory and Russell, 2021; Marshal et al., 2013), LGBTQ-Latinx emerging adults are less likely to access health care than LGBTQ-White emerging adults (Green et al., 2022), preventing the assessment and treatment of depressive symptoms among this population. However, without diminishing the seriousness of these health disparities, it must be recognized that depressive symptoms have a multiply determined etiology (Guerry and Hastings, 2011; Kennis et al., 2020), and not all LGBTQ emerging adults who experience discrimination also evince depressive symptoms (e.g., McLaughlin et al., 2010). Yet, there is scant consideration of the stress physiological systems that potentially demarcate which LGBTQ emerging adults may be more prone to experiencing depressive symptoms when subjected to heterosexist victimization and of which physiological systems may help explain minority stress-mental health disparities.

1.2. The HPA axis, allostatic load, diathesis-stress, and depression

Disruptions to typical HPA axis functioning place individuals at greater risk for depressive symptoms. The HPA axis is one of the body's primary stress response and regulation systems (Gunnar and Adam, 2012). The usual daily pattern of cortisol production is characterized by high cortisol concentrations upon waking, an increase in cortisol about 30–45 minutes after waking, and a gradual decline in cortisol concentrations throughout the day, reaching their lowest point in the evening. (Adam et al., 2017; Gunnar and Adam, 2012; Hoyt et al., 2021). Lower waking cortisol (intercepts; Adam and Kumari, 2009) is associated with depressive symptoms (Zajkowska et al., 2022), as are flatter or less negative diurnal cortisol slopes (Adam et al., 2017; Doane et al., 2013; Guerry and Hastings, 2011; Hoyt et al., 2021; Juster et al., 2010; Saxbe, 2008). Together, lower waking cortisol and flatter diurnal slopes constitute a pattern characterized as hypocortisolism.

In accord with models of allostatic load (McEwen, 1998; McEwen and Stellar, 1993), biological embedding (Shonkoff et al., 2009), and biological embodiment (Krieger, 2012), hypocortisolism is also posited as a mechanism by which adversity results in depression and depressive symptoms (Adam et al., 2017; Fries et al., 2009; Heim et al., 2000, 2008). Numerous studies show that experiences of adversity earlier in the life course can disrupt healthy adrenocortical functioning. Hypocortisolism is found to follow experiences of chronic and severe adversity, such as growing up in poverty (Johnson et al., 2021), or facing racist discrimination (Adam et al., 2015; Huynh et al., 2016). Consistent with its posited mechanistic role, hypocortisolism has been argued to mediate the associations of stressful experiences with depressive symptoms (e.g., Cantave et al., 2019), although to our knowledge this has not been reported for LGBTQ samples.

Yet, heterosexist discrimination is also associated with hypercortisolism, characterized by higher waking cortisol and flatter diurnal slopes (Adam et al., 2017; Adam and Kumari, 2009; Hoyt et al., 2021). Studies have linked both direct and vicarious exposure to heterosexist discrimination or victimization with elevated cortisol patterns in LGBTQ samples (DuBois et al., 2017; Figueroa et al., 2021; Mijas et al., 2021; Parra et al., 2016, 2022). As with hypocortisolism, research has linked hypercortisolism with depressive symptoms (Adam et al., 2010, 2017; Guerry and Hastings, 2011; ter Horst et al., 2019). One study of predominantly LGBTQ-White emerging adults found heterosexist discrimination was indirectly associated with depressive symptoms via hypercortisolism (Parra et al., 2016).

Thus, it is plausible that either hypocortisolism or hypercortisolism could function as a biological mechanism by which exposure to heterosexist victimization contributes to depressive symptoms in LGBTQ emerging adults. However, we are unaware of any studies that have examined the mediating role of diurnal cortisol patterns between heterosexist victimization and depressive symptoms among LGBTQ-POC samples. It may be the case that having flatter diurnal cortisol slopes – or less variation in cortisol levels over the day, whether that reflects enhanced or suppressed HPA activity – may convey increased risk for depressive symptoms and may account for associations of heterosexist victimization with depressive symptoms in both LGBTQ-Latinx and LGBTQ-White emerging adults.

Fewer studies have considered whether the conjoint influences of adrenocortical activity and stressful experiences may confer risk for depressive symptoms. In accord with the diathesis-stress model of depression, individuals with diurnal hypo- or hypercortisolism may be more susceptible to feeling distress after experiencing adversity, compared to indviduals with healthier or more normative diurnal cortisol profiles (Guerry and Hastings, 2011). For example, adolescent girls who reported more stressful life events were more likely to develop depressive symptoms if they had lower than average, but not higher than average, diurnal cortisol levels (Schuler et al., 2017). Conversely, LeMoult and colleagues (2015) demonstrated almost the opposite effect; that negative life events predicted depressive symptoms among young girls with high overall daily cortisol concentrations but not among those with low cortisol concentrations. To our knowledge, the conjoint and interactive contributions of diurnal cortisol and stressful experiences to depressive symptoms have not been examined in LGBTQ samples, but it is similarly plausible that LGBTQ individuals who evince hypo- or hypercortisolism may be more susceptible to developing depressive symptoms when they experience more heterosexist victimization from peers.

1.3. The current study and hypotheses

It is only in recent years that scholars have adopted and integrated intersectionality perspectives to theoretically guide neurobiological research focused on stressor-adrenocortical-health associations among LGBTQ-POC (Parra and Hastings, 2018). To date, there are only three studies that examined adrenocortical functioning at the intersections of sexual orientation and ethnicity or race. Cook and colleague's (2017) intercategorical intersectional findings showed that Black bisexual and gay men evidenced elevated evening cortisol levels relative to their White counterparts. In a sample of predominately LGBTQ-POC adults, Vargas and colleagues's (2025) intercategorical findings showed no differences in hair cortisol concentrations between persons who identified as LGBTQ-POC, LGBTQ, or POC. However, the authors' intracategorical results indicated that experiences of intersectional heterosexist and racist discrimination had greater hair cortisol concentrations compared to those who only experienced racist discrimination or heterosexist discrimination. The third study focused on LGBTQ-Latinx emerging adults showed that independent experiences of heterosexist and racist discrimination, which included items assessing victimization, were associated with lower cortisol intercepts indirectly, via challenges to integrating their ethnically and sexually minoritized identities (Parra and Hastings, 2020).

We know of no longitudinal studies examining whether diurnal HPA axis functioning demarcates which LGBTQ persons with greater exposure to heterosexist victimization may be most prone to worsening depression over time, or whether it mediates the predictive associations of heterosexist victimization with future depressive symptoms. Thus, the current study addressed these gaps in the literature and tested the diatheses-stress and allostatic load models of depression, examining whether lower or higher diurnal cortisol intercepts and flatter diurnal cortisol slopes contributed to the risk for depressive symptoms, concurrently and prospectively, among LGBTQ-Latinx and LGBTQ-White emerging adults when exposed to more peer heterosexist victimization.

We expected that experiencing more heterosexist victimization would predict elevated depressive symptoms concurrently and that, over the subsequent 24-months, those associations would be moderated by waking and diurnal cortisol patterns. Specifically, we expected that heterosexist victimization would most strongly predict more depressive symptoms contemporaneously and prospectively among LGBTQ persons who evinced lower or higher waking cortiol and flatter diurnal cortisol slopes (i.e., either hypercortisolism or hypocortisolism). We also examined whether diurnal cortisol patterns would mediate the hypothesized positive associations of heterosexist victimization with contemporaneous and future depressive symptoms. We expected that higher or lower waking cortisol and flatter diurnal cortisol slopes would indirectly link heterosexist victimization to depressive symptoms. Finally, we conducted exploratory analyses using multi-group comparisons to examine whether associations among heterosexist victimization, diurnal cortisol patterns, and depression differed between LGBTQ-Latinx and LGBTQ-White emerging adults.

2. Method

2.1. Participants

Participants ($N = 97$) in the current study were between the ages of 18–29 ($M = 23.91$ years, $SD = 2.63$) and all self-identified as LGBTQ. A full description of participant characteristics is presented in Table 1. Participants were recruited at baseline in Northern California from June to August 2016 through free and paid advertisements on social media, and flyers distributed at information booths during Pride events. Follow-up assessments occurred at Wave 2 between February and June 2017 and at Wave 3 between June and September 2018. There were $n = 73$ (75.2 %) participants who participated at all three waves of data collection, $n = 12$ (12.4 %) participants who participated at Wave 1 and either Wave 2 or Wave 3, and $n = 12$ (12.4 %) participants who only participated at Wave 1. All participants gave informed consent and were compensated for their time and efforts at each of the three assessments.

Table 1
Participant Characteristics (N = 97).

	n	%
Race/ethnicity		
Latinx	46	47.4
White	51	52.6
Sexual orientation		
Bisexual/Pansexual	34	35.1
Gay	36	37.1
Lesbian	6	6.2
Queer	21	21.6
Sex-designated at birth		
Female	50	51.5
Male	47	48.5
Gender		
Cisgender female	37	38.1
Cisgender male	44	45.4
Transgender female to male	10	10.3
Transgender male to female	1	1.0
Genderqueer or non-binary	5	5.2
Education		
High school	9	9.3
Trade school or some college courses	46	47.4
College degree	42	43.3
Employment		
Employed	52	53.6
Unemployed	6	6.2
Full-time student	29	29.9
Student and employed	10	10.3
Income		
$0 – $19,999	49	50.5
$20,000 – $29,999	16	16.5
$30,000 – $39,999	17	17.5
$40,000 – > $100,000	15	15.5

2.2. Procedure

Wave 1 (W1). Participants ($N = 102$) were enrolled in a four-day testing protocol after completing a phone screen for eligibility based on the following criteria: self-identification as lesbian, gay, bisexual, or queer; Latinx or White; fluent in the English language; and between the ages of 18–29 years. Participants who reported taking antidepressants known to normalize salivary cortisol levels ($n = 5$) were excluded from the main analytical sample in the current study ($n = 97$).

Visit 1.1. After establishing eligibility, participants met with research staff. During the first visit, participants gave signed informed consent and completed a questionnaire packet. Participants practiced saliva sampling and were instructed to collect three saliva samples per day over two consecutive weekdays (for a total of 6 samples) using absorbent oral swabs (Salivettes™, Salimetrics Inc., State College, PA). Participants reported their usual times of waking and going to bed on weekdays, which were also their expected times of waking and going to bed on the two specific weekdays they selected for in-home data collection. Research staff programmed automated text messages to participants' phones and automated email reminders synchronized to their reported wake time, 30 minutes post waking, and at bedtime. This approach was used to prompt each participant to report on their own circadian rhythm indexed by their self-reported waking- and bed-times on daily diary logs. The 30 minute post waking samples were not included in the computation of diurnal cortisol intercept and slope to avoid conflating the cortisol awakening response with the diurnal cortisol slope (Chida and Steptoe, 2009). Participants received printed instructions, a freezer ice pack, and a second questionnaire packet that included daily diaries for the saliva collection protocol. Participants received a $25 cash payment at the end of the visit.

Self-administered procedures at home. Participants were instructed to not brush their teeth for two hours, and to not consume food, drinks, tobacco, or caffeine for one hour, before collecting each saliva sample. Participants also used daily diaries to log whether they had experienced unusual events, or had consumed food, drinks, tobacco, or caffeine one hour prior to completing each sample. Saliva samples were kept in freezer ice packs at the participants' home freezers. Participants completed a second questionnaire packet at home.

Visit 1.2. Participants returned their frozen saliva samples in the icepacks and their second questionnaire to research staff. At this time, research staff checked the questionnaire packet and daily diaries for completion. Participants were thanked for their work, debriefed, and received a $75 cash payment. In sum, participants were compensated $100 in cash for their time and efforts. Participants were notified they would be invited for follow-up visits in 6–9 months (Wave 2). Participants received 'check-in' reminder emails every 3 months between assessments and were asked to update their contact information as necessary.

Follow-up visits.

Wave 2 (W2). Approximately 9 months post W1, all participants were contacted and 88 LGBTQ participants agreed to be scheduled for their follow-up visits. Participants were reconsented, repeated the 4-day testing protocol, and were compensated $100 for their work. Participants were informed of a third and final follow-up behavioral assessment via online questionnaires that would not include saliva sampling. Reminder emails were generated every 3 months to maintain contact with research participants until the online survey was administered.

Wave 3 (W3). Approximately 15 months post W2, all participants were contacted and 79 LGBQ respondents reconsented their participation and received an online questionnaire via Qualtrics™. Participants were compensated $25 via e-gift cards for completing this final assessment of the prospective study.

2.3. Measures

Demographic Information. Participants reported demographic

information including their age, sex-designated at birth, gender, sexual orientation, ethnicity, race, education, employment status, and household income.

Lifetime Heterosexist Victimization. Nine items from the Lifetime Scope and Prevalence of Anti-Lesbian/Gay Victimization (Pilkington and D'Augelli, 1995) were used to assess frequency of heterosexist victimization by non-family members (peers and others) at W1. Example items included having ever experienced "verbal insults", "threats of physical violence", or "being hit, kicked, or beaten," all rated on a scale ranging from: 1 = *Never*; 2 = *Once*; 3 = *Twice*; and 4 = *More than twice.* Higher averaged scores suggested more experiences of lifetime heterosexist victimization. The Cronbach's alpha was α = .82

Depressive symptoms. The Beck Depression Inventory – Second Edition (Beck et al., 1996) was used to assess depressive symptoms in the past week. Participants rated items on a scale from 0 to 3, with higher responses indicative of more depressive symptoms (e.g., *0 – "I do not feel sad," 3 – "I am so sad or unhappy that I can't stand it"*). The possible total range for the scale after summing all items was 0–63. Scores of 0–16, 17–30, and 31–63 represented low, moderate, and severe symptoms of depression, respectively (Beck et al., 1996). Cronbach's alpha across W1–3 was α = 0.90, 0.91, and 0.90, respectively).

Covariates. The following covariates were considered for inclusion in the predictive model: age, race/ethnicity (0 = *Latinx*, 1 = *White*, please see Supplemental Results that informed dummy coding), sex-designated at birth (0 = *Female*, 1 = *Male*), body mass index (BMI), medication use (e.g., corticosteroids, birth control; 0 = *No*, 1 = *Yes*), and annual income. These variables were tested for their known effects on heterosexist victimization and depressive symptoms (Price-Feeney et al., 2018) and salivary cortisol's diurnal rhythm (Kudielka et al., 2009).

Diurnal salivary cortisol assays. Diurnal cortisol was assayed from the two waking and two bedtime saliva samples collected at W1 (n = 407; one (n = 1) participant did not return a bedtime sample). On average, saliva samples at waking were collected at 07:38 (AM) and bedtime samples were collected at 22:53 (PM). Saliva samples were stored in a medical freezer at −30°C for two months in the laboratory until all data were collected to assay for cortisol in a single batch. Samples were shipped to Salimetrics Saliva Lab (Salimetrics, Carlsbad, CA) for salivary cortisol assay, in duplicate, using a highly sensitive enzyme immunoassay (Salimetrics, State College, PA). The minimum detection ranged from 0.007 to 1.8 μg/dL, and the intra- and interassay variabilities were 8.31 % and 7.69 %, respectively. Of the total samples assayed, 6 samples did not contain enough saliva for assay and 1 sample was flagged by technicians for likely interference during assay and was removed from all subsequent analyses. All but two (n = 2) samples yielded raw cortisol values within ± 3 *SD*s above or below the mean. Raw cortisol values, including the two extreme values, were corrected for non-normal distribution with $\log_{10}$ transformations. The averages of the duplicate cortisol values were used in all subsequent analyses.

Cortisol intercepts and slopes. Self-reported medication use, experiences of unusual events, and consumption of food, caffeine, or tobacco 60 minutes before each sample were dummy coded (*No* = 0, *Yes* = 1) and tested for their respective associations with raw cortisol values.[1] As described in prior work (Parra et al., 2022; Parra and Hastings, 2020), multilevel linear modeling was used to compute participants' diurnal cortisol intercepts (cortisol at waking) and diurnal cortisol slopes (degree of change from waking to bedtime) from the individual $\log_{10}$-transformed waking and bedtime cortisol values. Each participant's cortisol intercept and slope was derived by fitting a linear regression line predicted from that person's four (2 waking and 2 bedtime) cortisol values, accounting for variation in collection times (centered at waking) and two sampling days (Adam and Gunnar, 2001; Hruschka et al., 2005; Saxbe, 2008). Given $\log_{10}$-transformed values, higher diurnal cortisol intercepts were indexed by less negative or more positive coefficients. Lower diurnal cortisol intercepts, indexed by more negative coefficients, were interpreted as representing a hypoactive HPA axis associated with greater stress (Vargas and Lopez-Duran, 2014). Elevated cortisol intercepts, represented by more positive coefficients, were interpreted as an adaptive HPA axis response linked to better health and well-being (Rector et al., 2019; Vargas and Lopez-Duran, 2014). Diurnal cortisol slopes with more negative values (more steeply decreasing) were interpreted as representing more adaptive regulation of daily cortisol secretion (greater decreases in cortisol production from waking to bedtime), associated with greater flexibility in affective and stress management. Flatter slopes with smaller negative values, or with zero or positive values, were interpreted as reflecting less adaptive HPA axis functioning implicated with poorer mental and physical health, including psychological and somatic symptoms of depression (Adam et al., 2017; Gunnar and Adam, 2012; Harris et al., 2015).

2.4. Analytic strategy

After examining bivariate associations among the predictor, moderator, and outcome variables, a latent growth curve (LGC) analysis in a structural equation model framework (McArdle and Epstein, 1987) was used to assess overall (linear) change in depressive symptoms. This analysis was conducted in R-studio (Version 1.1442) using the lavaan package. Missing data among respondents across waves occurred at a low frequency, with 4.5 % of data missing overall. Full-information maximum likelihood (FIML) estimation was used to account for missing data (Widaman, 2006). Model fit was assessed with the root mean square error of approximation (RMSEA), comparative fit index (CFI), Normed Fit Index (NFI), and standardized root mean residual (SRMR). Model fit was considered acceptable if RMSEA values were < .08, CFI and NFI values were > .95, and SRMR values were < .06 (Hu and Bentler, 1999).

Repeated measures of depressive symptoms were used to calculate the latent intercept and slope of each participant's depressive symptoms across all timepoints, anchored at W1. Factor loadings of the depressive symptoms intercept and slope were set so that the intercept represented the average depressive symptoms at W1, and the slope represented the linear change in depressive symptoms from W1 to W3.

To test our moderation hypotheses, a LGC model was run to predict the latent intercept and slope of depressive symptoms from heterosexist victimization and the extracted cortisol intercepts and slopes at W1. The model included two interaction coefficient terms between heterosexist victimization and diurnal cortisol indices: 1) Heterosexist Victimization X Cortisol Intercepts and 2) Heterosexist Victimization X Cortisol Slopes. All independent and control variables were mean centered prior to running the prediction model, and the latent intercept and slope of depressive symptoms were allowed to covary. Significant interaction effects (CI's that did not include zero) were probed using simple slopes analyses at ± 1 standard deviation (*SD*) of the moderator (diurnal cortisol intercepts and slopes).

Finally, we ran a second LGC model with multiple parallel mediation (Hayes and Preacher, 2013) to test the indirect effect of heterosexist discrimination on the intercept and slope of depressive symptoms via both diurnal cortisol intercepts and slopes. We calculated four indirect effects by multiplying the effect of heterosexist discrimination on the intercept of depressive symptoms through (1) diurnal cortisol intercepts and (2) diurnal cortisol slopes and the effects of heterosexist

[1] Independent sample *t*-tests showed no mean differences in raw salivary cortisol values between participants who endorsed the use of medication (M =.23, SD =.24) versus those who did not use mediations (M =.24, SD =.26, t(398) = .33, p > .05; experienced unusual events at time of sampling (M =.28, SD =.31) versus those who did not experience unusual events at sampling time (M =.23, SD =.24), t(398) = -1.73, p > .05; and among participants who reported consuming food (M =.15, SD =.15), t(397) = 1.36, p > .05, or tobacco (M =.20, SD =.02), t(398) = .283, p > .05, when compared to participants who did not (M =.24,.24; SD =.26,.25). All participants reported that they did not consume caffeine one hour prior to sampling.

discrimination on the slope of depressive symptoms through (3) diurnal cortisol intercepts and (4) diurnal cortisol slopes. The indirect associations of heterosexist discrimination with the intercept and slope of depressive symptoms through each diurnal cortisol index were interpreted as meeting mediation criteria if the Bias-Corrected accelerated Confidence Intervals (BCa CIs) of the tested indirect effects, above and beyond the direct and total effects, did not include zero (Hayes, 2015). The degree of model fit was assessed using the model fit indices and cutoffs described in the moderation model above. The LGC multiple mediation analysis was fitted as a path model with the lavaan package in R-studio (Version 1.1442) adjusting for all associated covariates in the model. We obtained 95 % BCa CIs for model estimates using bootstrapping (MacKinnon et al., 2004; Preacher and Hayes, 2008), to adjust for the nonnormality of the sampling distribution of the indirect effect (Montoya and Hayes, 2017). Multiple group analsyes were conducted in the moderation and mediation models to test whether all predcited associations varied by race or ethnicity.

3. Results

3.1. Descriptive analyses

Table 2 displays the means (*M*), standard deviations (*SD*), ranges, skews, and zero-order correlations among all continuous study variables. Heterosexist victimization was positively associated with depressive symptoms across all timepoints. Diurnal cortisol intercepts and slopes were positively correlated. Depressive symptoms across all waves were positively correlated. Age was negatively correlated with depressive symptoms at W2. Participants who were designated female at birth reported more depressive symptoms at W1 ($M = 14.98$; $SD = 9.10$) than those who were designated male at birth ($M = 9.96$, $SD = 7.10$), t (95) = 3.02, $p = .002$. There were no statistically significant group differences by race or ethnicity (Latinx and White) (all $t < |1.64|$, $p > .05$) and medication use (all $t < |1.37|$, $p > .05$) on heterosexist victimization, diurnal cortisol intercepts and slopes, and assessments of depressive symptoms (all $t < |1.64|$, $p > .05$). White participants reported more medication use than Latinx participants, $\chi^2(1) = 12.54$, $p < .01$. All remaining associations among predictor, moderator, and control variables were non-significant.

3.2. Depressive symptom trajectories

Depressive symptoms across three waves were modeled using a latent linear growth model, which controlled for all covariates and a significant association between race/ethnicity and depressive symptoms at W2. The model showed good fit to the data (χ^2 (8) = 7.13, $p > .05$, CFI = 1.00, NFI = .963, RMSEA = .000, RMSEA CI 90 % = [0.00, 0.11], SRMR = .023). The mean parameter estimate for the intercept (μ_i = 12.27, $p < .001$) represented the average depressive symptom score at W1 across all participants, and the estimate for the slope ($\mu_s = -.33$, $p = .42$) indicated the average value of the change in depressive symptoms across all time points. Stated differently, participants experienced an average depressive symptom score of 12.27 at W1 with an average growth rate across waves that did not significantly vary across participants. The variance of the intercept was significant ($\sigma_i = 33.56$, $p < .001$), and the variance of the slope was non-significant ($\sigma_s = 1.25$, $p = .65$). The intercept and slope of depressive symptoms were not significantly associated ($p > .05$). These variances indicate that participants' depression remained relatively stable across repeated measures (i.e., a flat trajectory), with some participants' flat trajectories being higher than others.

3.3. Predictive moderation model

The unstandardized regression weights and confidence intervals for the main effects and interaction effects predicting depressive symptoms

Table 2
Descriptive Statistics and Correlations.

Variables	*Mean*	*SD*	*Min*	*Max*	Skewness	1	2	3	4	5	6	7	8	9	10	11
1. Age	23.92	2.63	18.90	29.06	.03	—	.221*	0.075	0.152	0.177	−0.001	0.122	−0.042	−0.051	−.230*	−0.194
2. BMI	24.92	7.20	0.00	43.00	−0.88		—	0.135	−0.121	0.03	0.081	0.09	0.053	0.089	−0.026	−0.042
3. Annual Income	2.33	1.97	1.00	9.00	1.86			—	−0.004	−0.036	−0.047	−0.069	0.003	−0.065	−0.117	0.015
4. Heterosexist Peer Victimization W1	14.16	5.20	9.00	32.00	1.56				—	−0.095	−0.033	−0.105	0.017	0.169	0.156	0.214
5. Raw Waking Cortisol	0.395	0.23	0.09	1.30	1.52					—	.246*	.771**	−.205*	−0.062	−.222*	−0.111
6. Raw Bedtime Cortisol	0.089	0.09	0.004	0.60	3.37						—	.574**	.621**	−0.081	−0.117	0.153
7. Log_{10} Cortisol Intercepts W1	0.003	0.13	−0.49	0.31	−0.29							—	.230*	−0.077	−0.112	0.06
8. Log_{10} Cortisol Slopes W1	−0.0002	0.01	−0.03	0.03	−0.15								—	−0.078	−0.014	0.167
9. Depressive symptoms W1	12.55	8.52	0.00	35.00	0.50									—	.575**	.522**
10. Depressive symptoms W2	11.23	7.97	0.00	39.00	1.04										—	.688**
11. Depressive symptoms W3	11.73	8.40	0.00	38.00	0.86											—

Note: $N = 97$; *$p < .05$, **$p < .01$ (all tests were 2-tailed). Unit of measurement for salivary cortisol was μg/dL.

intercept and slope are presented in Table 3. This moderation effects model had good fit to the data, (χ^2 (13) = 12.91, $p > .05$; *RMESA* = 0.00, 90 %CI [0.00, 0.10], *CFI* = 1.00, *NFI* = .95. *SRMR* = 0.02). The multiple group comparison model indicated no differences by race or ethnicity and had worse model fit (AIC = 5898.9; BIC = 6323.7) when compared to the model controlling for race or ethnicity (AIC = 5444.3; BIC = 5647.7; χ^2 $p < .001$). Thus, all subsequent results are based on models controlling for race or ethnicity.

3.3.1. Intercept of depressive symptoms

The main effect of heterosexist victimization on the intercept of depressive symptoms was non-significant, yet the interaction between heterosexist victimization and diurnal cortisol slopes was significant (see Fig. 1). Simple slope analyses were used to probe this interaction effect; the association between heterosexist victimization and depressive symptoms intercept was examined at −1 *SD* cortisol slope (suggesting steeper and more typical HPA axis functioning), and + 1 *SD* cortisol slope (suggesting flatter or less variable HPA axis functioning). Contrary to our hypotheses, heterosexist victimization was not associated with contemporaneous depressive symptoms when cortisol slopes were flatter (+1 *SD*; $b = -.24$, $p = .31$, 95 % CI [-.68,.21]), whereas heterosexist victimization predicted elevated contemporaneous depressive symptoms when participants evidenced steeper cortisol slopes (-1 *SD*; $b = .73$, $p < .01$, 95 % CI [.28, 1.17]).

3.3.2. Slope of depressive symptoms

Heterosexist victimization was also not associated with the slope of depressive symptoms, whereas the main effect of diurnal costisol slopes and both the interaction between heterosexist discrimination and cortisol intercepts (see Fig. 2) and between heterosexist discrimination and cortisol slopes (see Fig. 3) were significant. Probing the first of these interactions with simple slope analyses, heterosexist victimization negatively but non-significantly predicted the slope of depressive symptoms when cortisol intercepts were higher (+1 *SD*; $b = -.26$, $p = .14$, 95 % CI [-.61,.08]), but heterosexist victimization positively and significantly predicted the slope of depressive symptoms when cortisol intercepts were lower (-1 *SD*; $b = .23$, $p = .04$, 95 % CI [.01,.46]). Conversely, when the second interaction was examined, heterosexist victimization positively but non-significantly predicted the slope of depressive symptoms when cortisol slopes were flatter (+1 *SD*; $b = .29$, $p = .08$, 95 % CI [-.03,.61]) whereas heterosexist victimization negatively and significantly predicted the slope of depressive symptoms when cortisol slopes were steeper (-1 *SD*; $b = -.32$, $p = .02$, 95 % CI [-.59,.–04]).

Results including the 5 persons using antidepressant medications yielded similar pattern of interaction effects between heterosexist victimization and cortisol slopes on the intercept and slope of depressive symptoms (See Supplemental Results).

3.4. Predictive mediation model

The unstandardized regression coefficients for total, direct, and indirect effects for the full model are reported in Table 4. Overall, the mediation model showed good fit to the data ($\chi^2 = 10.12$, $df = 9$, $p > .05$; *CFI* =.990; *NFI* =.936; *RMSEA* =.036, 90 % BCa CIs = [.000,.123], *SRMR* =.029), accounting for 19.4 %, 58.8 %, 1 % and 0 % of the variability in the intercept and slope of depressive symptoms, and diurnal cortisol intercepts and slopes, respectively. Results yielded no significant indirect effects.

3.5. Theoretical and applied implications

Guided by minority stress (Meyer, 2003), allostatic load (McEwen, 1998; McEwen and Stellar, 1993), diathesis-stress (Beck, 1967; Monroe and Simons, 1991; Robins and Block, 1989), biological embedding (Shonkoff et al., 2009), and biological embodiment (Krieger, 2012) theoretical frameworks, the present study examined the moderating and mediating role of diurnal salivary cortisol intercepts and slopes on the predictive effects of heterosexist victimization by peers and other non-family members on concurrent and future depressive symptoms in a diverse group of LGBTQ emerging adults. Our results indicated that experiences of heterosexist victimization and varying patterns of diurnal

Table 3
Interaction effects model predicting intercept and slope of depressive symptoms from heterosexist victimization and diurnal cortisol.

Outcomes	Predictors	β	Estimate (*b*)	SE	*p* value	95 % LCI	95 % UCI
Intercept of Depressive Symptoms							
	Heterosexist Victimization	0.183	0.245	0.157	0.119	−0.063	0.554
	Diurnal Cortisol Intercepts	−0.121	−0.632	0.595	0.288	−1.799	0.534
	Diurnal Cortisol Slopes	−0.104	−0.574	0.617	0.352	−1.785	0.636
	Heterosexist Victimization X Cortisol Intercepts	−0.135	−0.146	0.128	0.254	−0.397	0.105
	Heterosexist Victimization X Cortisol Slopes	−0.357	−0.382	0.132	0.004	**−0.640**	**−0.123**
Covariates							
	Age	−0.150	−0.397	0.301	0.186	−0.986	0.192
	Race/ethnicity	0.017	0.115	0.785	0.884	−1.424	1.653
	Sex-designated at birth	−0.187	−1.295	0.800	0.106	−2.863	0.273
	BMI	0.207	1.963	1.239	0.113	−0.465	4.391
Slope of Depressive Symptoms							
	Heterosexist Victimization	−0.025	−0.015	0.101	0.885	−0.213	0.184
	Diurnal Cortisol Intercepts	−0.074	−0.171	0.352	0.626	−0.860	0.518
	Diurnal Cortisol Slopes	0.283	0.692	0.345	0.045	**0.015**	**1.369**
	Heterosexist Victimization X Cortisol Intercepts	−0.389	−0.185	0.082	0.023	**−0.345**	**−0.025**
	Heterosexist Victimization X Cortisol Slopes	0.509	0.240	0.089	0.007	**0.065**	**0.416**
Covariates							
	Age	−0.244	−0.285	0.153	0.063	−0.584	0.015
	Race/ethnicity	0.294	0.882	0.400	0.027	**0.099**	**1.666**
	Sex-designated at birth	0.400	1.223	0.420	0.004	**0.400**	**2.045**
	BMI	−0.148	−0.618	0.614	0.314	−1.820	0.585
Covariances							
Depressive Symptoms W2	Race/ethnicity	−0.487	−2.285	0.640	<.001	**−3.539**	**−1.031**
Diurnal Cortisol Intercepts	Diurnal Cortisol Slopes	0.230	0.383	0.174	0.028	**0.042**	**0.725**

Notes. LCI and UCI: lower confidence interval and upper 95 % confidence intervals. Significant CIs are presented in bold font. Unit of measurement for salivary cortisol was μg/dL.

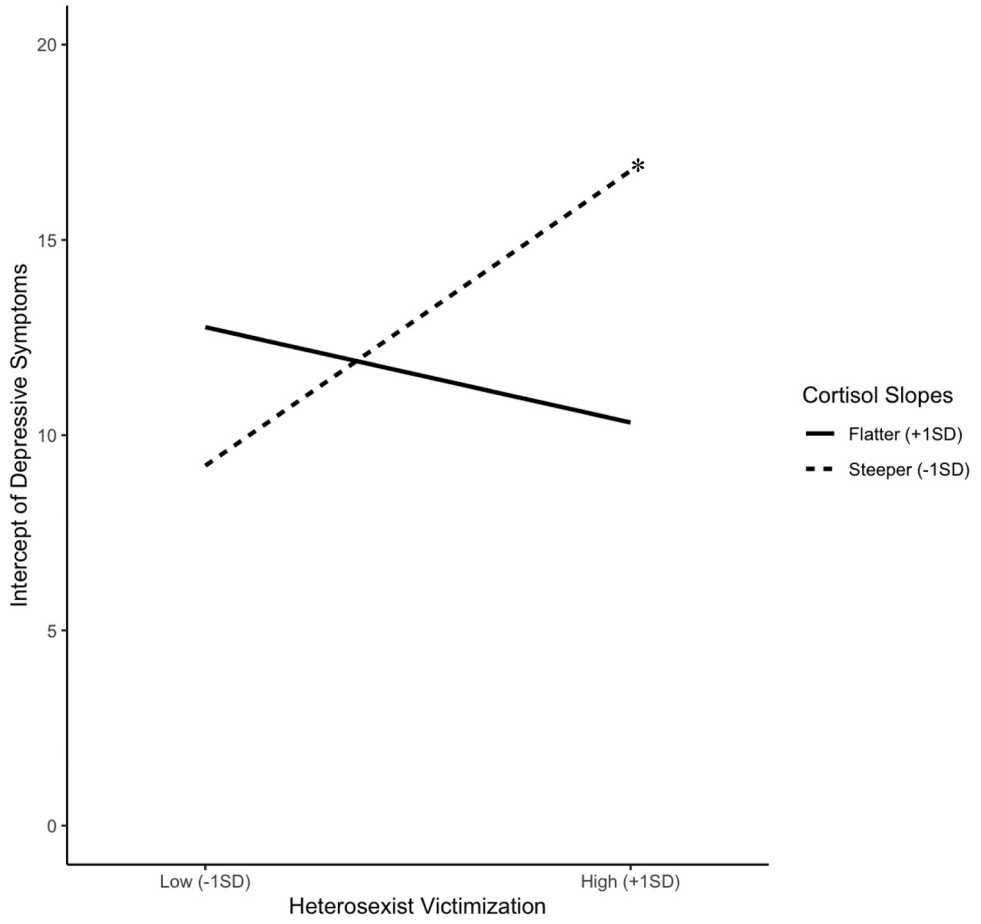

Fig. 1. *Interaction effects between heterosexist victimization and diurnal salivary cortisol slopes on intercept of depressive symptoms.* Note: * $p < .05$ (simple slope statistically significantly different from zero).

cortisol intercepts and slopes interacted to predict depressive symptoms both contemporaneously and prospectively. However, the current findings did not support diurnal cortisol intercepts and slopes as biological mechanism (i.e., mediators) linking heterosexist victimization to contemporaneous and future depressive symptoms.

Specifically, more experiences of heterosexist victimization were associated with LGBTQ persons' reports of elevated contemporaneous depressive symptoms when diurnal cortisol slopes were steeper, but not when diurnal cortisol slopes were flatter. While this finding did not align with our *a priori* prediction, some prior empirical evidence suggests that steeper cortisol slopes are associated with more social engagement and receptiveness, including attentiveness to treatment by others (Dickman et al., 2020) and awareness of being discriminated (Fuller-Rowell et al., 2012). It is important to recognize, too, that most participants reported subclinical depressive symptoms, such that their concurrent emotional response to heterosexist maltreatment could be seen as the reasonable reaction of physiologically well-regulated persons to offensive treatment by others (Gunnar and Adam, 2012), rather than indicative of maladjustment or potential psychopathology. Conversely, when LGTBQ participants evidenced steeper cortisol slopes, more heterosexist victimization also was associated with decreases in depressive symptoms over two years. Hence, steeper cortisol slopes appeared to demarcate LGBTQ emerging adults who were prone to reporting more depressive symptoms while experiencing victimization, but to subsequently progress toward healthier psychosocial functioning. This would be consistent with hypotheses that steeper cortisol slopes may be indicators of effective regulation and healthy adaptation to stressful life circumstances via flexibility in responding to threat (Juster et al., 2010; McEwen, 2007; Slavich, 2020). Thus, when LGBTQ individuals with more well-regulated diurnal cortisol processes think about having experienced such social stressors as being mistreated and threatened by others who oppose a core feature of their personhood, they may attend more closely (Dickman et al., 2020; Fuller-Rowell et al., 2012) and respond with acute yet reasonable feelings of distress and other depression-related symptoms (Dickerson and Kemeny, 2004; Juruena et al., 2018), from which they are subsequently able to recover, given their physiological capacities to regulate their responses effectively and adaptively.

The persistence or exacerbation of depressive symptoms for months or years, however, could be considered more concerning. When diurnal cortisol slopes were flatter, there was a non-significant positive association between experiencing more heterosexist victimization and having increases in depressive symptoms over time. Paralleling this, and consistent with our hypotheses, LGBTQ-Latinx and LGBTQ-White emerging adults who reported more lifetime experiences of heterosexist victimization outside the home had increasing depressive symptoms over the subsequent two years when they had evinced lower cortisol intercepts, but not when they had evinced higher cortisol intercepts, on average. As is true for flatter diurnal cortisol slopes, lower cortisol intercepts may be indicative of tendencies toward hypocortisolism, demarcating LGBTQ persons at greater risk for persistent and enduring depressive symptoms. This interpretation is corroborated by research showing that it is likely that a person's stress sensitivity may be reflected in their diurnal adrenocortical patterns (Hoyt et al., 2021), and that a hypocortisolism, usually driven by low waking cortisol, is indicative of compromized biological ability to manage stressor exposure (Adam et al., 2017; Doane et al., 2013). This premise and interpretation of results further corroborate low diurnal cortisol as a risk factor for

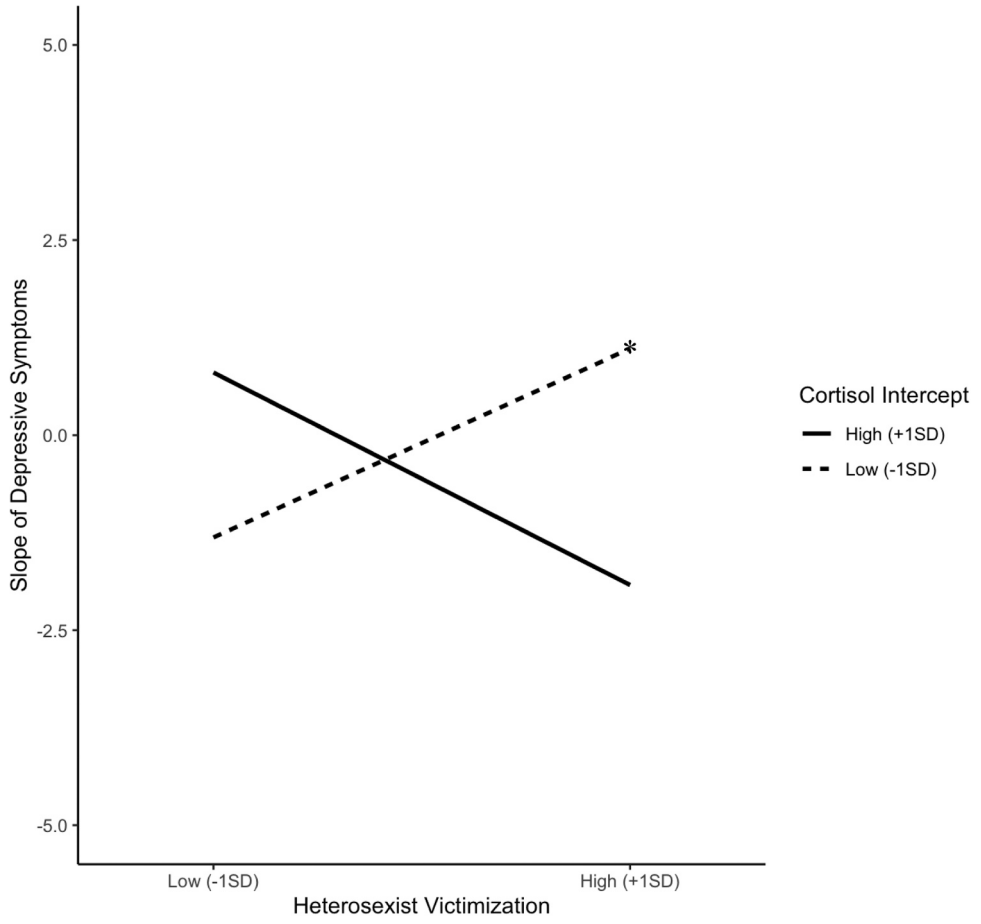

Fig. 2. *Interaction effects between heterosexist victimization and diurnal salivary cortisol intercepts on slope of depressive symptoms.* ote: * $p < .05$ (simple slope statistically significantly different from zero).

depressive symptoms when stressors are experienced. This biological vulnerability may increase greater proneness to interpersonal rejection sensitivity and fatigue or depleted energy, which can impact sleep (e.g., oversleeping), cognition (e.g., concentration difficulties), diet (e.g., overeating) (Fries et al., 2009; Guerry and Hastings, 2011; Gunnar and Adam, 2012; Juruena et al., 2018; Juster et al., 2010), and other indicators of depression. Together, these findings lend support to the diathesis-stress model for depression (Beck, 1967; Monroe and Simons, 1991; Robins and Block, 1989) and corroborate hypocortisolism as an indicator of the HPA axis' compromised ability to manage stressor exposure (Adam et al., 2017; Doane et al., 2013).

Lastly, the lack of significant indirect effects in the mediation model do not lend support to hypotheses of diurnal cortisol intecepts and slopes acting as biological mechanisms linking stressful experiences to depressive symptoms (Adam and Kumari, 2009; Doane et al., 2013). One past cross-sectional study with LBG emerging adults showed that higher and flatter cortisol slopes, driven by high cortisol at waking, indirectly linked heterosexist discrimination with depressive symptoms (Parra et al., 2016), similar to what has been observed in longitudinal studies of other emerging adults (Hoyt et al., 2021) and consistent with models of biological embedding (Shonkoff et al., 2009) and embodiment (Krieger, 2012). It is uncertain why there was a lack of such indirect effects, whether concurrent or prospective, in the current study, although it may be the case that the observed levels of heterosexist victimization were not severe or prolonged enough to disrupt patterns of diurnal adrenocortical activity. Future research will be needed to determine the magnitude of identity-related stressors that can convey neurotoxic effects on LGBTQ individuals, and whether that can convey effects on psychological functioning as indicated by depressive symptoms.

3.6. Additional considerations

Persistent and exacerbating depressive symptoms in emerging adulthood appear to be the consequence of biological vulnerability coupled with the rejection of a core and immutable feature of one's identity by others. This is consistent with the tenets of the minority stress model (Meyer, 2003) and the diathesis-stress model for depression (Beck, 1967; Monroe and Simons, 1991; Robins and Block, 1989). Experiences of heterosexist victimization from peers and others outside of the family were associated with contemporaneous and prospective depressive symptoms, dependent on the diurnal cortisol pattern, corroborating findings from longitudinal studies assessing the effects of minority stress on prospective depressive symptoms (Layland et al., 2025; Pachankis et al., 2018). These findings have implications for social policies necessary to protect the lives of LGBTQ persons at heightened risk for developing prolonged depression-related health problems. At the macro-level, federal, state, and local policies that discriminate against LGBTQ persons can have severe implications for LGBTQ mental health, with lasting effects into adulthood. For example, prior to 2015 when the United States extended marriage rights to same-sex partnerships, sexual minority adolescents raised in states with anti-same-sex marriage policies were more likely to show blunted cortisol patterns as adults (Hatzenbuehler and McLaughlin, 2014) as compared to sexual minority adolescents raised in states with non-discriminating same-sex union policies. Relatedly, the current study's focus on understanding the intersections of diurnal HPA axis functioning via salivary cortisol, heterosexist experiences, and mental health disparities underscores the critical need for inclusive social spaces and to lessen heterosexist beliefs and attitudes.. Regrettably, numerous state and local jurisdictions are

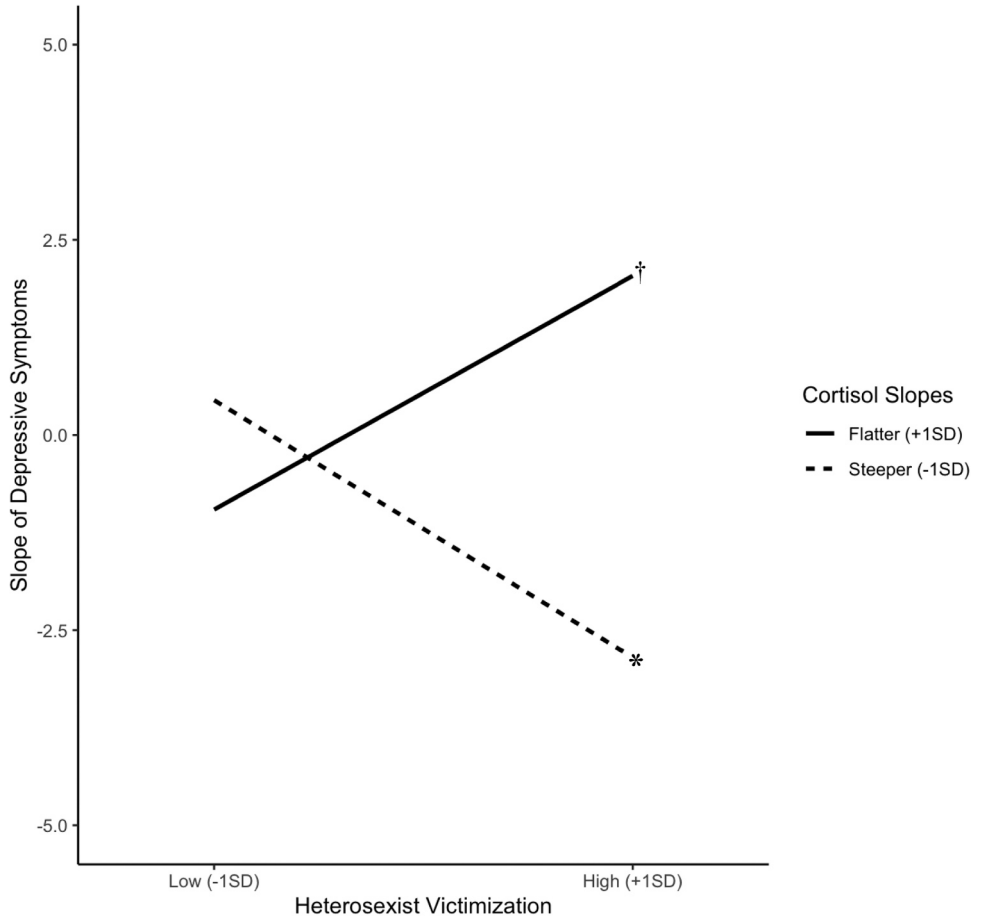

Fig. 3. *Interaction effects between heterosexist victimization and diurnal salivary cortisol slopes on the slope of depressive symptoms.* Note: * $p < .05$ (simple slope statistically significantly different from zero); † $p < .10$ (non-significant).

enacting laws and policies that seem likely to exacerbate, rather than ameliorate, the stressful heterosexist discrimination experienced by their LGBTQ inhabitants (Hastings et al., 2022)

We also note that we adjusted for a significant association between race/ethnicity and depressive symptoms at W2, indicating that LGBTQ-Latinx participants reported greater depressive symptoms than LGBTQ-White participants at this time point. This finding is not surprising, given that data collection at W2 was collected weeks after the 2017 presidential inauguration when the first Trump administration targeted multiple marginalized groups. For example, the Trump administration and supporters augmented anti-Latinx rhetoric and adopted anti-immigrant policies (Philbin et al., 2018), resulting in mass deportations targeting undocumented Latinx children and adults. Anti-LGBTQ rhetoric and the dismantling of LGBTQ anti-discriminatory employer polices also became more prevalent during this period (Albright and Hurd, 2020), all of which threatened the safety and compromised the mental health of multiple marginalize groups (Albright and Hurd, 2020). Our findings align with research indicating that predominately Latinx pre-adolescents showed increases in stress reflected in greater bedtime cortisol and flattening diurnal cortisol slopes across the 2016 election week (Zeiders et al., 2020). These oppressive and violent historical political patterns have resurfaced more aggresively during the second Trump administration in 2025, posing increased risk of widening stress-health disparities among multiply minoritized persons living in the United States. Yet, it is noteworthy that we found no indication of differences in trajectories of depressive symptoms across all waves between LGBTQ-Latinx and LGBTQ-White emerging adults in the associations of heterosexist victimization and diurnal HPA axis functioning. As suggested by some prior applications of an intersectionality lens to these populations (Parra and Hastings, 2018, 2020; Vargas et al., 2025), simultaneous examination of experiences of stressors touching upon multiple aspects of complexly minoritized identities – for example, both heterosexist and racial or ethnic victimization – may be necessary to disentangle the influences of intertwined versus independent stressors on physiological regulation and mental health. Considered another way, though, it is salient that we identified elevated waking cortisol levels and steeper diurnal cortisol slopes as potential sources of resilience against the enduring effects of heterosexist victimization on future mental health for LGBTQ, Latinx, and White emerging adults.

3.7. Limitations and future directions

This study's limitations included our reliance on waking and evening cortisol samples over the course of two days to model the average salivary cortisol intercept and diurnal slope. Although this conformed to recommended practices at the time of data collection (Adam and Kumari, 2009; Kraemer et al., 2006; Segerstrom et al., 2014), had we collected more samples per day over more days, we could have analyzed additional aspects of HPA axis activity, such as area under the curve. Moreover, the saliva collection protocol relied on self-report sampling collection times in daily diary logs with support from programmed automated text messages at each participant's usual time of waking and going to bed. Although this was in accordance with recommended practice (Stalder et al., 2022), the use of electronic monitoring vials (e.g., eDEM™ electronic monitor cap; Aardex Ltd., Switzerland) to record individual times of bottle openings at each sample collection could have more definitely ascertained precise salivary sampling times (Broderick

Table 4
Indirect effects model of heterosexist discrimination on the intercept and slope of depressive symptoms via diurnal cortisol intercept and slopes.

Outcomes	Predictor	Label	β	Est (*b*)	*SE*	*p* value	95 % LCI	95 % UCI
***a* paths**								
Diurnal Cortisol Intercepts	Heterosexist Victimization	a_1	−0.106	−0.027	0.024	0.264	−0.068	0.032
Diurnal Cortisol Slopes	Heterosexist Victimization	a_2	0.017	0.004	0.025	0.874	−0.043	0.055
***b* and *c'* paths**								
Intercept of Depressive Symptoms	Heterosexist Victimization	c'_1	0.220	0.292	0.184	0.114	−0.027	0.699
	Diurnal Cortisol Intercepts	b_1	−0.080	−0.413	0.659	0.530	−1.694	0.865
	Diurnal Cortisol Slopes	b_3	−0.092	−0.507	0.762	0.506	−2.010	1.014
	Age		−0.134	−0.352	0.339	0.300	−0.991	0.322
	Race/ethnicity		0.033	0.221	0.854	0.795	−1.504	1.849
	Sex-designated at birth		−0.307	−2.109	0.844	0.012	**−3.762**	**−0.501**
	BMI		0.102	0.977	1.407	0.487	−1.709	3.807
Slope of Depressive Symptoms	Heterosexist Victimization	c'_2	0.081	0.039	0.152	0.798	−0.286	0.306
	Diurnal Cortisol Intercepts	b_2	0.069	0.127	0.389	0.744	−0.800	0.763
	Diurnal Cortisol Slopes	b_4	0.256	0.506	0.444	0.254	−0.296	1.454
	Age		−0.326	−0.308	0.164	0.061	−0.613	0.025
	Race/ethnicity		0.351	0.855	0.416	0.040	**0.080**	**1.709**
	Sex-designated at birth		0.489	1.210	0.461	0.009	**0.312**	**2.162**
	BMI		−0.084	−0.288	0.651	0.659	−1.695	0.951
Covariances								
Diurnal Cortisol Intercepts	Diurnal Cortisol Slopes		0.233	0.386	0.238	0.105	−0.012	0.993
Depressive Symptoms W2	Race/ethnicity		−0.473	−2.263	0.641	0.000	**−3.513**	**−0.992**
Indirect and Total Effects on the Intercept of Depressive Symptoms								
Heterosexist discrimination → Cortisol intercepts → Intercept of Depressive Symptoms								
Indirect effect	a_1*b_1		0.008	0.011	0.028	0.689	−0.024	0.102
Total Effect	$c'_1 + (a_1*b_1)$		0.228	0.303	0.181	0.094	−0.028	0.681
Heterosexist discrimination → Cortisol Slopes →Intercept of Depressive Symptoms								
Indirect effect	a_1*b_2		−0.007	−0.003	0.016	0.826	−0.050	0.019
Total Effect	$c'_2 + (a_1*b_2)$		0.074	0.035	0.150	0.813	−0.281	0.290
Indirect and Total Effects on the Slope of Depressive Symptoms								
Heterosexist discrimination→ Cortisol intercepts→ Slope of Depressive Symptoms								
Indirect effect	a_2*b_3		−0.002	−0.002	0.025	0.934	−0.078	0.035
Total Effect	$c'_1 + a_2*b_3$		0.218	0.290	0.183	0.113	−0.029	0.672
Heterosexist discrimination → Cortisol slopes → Slope of Depressive Symptoms								
Indirect effect	a_2*b_4		0.004	0.002	0.018	0.910	−0.025	0.058
Total Effect	$c'_2 + a_2*b_4$		0.086	0.041	0.152	0.787	−0.276	0.307

Notes. LCI and UCI: lower confidence interval and upper 95 % confidence intervals. Significant CIs are presented in bold font. Unit of measurement for salivary cortisol was μg/dL.

et al., 2004; Jacobs et al., 2005; Kudielka et al., 2009; Laudenslager et al., 2013). Additionally, our findings were specific to a targeted convenience sample of residents in Northern California who, on average, reported depressive symptoms that fell within the low range of the depression inventory we administered. The fact that our sample of participants evinced non-significant variability in depressive symptoms slopes may have resulted in our tests predicting depressive symptoms slopes being overly conservative, as the limited variability may have constrained the ability to detect associations. Replicating our findings with a larger sample of participants with greater variability in mental health will be important.

Additionally, our sample, on average, reported relatively few instances of heterosexist victimization at baseline, and we did not assess for the severity of those experiences across all waves of data collection. If anything, though, our findings suggest that even infrequent experiences of heterosexist discrimination confer risks to the mental health of susceptible LGBTQ emerging adults, and it is probable that experiencing more frequent or serious heterosexist discrimination could drive depressive symptomology into the clinically significant range. Our study also lacked measures of intersectional discrimination that could be applied to LGBTQ-Latinx and LGBTQ-White emerging adults, such as experiences of discrimination or victimization based on gender, socioeconomic status, and ableism. Finally, our sample was not large enough to have adequate power for testing whether associations between heterosexist discrimination, diurnal cortisol indices, and depressive symptoms were heterogenous across participants with varying sexual and gender identities (i.e., lesbian; non-binary). Similarly, we had limited power for the multiple group comparison of Latinx and White participants; hence, that non-significant comparison should be considered with caution. Replicating our study with a larger sample of LGBTQ participants will be necessary for consideration of the more specific intersectional identities within the diverse LGBTQ community.

4. Conclusions

Developmental scientists have argued for the need to apply the intersectionality framework to our understanding of adrenocortical patterns that may place racially and ethnically diverse LGBTQ youths and emerging adults at varying risk for mental health problems in the context of identity-based victimization (Marshal et al., 2013; Parra and Hastings, 2018; Vargas et al., 2025). Strikingly, in this effort to do so, we appear to have identified normative and healthy diurnal HPA axis functioning as a protective biological factor that similarly buffers both LGBTQ-Latinx and LGBTQ-White emerging adults against acute responses to heterosexist victimization becoming enduring problems of depressive symptomology over the subsequent two years. Conversely, these protracted mental health difficulties were more likely when participants evinced hypocortisolism. Building on the substantial evidence base for healthy HPA axis functioning promoting better mental health (Adam et al., 2017; Guerry and Hastings, 2011), the current findings could be leveraged to inform health prevention and intervention efforts for racially and ethnically diverse LGBTQ emerging adults, who are tasked with navigating ambient heterosexist environments (Meyer, 2003) while simultaneously exploring and forming their stigmatized

sexual identities (Patterson, 2008).

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Research with Human Participants

This study was carried out in accordance with the recommendations of and approved by the UC Davis Institutional Review Board. All participants gave written informed consent.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.psyneuen.2025.107476.

Data Availability

The raw data supporting the conclusions of this manuscript will be made available by the authors to any qualified researcher upon request.

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