

Sexual Orientation and Daily Stress and Well-Being

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Objective: Stigmatization is believed to contribute to health disparities experienced by lesbian, gay, and bisexual (LGB) adults. However, few studies have examined how stigma shapes the perception and response to daily stress by sexual orientation grouping, an important potential mechanism by which stigma impacts health. This study examined responses of daily stress and well-being by sexual orientation. **Method:** Lesbian/gay ($N = 943$), bisexual/pansexual ($N = 919$), and heterosexual ($N = 27,751$) adults self-selected to participate in a 21-day ecological momentary assessment study using a digital platform on eligible smartphones that had an embedded optic sensor to measure physiological responses. Participants were prompted three times daily to provide perceptions of stress, psychological well-being, blood pressure, heart rate, and recent health behaviors. **Results:** Bisexual/pansexual adults reported more stress events, greater perceptions of stress, poorer coping, and less positive emotions compared to lesbian/gay and heterosexual adults. Bisexual/pansexual and lesbian/gay adults recorded higher heart rate compared to heterosexual adults. No differences were observed in blood pressure, perceptions of threat, or unfair treatment. Unfair treatment mediated the relationship between sexual orientation and stress for bisexual/pansexual but not lesbian/gay adults. **Conclusion:** Stigma has the potential to shape perceptions of stress, psychological well-being, and markers of physical health for LGB adults. Despite several indices of poor health, LGB adults demonstrate some elements of psychological and physical resilience that may have long-term health effects.

Public Significance Statement

This study found that while sexual minorities do perceive more stress and poorer coping compared to non-sexual minorities, their physiological responses do not uniformly reflect a maladaptive response. These results suggest that while stigma may shape how sexual minorities perceive and respond to stress, it does not altogether result in markers that reflect poorer health and point to the resilience of sexual minorities.

Keywords: sexual orientation, stress, blood pressure, health, ecological momentary assessment

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Lesbian, gay, and bisexual (LGB) people disproportionately experience worse outcomes across various health domains (Lick et al., 2013). Some research has explored the causes of these disparities, with evidence suggesting that stigma may be the primary driver of these health inequities (Hatzenbuehler, Phelan, & Link, 2013). Stigma—negative feelings, perceptions, or treatment based on marginalized group identity—manifests at multiple levels including

structural (e.g., laws), interpersonal (e.g., discrimination), and intrapersonal (e.g., anticipated rejection). Collectively, stigma places individuals at a social disadvantage in accessing resources, which can be a major source of stress that elicits affective, physiological, and behavioral responses that can contribute to health disparities (Trujillo & Mendes, 2021). However, research on these responses in daily life has often been limited to smaller and less diverse

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samples, controlled laboratory settings limiting external validity, and been unable to capture physiological responses (e.g., blood pressure [BP]) in naturalistic contexts. This study seeks to address these limitations by examining the affective, physiological, and behavioral experiences as they relate to daily stress by sexual orientation.

Daily Experiences of LGB People

The consequences of stress for physical health are well documented with both acute and chronic stress associated with poor health and disease. Chronic stress (e.g., stigma) is associated with more overall daily stress (Almeida, 2005) and more emotional reactivity to daily stressors (Surachman et al., 2019). However, theoretical models of stigma suggest that stress plays a unique role in the lives of stigmatized people. According to minority stress theory (Meyer, 2003) and identity threat models of stigma (Major & O'Brien, 2005), individuals with a stigmatized identity experience additional and chronic stress because of their devalued social identity. This includes exposure to external (e.g., discrimination) and internal stressors (e.g., internalized heterosexism), which are linked to poor health outcomes (Flentje et al., 2019) and poor psychological well-being (e.g., feelings of joy; Timmins et al., 2020) among LGB people. Prior evidence has identified LGB people to report more daily stressors (Wardecker et al., 2022) and discrimination (Mays & Cochran, 2001) compared to heterosexuals. While all LGB people are at risk of sexual minority stress, a growing body of literature has identified that bisexual and pansexual individuals (people who have multigender attraction) face additional stressors associated with their sexual identity. For instance, stereotypes of bisexual and pansexual individuals as promiscuous and beliefs of the illegitimacy of their identities are endorsed by heterosexuals and lesbians/gays alike (Brewster & Moradi, 2010) resulting in marginalization from both populations. Accordingly, bisexuals experience elevated minority stress (Feinstein & Dyar, 2017) and report worse health outcomes compared to lesbian and gay people (Dyar et al., 2019), suggesting they may be most at risk for the consequences associated with stress.

Physiological functioning is one way that stress contributes to markers of poor health and disease. Decades of laboratory research have identified cardiovascular responses to stress including changes in BP and heart rate (HR; Herd, 1991), which when chronically activated can influence the development of various diseases like hypertension (Matthews et al., 2004) and cardiovascular disease, a disease LGB individuals are increased risk for developing (Caceres et al., 2019). However, there have been limited studies examining differences in cardiovascular responses to stress by sexual orientation. One study by Juster et al. (2019) found that LGB individuals exhibited higher BP and HR in response to an acute laboratory stressor compared to heterosexuals. Other work examining sexual orientation differences in resting BP and HR provided mixed results with lesbian and gay individuals demonstrating both higher and lower BP, while bisexuals generally demonstrating elevated BP compared to heterosexual counterparts (Dyar et al., 2019; Hatzenbuehler, McLaughlin, & Slopen, 2013; Mays et al., 2018).

Engaging in physical activity and exercise has long been identified as an effective health-promoting activity that may be particularly beneficial for individuals exposed to chronic stress. Exercise can attenuate BP responses to stress (Hamer et al., 2006), improve mood (Wichers et al., 2012), and improve psychological well-being (via reduced stress, anxiety, and depression; Warburton et al., 2006).

Evidence for differences in physical activity by sexual orientation is mixed with research reporting LGB people engage in less (Rosario et al., 2014) or more (Fricke et al., 2019) physical activity compared to their heterosexual counterparts. Other work has failed to identify any differences in physical activity by sexual orientation (Boehmer et al., 2012; Hatzenbuehler, McLaughlin, & Slopen, 2013).

How individuals perceive and respond to stress provides critical insight into how stress may have downstream health consequences. According to classic theories of stress and coping (Lazarus & Folkman, 1984), individuals first appraise the extent to which a situation is demanding (e.g., potential for harm) followed by whether individuals believe they have access to the resources (e.g., knowledge) necessary for attending to and/or changing the situation. Two primary psychological states have been defined by demands and resources: challenge, occurring when individuals perceive that their resources exceed the demands of the moment, and threat, when demands outweigh resources (Blascovich & Mendes, 2010). The biopsychosocial model of challenge and threat posits a connection between these psychological states and patterns of physiological responses (Blascovich & Tomaka, 1996) including activation of the sympathetic-adrenomedullary and hypothalamo-pituitary-adrenocortical axes. Laboratory studies examining physiological responses to novel situations show that when individuals perceive a challenge participants show greater increases in cardiac output and smaller increases in BP. Threat, however, is associated with little or no changes in cardiac output and greater increases in BP (Blascovich & Mendes, 2010). Threat states, when repeated over time, may affect health behaviors, cardiovascular health, and immune functioning (Mendes & Muscatell, 2018).

There is reason to believe that stigma may shape these perceptions. Stigma constrains access to resources including money, knowledge, and power (Hatzenbuehler, Phelan, & Link, 2013), which can influence one's perceived control to change their immediate situation. Access and quality of social relationships are also diminished by stigma by intervening on people's need for affiliation, support, and human connection (Link, 2023). This intrusion contributes to social isolation and disconnection (Pachankis, 2007), limiting access to the salubrious effects of social support that stigmatized individuals rely on in their perception of available resources. Previous research has identified that exposure to stigma among sexual minorities engenders rumination (Hatzenbuehler et al., 2009), which prolongs and exacerbates distress, depleting strategies to successfully cope with stress.

The Present Study

The present study sought to identify affective, physiological, and behavioral experiences as they relate to stress by sexual orientation. This study seeks to address some limitations of prior work. First, we utilized a large international sample to capture daily stress experiences from individuals less typically found in work on LGB individuals. Second, this work captured BP during daily life as opposed to in response to laboratory-based stressors. Because of the difficulty in capturing valid measurements of BP in daily life, there is limited knowledge of the association between daily stress and BP that is not based on small samples, sample-specific characteristics (e.g., individuals with cardiovascular disease), and/or short-term studies (i.e., a couple of days). Considering that BP responses captured in daily life might be better predictors of cardiovascular morbidity

and mortality than lab-based measures in artificial settings (Kamarck et al., 2011), this work can provide greater clarity of those most at risk. Taking this into consideration and our current theoretical framework, we hypothesize LGB individuals to experience greater objective and subjective stress, poorer markers of physical health (i.e., higher HR, BP), and poorer psychological well-being (i.e., positive emotions, coping) compared to heterosexuals, with bisexual and pansexual identified individuals reporting worse outcomes. We remain uncertain whether we will observe differences in physical activity by sexual orientation given previous mixed findings. We also hypothesize that experiences with discrimination mediate the relationship between sexual orientation and our outcomes for LGB individuals.

Method

Open Data Statement

The study was approved by the Human Research Protection Program at the University of California, San Francisco, San Francisco, California, United States (Institutional Review Board 19-27169). Data were collected from March 15, 2019, until December 31, 2021. The data have been taken from a larger project, and some of the data that have addressed distinct questions from the present one have been published previously (Gordon & Mendes, 2021; Newman et al., 2023). All data, materials, and analyses are provided as the additional online materials at Open Science Framework (Newman et al., 2024). The study was not formally preregistered.

Participants and Procedure

Data were collected using the MyBPLab (<https://mybplab.com>) app that was available on the Google Play Store and Samsung website. The app required a compatible phone (e.g., Samsung S9) that was manufactured with an embedded optic sensor. Participants voluntarily downloaded the app and enrolled in the MyBPLab study, which was the only way to access the optic sensor to measure BP. Upon enrolling, participants provided demographic information. We designed the study as an ecological momentary assessment study in which participants were instructed to complete three check-ins each day for a period of 21 days. The check-ins were completed in the morning (7:00 a.m.–10:00 a.m.), afternoon (10:00 a.m.–4:00 p.m.), and evening (8:00 p.m.–11:00 p.m.) following random notifications within the specified time window. At each check-in, participants were instructed to place their finger over the optic sensor for approximately 30 s, which measured their HR and BP. Following this, they were presented with questions regarding their current stress, coping, and emotions. In addition to these questions at every check-in, various additional questions rotated across nine check-ins (every fourth day, the pattern of questions repeated). One of the nine sets of questions queried participants about their exercise and experiences of discrimination/unfair treatment on that day. As an incentive to participate in the study, participants received feedback about their HR and BP so that they could track their values over time.

Demographics and descriptive statistics were drawn from a sample of participants who completed at least three check-ins¹ of one of the daily measures and answered a question about their sexual orientation at enrollment. In total, 29,613 ($M_{\text{age}} = 44.01$, $SD = 12.79$, 69.01% male, 30.66% female, 0.32% another gender) participants

completed the study. Males outnumbered females (as is expected given Android phone users are typically more than 80% male globally), and the participants were generally well educated, but the sample was diverse in terms of age and race/ethnicity. Though the MyBPLab was only available in English, it could be downloaded in several countries and was promoted on the Google Play Store in the following countries: United States, United Kingdom, Australia, Canada, India, Singapore, Hong Kong, and New Zealand, though the app could be accessed anywhere, and the study was approved for global use. Table 1 provides demographic data for participants across sexual orientation categories.

Measures

Participant Characteristics

Prior to beginning the ecological momentary assessment portion of the study, participants provided their age and their race and ethnicity. We assessed the highest level of education achieved, relative income, and body mass index (BMI; see the [online supplemental materials](#)). Gender was assessed by the question, “How do you describe yourself? (Select one)” with response options recorded on a 4-point scale (1 = *male*, 2 = *female*, 3 = *transgender*, 4 = *something else*). To assess for sexual orientation, participants were asked to provide one response to the question, “Do you consider yourself to be”: on a 5-point scale (1 = *heterosexual*, 2 = *gay or lesbian*, 3 = *bisexual*, 4 = *other [text entry]*, 5 = *decline to comment*). Open text responses to the “other” option were examined for sexual orientations not listed. The sample was organized into three sexual orientation groups: lesbian/gay, bisexual/pansexual, and heterosexual. If participants selected “gay or lesbian” or if they provided another monosexual sexual orientation (e.g., same-gender loving), they were grouped in the lesbian/gay group. Participants were grouped into the bisexual/pansexual group if they selected “bisexual” or if they provided another sexual orientation noting multigender attraction (e.g., pansexual). Individuals who selected “heterosexual” or indicated their sexual orientation as “straight” were included in the heterosexual group. Individuals providing open-text responses outside of these options (e.g., “normal”) or who declined to comment to the sexual orientation question were not categorized.

Physiological Responses

During each check-in, participants recorded their HR and BP using the optic sensor on their phone. When enrolling in the study, participants viewed a video on how to obtain BP values using the optic sensor and then were encouraged to calibrate their BP using an external cuff. Entering calibration values allowed participants to view BP and HR values (otherwise, they were presented only with percentage changes in BP from the last check-in). In the present analyses, we only included participants with calibrated values so that we could accurately compare differences across sexual orientation categories. See Gordon and Mendes (2021) for the validation studies of the optic sensor to measure BP. We also included BP values only if participants indicated that they did not exercise in the last 30 min as exercise can acutely raise BP.

¹ See the [online supplemental materials](#) for a rationale.

Table 1
Participant Demographics

Characteristic	Total		Lesbian/gay (N = 943)		Bisexual/pansexual (N = 919)		Heterosexual (N = 27,751)	
	N	%	N	%	N	%	N	%
Gender								
Male	20,437	69.01	736	78.05 ^a	358	38.96 ^b	19,343	69.70 ^c
Female	9,080	30.66	187	19.83 ^a	521	56.69 ^b	8,372	30.17 ^c
Neither male nor female	96	0.32	20	2.12 ^a	40	4.35 ^b	36	0.13 ^c
Age								
18–29 years old	3,830	12.94	188	19.94 ^a	303	32.97 ^b	3,339	12.03 ^c
30–39 years old	7,553	25.52	298	31.60 ^a	325	35.36 ^a	6,930	24.97 ^c
40–49 years old	8,630	29.16	231	24.50 ^a	186	20.24 ^b	8,213	29.60 ^c
50–64 years old	7,561	25.54	194	20.57 ^a	81	8.81 ^b	7,286	26.25 ^c
65+ years old	2,025	6.84	32	3.39 ^a	24	2.61 ^a	1,969	7.10 ^c
Country								
United States	19,884	67.17	634	67.23	654	71.16	18,596	67.01
United Kingdom	2,692	9.09	100	10.60 ^a	77	8.38 ^a	2,515	9.06 ^a
Australia	2,410	8.14	102	10.82 ^a	69	7.51 ^b	2,239	8.07 ^b
Canada	1,646	5.56	45	4.77 ^a	54	5.88 ^a	1,547	5.57 ^a
India	745	2.52	3	0.32 ^a	15	1.63 ^b	727	2.62 ^b
Singapore	526	1.78	16	1.70	7	0.76	503	1.81
Hong Kong	321	1.08	11	1.17 ^a	6	0.65 ^a	304	1.10 ^a
New Zealand	144	0.49	0	0.00 ^a	6	0.65 ^a	138	0.50 ^a
Other	1,235	4.17	32	3.39 ^a	31	3.37 ^a	1,172	4.22 ^a
Education								
Elementary school (no high school)	804	2.76	18	1.91 ^a	27	2.94 ^a	759	2.74 ^a
High school or GED	4,763	16.35	126	13.36 ^a	155	16.87 ^b	4,482	16.15 ^b
Some college	6,815	23.40	243	25.77 ^a	304	33.08 ^b	6,268	22.59 ^c
2-year degree	3,253	11.17	118	12.51 ^a	116	12.62 ^a	3,019	10.88 ^a
4-year degree	7,167	24.60	235	24.92 ^a	182	19.80 ^b	6,750	24.32 ^a
Graduate school	6,328	21.72	194	20.57 ^a	131	14.25 ^b	6,003	21.63 ^a
Race/ethnicity								
Non-Hispanic White	18,484	62.42	618	65.54 ^a	620	67.46 ^a	17,246	62.15 ^b
Non-Hispanic Black	1,777	6.00	51	5.41 ^a	32	3.48 ^b	1,694	6.10 ^a
Non-Hispanic Asian	2,795	9.44	75	7.95 ^a	42	4.57 ^b	2,678	9.65 ^a
Hispanic/Latinx	3,128	10.56	118	12.51	98	10.66	2,912	10.49
Multiple races	2,628	8.87	46	4.88 ^a	66	7.18 ^b	2,516	9.07 ^c
Other	801	2.70	35	3.71 ^a	61	6.64 ^b	705	2.54 ^c
Income								
Ladder Rung 1 (lowest)	599	2.27	29	3.08 ^a	46	5.01 ^b	524	1.89 ^c
Ladder Rung 2	1,358	5.14	50	5.30 ^a	94	10.23 ^b	1,214	4.37 ^a
Ladder Rung 3	2,932	11.09	119	12.62 ^a	150	16.32 ^b	2,663	9.60 ^c
Ladder Rung 4	3,573	13.52	133	14.10 ^a	126	13.71 ^a	3,314	11.94 ^a
Ladder Rung 5	4,136	15.65	130	13.79	113	12.30	3,893	14.03
Ladder Rung 6	4,045	15.31	101	10.71 ^a	91	9.90 ^a	3,853	13.88 ^b
Ladder Rung 7	3,388	12.82	119	12.62 ^a	70	7.62 ^b	3,199	11.53 ^a
Ladder Rung 8	2,826	10.69	85	9.01 ^a	81	8.81 ^a	2,660	9.59 ^a
Ladder Rung 9	2,787	10.55	89	9.44	73	7.94	2,625	9.46
Ladder Rung 10 (highest)	784	2.97	21	2.23 ^a	18	1.96 ^a	745	2.68 ^a
BMI	29.84 (M)	6.86 (SD)	29.79 ^a (M)	7.72 (SD)	30.91 ^b (M)	8.49 (SD)	29.81 ^a (M)	6.76 (SD)

Note. Superscripts that are the same, that is, both “a,” indicate no significant difference between the groups, while groupings with superscripts that are different (i.e., “a” and “b”) signify a significant difference between groups for each specific row. Rows without superscripts indicated some significant and nonsignificant differences such that clean distinctions were not possible to label. BMI = body mass index; GED = general educational development diploma.

Affective and Behavioral Responses

After recording their HR and BP, participants were asked whether they had experienced any particularly stressful event (stress exposure) since the last check-in (yes/no). If they reported they had (13.05%), they then were asked the following three questions that captured stressor intensity and coping: “How stressful was it?”, “How much did it impact your life?”, and “Do you feel like you handled it/are handling it well?” (coping). Response options were recorded on a 5-point scale (1 = *not at all*, 2 = *a little bit*, 3 = *somewhat*, 4 = *moderately*,

5 = *extremely*). The threat ratio was calculated by averaging the responses to the first two questions and dividing by the response to the third question. A higher score meant the stressfulness of the experience exceeded their ability to cope or handle the stressor. If they reported no stressful experience since the last check-in (86.95%), they were presented with the following three statements that captured overall daily stress, coping, and well-being: “I feel stressed, anxious, overwhelmed” (daily stress), “I feel in control, coping well, on top of things” (perceived coping), and “I feel joyful, glad, happy” (positive emotions). Responses were recorded on the same 5-point scale.

In addition to the questions that were asked at every check-in, participants were asked two questions in the evening every third day about their daily exercise. They were asked, "Today, how much time did you spend doing the following? Moderate physical activity (e.g., brisk walking, strength training, gentle swimming) and vigorous physical activity (e.g., aerobics class, jogging, running, power walking, team sports)?" Responses for each category of physical activity were recorded on a 6-point scale (1 = none, 2 = less than 15 min, 3 = 15–29 min, 4 = 30–44 min, 5 = 45–60 min, 6 = more than 60 min). Every third day during the afternoon check-in, participants were asked to complete some items from the Everyday Discrimination Scale (Williams et al., 1997), specifically if they experienced any unfair treatment based on any of the following characteristics: gender, age, religion, race/ethnicity, shade of skin color, weight, sexual orientation, education or income level, or physical disability. Response options were yes or no. If the participant responded yes to any of the following, they received a score of 1; otherwise, they received a score of 0.

Results

As a preliminary step, we examined demographic differences between lesbian/gay, bisexual/pansexual, and heterosexual participants. These analyses served as a basis for determining which variables to add as covariates in our primary analyses. We detected differences across groups in terms of their gender, age, education, income, and race and ethnicity. Therefore, we controlled for gender, age, education, income, race, ethnicity, and BMI. See Table 1 and online supplemental materials for details.

For all remaining analyses, we used multilevel modeling to account for between-person and within-person variation. Check-ins were nested within persons, and we used the lme4 (Bates et al., 2015) package in R. At a descriptive level, we ran null or unconditional models in which each daily variable was the outcome measure at Level 1. A random intercept was included but no predictors were in the model. These results indicated that there was more between-person than within-person variation for HR, BP, perceived coping, and positive emotions (see the online supplemental materials for details). Although there was more within-person than between-person variation for daily stress, threat ratio, and exercise, there was a substantial between-person variation to suggest that between-person relationships could be examined reliably.

As our primary question, we compared differences in the daily measures across the three groups of people. In separate models, each daily measure was the outcome variable at Level 1. To compare differences between lesbian/gay and bisexual/pansexual participants, separate dummy-coded variables for bisexual/pansexual and heterosexual participants were entered uncentered at Level 2. Because the intercept represented means for lesbian/gay participants, the coefficient for bisexual/pansexual represented the difference between those groups. An additional model that included dummy-coded variables for bisexual/pansexual and lesbian/gay participants with an intercept that represented heterosexual participants provided the means to make the two remaining comparisons. In both models, additional covariates for gender, age, income, education, race/ethnicity, and BMI were entered at Level 2. Effect size estimates were calculated with Cohen's *d* from models that aggregated the daily measures.

As shown in Table 2, heterosexual participants had lower HR than lesbian/gay and bisexual/pansexual participants, who did not differ from each other. The groups did not differ in their levels of BP, threat

ratio, exercise, or unfair treatment. Heterosexuals reported lower daily stress than bisexual/pansexual participants, and though levels of daily stress among lesbian/gay participants fell in between, they did not differ from the other groups. Bisexual/pansexual participants reported lower perceived coping, lower positive emotions, and higher stress exposure than lesbian/gay and heterosexual participants who did not differ from each other. In sum, most of the difference concerned the well-being outcomes in which bisexual/pansexual participants fared the worst and there were no differences between lesbian/gay and heterosexual participants. The only difference we observed for the health-relevant outcomes was HR, in which heterosexuals recorded lower levels than the other groups who did not differ.

To unpack these findings, we ran additional analyses to shed light on some of the nuances. First, we considered whether the observed differences in HR, daily stress, perceived coping, positive emotions, and stress exposure could be explained by accumulated instances of unfair treatment. Though we did not find any significant differences in unfair treatment between the groups, this variable could nevertheless serve as a potential mediator if the other relationships between unfair treatment and the outcome variables were reasonably strong. To examine such possibilities, we aggregated daily states of the outcome measures and daily unfair treatment and ran mediation models using the PROCESS function in R with 1,000 bootstrap samples to account for nonnormal distributions. We found that the difference in stress exposure between bisexual/pansexual and heterosexual participants was mediated by unfair treatment, partially standardized $b = -0.04$, $SE = 0.02$, 95% confidence interval (CI) $[-0.08, -0.00]$. All other differences between groups for the other outcomes were not significantly mediated by unfair treatment.

Second, we examined whether the differences in HR were explained by differences in vigorous exercise. That is, we considered whether the difference in the one health outcome could be explained by a particular health behavior. We ran the same type of mediation analysis described above and found one significant indirect effect when comparing lesbian/gay participants with heterosexual participants, partially standardized $b = -0.01$, $SE = 0.01$, 95% CI $[-0.03, -0.00]$. Thus, the reason why heterosexual participants had lower HR levels on average than lesbian/gay participants is because heterosexual participants reported higher levels of vigorous exercise. The indirect effects for the comparisons of the other groups were not significant (95% CIs $[-0.04, 0.07]$ and $[-0.02, 0.02]$).

Third, we considered the different sources of unfair treatment by examining the differences in frequencies of each source individually between the groups. Bisexual/pansexual participants ($M = 0.14$, $SE = 0.03$) reported a higher frequency of unfair treatment regarding their age than heterosexual participants ($M = 0.11$, $SE = 0.03$), $OR = 3.66$, $z = 2.67$, $p = .008$. Lesbian/gay participants ($M = 0.10$, $SE = 0.03$) did not differ from the other groups. Heterosexual participants ($M = 0.13$, $SE = 0.01$) reported a lower frequency of unfair treatment regarding their sexual orientation than bisexual/pansexual ($M = 0.14$, $SE = 0.01$), $OR = 12.60$, $z = 2.92$, $p = .004$, and lesbian/gay participants ($M = 0.15$, $SE = 0.01$), $OR = 17.82$, $z = 4.37$, $p < .001$. All other differences were not significant (all $ps > .052$; see the online supplemental materials for details). Thus, in comparison to heterosexuals, when lesbian/gay and bisexual/pansexual participants experienced unfair treatment, they perceived the treatment as due to their sexual orientation.

Fourth, we examined how differences in each outcome across the groups were moderated by gender. We considered differences

Table 2
Between-Person Relationships Between Sexual Orientation Grouping and Daily Outcomes, Controlling for Demographics

Outcome variable	Lesbian/gay, M (SE)		Bisexual/pansexual, M (SE)		Heterosexual, M (SE)		Lesbian/gay versus bisexual/pansexual			Lesbian/gay versus heterosexual			Bisexual/pansexual versus heterosexual			
	N	b	t	p	d	b	t	p	d	b	t	p	d	b	t	p
HR (bpm)	80.56 (1.24)	80.05 (1.21)	78.79 (1.21)	25,497	-0.51	-1.03	.301	-0.13	1.77	5.00	<.001	0.18	1.26	3.44	<.001	0.31
SBP (mmHg)	125.99 (2.21)	126.74 (2.18)	126.62 (2.18)	18,045	0.75	0.88	.379	0.07	-0.62	-1.03	.303	-0.05	0.13	0.21	.836	-0.11
DBP (mmHg)	80.31 (1.62)	80.89 (1.59)	81.00 (1.59)	18,045	0.59	0.93	.351	-0.01	-0.70	-1.57	.116	-0.04	-0.11	-0.24	.811	-0.03
Daily stress	1.94 (0.09)	1.99 (0.09)	1.91 (0.09)	20,778	0.05	1.47	.142	-0.13	0.03	1.37	.169	0.15	0.08	3.27	.001	0.28
Perceived coping	3.52 (0.11)	3.42 (0.11)	3.52 (0.11)	20,774	-0.10	-2.37	.018	0.21	-0.01	-0.25	.802	-0.09	-0.11	-3.42	<.001	-0.24
Positive emotions	3.18 (0.11)	3.07 (0.11)	3.19 (0.11)	20,770	-0.11	-2.53	.011	0.18	-0.01	-0.48	.630	-0.09	-0.12	-3.86	<.001	-0.26
Threat ratio	1.25 (0.15)	1.21 (0.14)	1.26 (0.15)	4,563	-0.03	-0.54	.588	0.02	-0.01	-0.20	.839	0.05	-0.04	-1.03	.305	0.03
Moderate exercise	3.41 (0.40)	3.63 (0.40)	3.47 (0.40)	3,495	0.22	1.29	.196	0.11	-0.06	-0.50	.617	-0.08	0.16	1.23	.217	-0.19
Vigorous exercise	2.54 (0.33)	2.71 (0.33)	2.68 (0.33)	3,502	0.17	1.17	.241	0.00	-0.14	-1.46	.144	-0.11	0.03	0.25	.804	-0.11

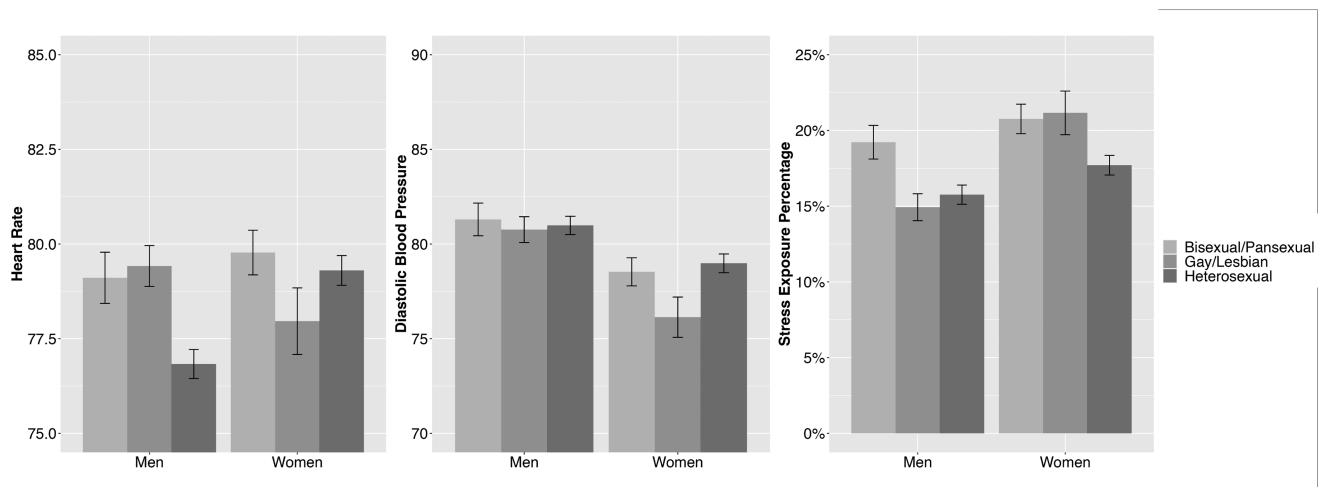
Outcome variable	Lesbian/gay versus bisexual/pansexual			Lesbian/gay versus heterosexual			Bisexual/pansexual versus heterosexual		
	N	OR	z	N	OR	z	N	OR	z
Unfair treatment	4,016	1.26	0.50	4,016	1.56	1.35	4,016	1.97	1.94
Stress exposure	24,377	1.27	3.43	24,377	0.98	-0.36	24,377	1.25	4.40

Note. Cohen's *d* was calculated from aggregated daily outcome measures which combine between-person and within-person variation. These models did not include covariates and thus provide a rough approximation of the effect size estimate. HR = heart rate; SBP = systolic blood pressure, DBP = diastolic blood pressure.

between men and women only in these analyses as we were underpowered to examine those who were nonbinary. We found significant two-way interactions for HR between bisexual/pansexual and lesbian/gay participants, $b = 1.70$, $t = 2.29$, $p = .022$, $\eta_p^2 = .002$, between lesbian/gay and heterosexual participants, $b = 3.93$, $t = 4.36$, $p < .001$, $\eta_p^2 = .001$, and between bisexual/pansexual and heterosexual participants, $b = 1.80$, $t = 2.42$, $p = .016$, $\eta_p^2 = .000$. There was a significant two-way interaction for DBP between lesbian/gay and heterosexual participants, $b = 2.63$, $t = 2.40$, $p = .017$, $\eta_p^2 = .000$, and there was a significant interaction for stress exposure between lesbian/gay and heterosexual participants, $b = -0.33$, $t = -2.58$, $p = .010$, $\eta_p^2 = .000$. All other interaction terms were not significant (see the [online supplemental materials](#) for details). Means across specific groups are presented in [Figure 1](#). We ran contrasts between (a) gay men and bisexual men, (b) gay men and heterosexual men, (c) bisexual/pansexual men and heterosexual men, (d) lesbian women and bisexual women, (e) lesbian women and heterosexual women, and (f) bisexual/pansexual women and heterosexual women. Heterosexual men had lower HR than gay men, difference (diff) = 2.59, 95% CI [1.81, 3.70], $z = 6.51$, $p < .001$, and bisexual/pansexual men, diff = 2.28, 95% CI [1.15, 3.40], $z = 3.97$, $p < .001$, whereas HR levels did not differ among the different groups of women, $ps > .05$. Regarding DBP, levels did not differ among the groups of men, but there were significant differences between lesbian women and bisexual/pansexual women, diff = -2.40, 95% CI [-4.62, -0.18], $z = -2.12$, $p = .034$, and between lesbian women and heterosexual women, diff = -2.85, 95% CI [-4.76, -0.94], $z = -2.92$, $p = .004$. Regarding stress exposure, bisexual/pansexual men reported higher stress exposure than gay men, diff = -0.04, 95% CI [-0.07, -0.02], $z = -3.80$, $p < .001$, and heterosexual men, diff = 0.03, 95% CI [0.02, 0.05], $z = 3.67$, $p < .001$, whereas heterosexual women reported less stress exposure than bisexual/pansexual women, diff = 0.03, 95% CI [-4.62, -0.18], $z = 3.86$, $p < .001$, and lesbian women, diff = 0.03, 95% CI [0.01, 0.06], $z = 2.62$, $p = .009$.

Next, we sought to provide greater clarity in understanding how these groups of people differ in their reactions to stress exposure. That is, we examined how sexual orientation moderated the within-person relationships between stress exposure (0 = *did not occur since the last check-in*, 1 = *did occur since the last check-in*) and HR and BP. Across all participants, people recorded higher HR, $b = 1.98$, $t = 31.38$, $p < .001$, SBP, $b = 1.46$, $t = 23.29$, $p < .001$, and DBP, $b = 0.69$, $t = 15.22$, $p < .001$, when something stressful occurred since the last check-in than when nothing stressful had occurred. However, the within-person relationships for HR, SBP, and DBP were not moderated by sexual orientation, all $ps > .058$. Similarly, we found that the within-person relationships between physiology and stressor intensity were not moderated by sexual orientation with the exception of one two-way interaction for DBP between bisexual/pansexual and lesbian/gay participants, $b = 1.20$, $t = 2.33$, $p = .022$, such that the within-person relationship between stressor intensity and DBP was positive (but not significant) among lesbian/gay participants, $b = 0.26$, $t = 0.85$, $p = .397$, whereas the relationship was negative (but not significant) among bisexual/pansexual participants, $b = -0.31$, $t = -0.96$, $p = .340$. While the primarily nonsignificant interactions show that LGB individuals do not react to stressors differently from heterosexuals, it is worth noting that their reactions are neither muted nor exacerbated. We also

Figure 1
Significant Gender by Sexual Orientation Interactions



Note. Error bars represent 1 *SE* above and below the mean within each group. Means are estimated controlling for income, education, BMI, and race and ethnicity. BMI = body mass index.

examined whether differences by sexual orientation might be moderated by country-level differences. All interactions were not significant (all p s > .343; see the [online supplemental materials](#)).

Discussion

The current investigation is among the first to examine sexual orientation differences in the daily stress experience of adults. Leveraging a built-in optic sensor available on smartphone devices and a large international sample, we found that LGB individuals generally demonstrated some evidence of poorer psychological well-being and physical health. Specifically, bisexual/pansexual adults evidenced poorer psychological well-being and more stressors compared to lesbian, gay, and heterosexual adults. LGB adults recorded higher HR levels than heterosexuals. However, there was no evidence for overall differences in perceptions of threat, unfair treatment, BP, or physical activity. Unfair treatment mediated the relationship between sexual orientation and stress for bisexual/pansexual but not lesbian/gay adults.

These findings add to the growing body of knowledge regarding the health of LGB adults and how they navigate their daily lives in several ways. Our study identified that bisexual/pansexual adults generally reported more daily stress and greater stress intensity than heterosexual adults, even after accounting for potential demographic contributing factors. These results are in line with previous empirical (Wardecker et al., 2022) and theoretical work (Major & O'Brien, 2005; Meyer, 2003) indicating that individuals exposed to stigma experience excess stress, often that which is associated with their stigmatized social position. This is reflected in our results identifying that the difference in stress exposure between bisexual/pansexual and heterosexual participants was mediated by unfair treatment. Though these effects are moderately small, they can have important practical consequences (Milkman et al., 2021) with stress exposure and perceived daily stress accumulating over time, putting a strain on bisexual/pansexual adults health (Dyar et al., 2019; Lick et al., 2013).

Bisexual/pansexual individuals also reported less positive emotions and poorer daily perceived coping compared to heterosexuals. One reason may be due to reduced access to psychological and social resources necessary to effectively cope (Hatzenbuehler, Phelan, & Link, 2013). Stigma has been found to deplete self-regulatory resources subsequently thwarting an ability to effectively manage emotions and ability to cope well (Hatzenbuehler et al., 2009). Stigma also might limit access to emotion regulation strategies and contribute to a lack of emotion awareness among sexual minorities (Pachankis et al., 2015) which may have impacted differences in positive affect. Considering that positive affect has the potential for improving psychological well-being and enhance physical health (Pressman et al., 2019), future work should consider interventions aimed at facilitating positive affect in an effort to improve the health of LGB people. The chronicity of stigma can also lead to social isolation and exhaust long-standing social resources used to effectively cope with stressors by overburdening sources of support (Kaniasty & Norris, 1993). Despite differences in perceived coping, bisexual/pansexual adults did not perceive more threat appraisals than heterosexuals which is noteworthy considering that they reported greater stress. Given the chronicity of stigma, bisexual/pansexual adults may have developed a sense of mastery insofar as they may be unthreatened by stressors they know they can handle. Though more empirical work is necessary, these results provide important points for future research.

It is important to acknowledge that bisexual/pansexual people also fared worse than lesbian/gay people with respect to perceived coping, psychological well-being, and stress exposure, while lesbian/gay people did not differ from heterosexuals across these affective domains. When considering differences among LGB people, these results are in line with mounting evidence that bisexual/pansexual people report stigma and hostility from both heterosexual and lesbian/gay people due to their sexual orientation (Brewster & Moradi, 2010). This hostility leads bisexual/pansexual people to be less open and more likely to conceal their sexual orientation

compared to lesbian/gay people and have a weaker sense of connection to the LGB community (Chan et al., 2020), depriving them of access to crucial social resources to cope with stress that are only accessible to individuals who identify and participate in their community (Crocker & Major, 1989). In contrast, it is notable that no differences emerged between lesbian/gay and heterosexual people. This is not to indicate that lesbian/gay people did not experience stress or stigma in our sample, evidenced by their attributing unfair treatment to sexual orientation. Rather, lesbian/gay people may have developed adaptive responses brought on by a history of stigma-related stress making them resilient to future stressors (Kwon, 2013). There is a growing body of research identifying unique personal and collective strengths allowing gay/lesbian people to thrive in the face of social adversity. For instance, when lesbian/gay people are fully supported and connected to their community, they develop a sense of identity pride which has positive downstream consequences for their health (Perrin et al., 2020). Though additional work in this area is necessary, the results of this study highlight those most at risk for negative consequences of stress and also the resilience of LGB people.

Our results show that LGB adults also demonstrated overall higher HR but not BP compared to heterosexuals. When examining these physiological indices by gender, we identified that elevated HR was specific to bisexual/pansexual and gay men compared to heterosexual men. In line with prior work and the results of this study, these differences may partly be explained by engaging in vigorous exercise, which has been shown to result in lower HR (Reimers et al., 2018). That we failed to find any differences in HR among women parallels previous research (Hatzenbuehler, McLaughlin, & Slopen, 2013) but stands in contrast to lesbian women recording lower DBP in our sample. Additional work is necessary to understand the unique factors that may protect bisexual/pansexual and lesbian women from poor physiological functioning.

It is striking that physiological responses to stress exposure did not differ by sexual orientation. That is, all participants responded with elevated HR and BP in response to a stressful event and that this within-person response to daily stress did not differ by sexual orientation. This work stands in contrast to previous work (Juster et al., 2019) demonstrating elevated HR and BP response to acute laboratory stress among LGB individuals compared to heterosexuals; however, these results indicated differential responses by gender suggesting the stress-physiological link may differ by gender. Another possibility for the divergence from prior work is that stressors experienced in daily life may differ from those elicited in laboratory settings, and daily stressors may elicit less robust cardiovascular responses compared to the social evaluative nature of laboratory-based stressors (Weber et al., 2022). Future work should continue to assess and compare types of stressors and their subsequent responses when captured in laboratory settings versus daily life.

These results should be considered in light of its limitations. First, the characteristics of the sample limit the generality of the results. The sample skewed toward younger White men with an eligible smartphone. While the international sample of the current study helps to mitigate some concerns, the sample was limited to English-speaking participants and predominately those from the Northern Hemisphere. Future work should continue to be conducted on diverse samples. Second, this study required participants to “check-in” on their phone, requiring them to stop their current activities. This on-demand feature of the study makes it possible that participants may not have checked in when stress was high, constraining our ability to fully

capture the variables of interest. As “wearable” devices allowing for continuous assessment of physiology become more common, this limitation will be more addressable. Third, some items were prompted less frequently than others (e.g., exercise), making it possible that some experiences were not captured because of timing. This precludes our ability to fully assess some experiences. Lastly, we did not assess for the degree of “outness” or “community connection” of LGB participants. Individuals who are more “out” about their sexual orientation may be at increased risk of experiencing interpersonal rejection based on their sexual identity subsequently impacting their perception and response to these experiences (Trujillo & Mendes, 2021). Additionally, LGB adults who are more connected to the LGB community may be uniquely poised to access resources that may buffer against stress. Future research should explore and/or account for these constructs and the impact they may have on the daily experiences of sexual minorities.

In sum, using a digital platform we examined almost 30,000 people with more than 300,000 check-ins to assess stress, emotion, and physiology in their daily lives. We observed that those who identified as bisexual/pansexual compared to lesbian/gay and heterosexual adults reported more stress exposure, greater daily stress intensity, lower coping resources, and less positive emotion. Both bisexual/pansexual and lesbian/gay adults recorded higher average HR. Though not all indicators showed differences by sexual orientation, notably BP levels were not different. These findings provide some insight into how stigmatization may accumulate over time to contribute to poor health.

Resumen

Objetivo: Se cree que la estigmatización contribuye a las disparidades de salud que experimentan adultos gays, lesbianas, y bisexuales (LGB, por sus siglas en inglés). Sin embargo, pocos estudios han examinado cómo el estigma moldea la percepción y la respuesta al estrés diario según el grupo de orientación sexual, un importante mecanismo potencial por el cual el estigma afecta la salud. Este estudio examinó las respuestas al estrés diario y al bienestar según la orientación sexual. **Métodos:** Adultos gays/lesbianas ($N = 943$), bisexuales/pansexuales ($N = 919$) y heterosexuales ($N = 27,751$) se autoseleccionaron para participar en un estudio de la EMA de 21 días utilizando una plataforma digital en teléfonos inteligentes elegibles que tenían un sensor óptico integrado para medir respuestas fisiológicas. Se incitó a los participantes tres veces al día que proporcionaran percepciones sobre el estrés, el bienestar psicológico, la presión arterial, la frecuencia cardíaca y los comportamientos de salud recientes. **Resultados:** Los adultos bisexuales/pansexuales informaron más eventos estresantes, mayores percepciones de estrés, peor afrontamiento y emociones menos positivas en comparación con los adultos gays/lesbianas y heterosexuales. Los adultos bisexuales/pansexuales y lesbianas/gays registraron una frecuencia cardíaca más alta en comparación con los adultos heterosexuales. No se observaron diferencias en la presión arterial, las percepciones de amenaza o el trato injusto. El trato injusto medió la relación entre la orientación sexual y el estrés para los adultos bisexuales/pansexuales, pero no para los adultos gays/lesbianas. **Conclusiones:** El estigma tiene el potencial de moldear las percepciones de estrés, el bienestar psicológico y los marcadores de salud física de los adultos LGB. A pesar de varios índices

de mala salud, los adultos LGB demuestran algunos elementos de resiliencia psicológica y física que pueden tener efectos en la salud a largo plazo.

References

- Almeida, D. M. (2005). Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science*, 14(2), 64–68. <https://doi.org/10.1111/j.0963-7214.2005.00336.x>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. <https://doi.org/10.18637/jss.v067.i01>
- Blascovich, J., & Mendes, W. B. (2010). Social psychophysiology and embodiment. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., pp. 194–227). John Wiley & Sons. <https://doi.org/10.1002/9780470561119.socpsy001006>
- Blascovich, J., & Tomaka, J. (1996). The biopsychosocial model of arousal regulation. *Advances in Experimental Social Psychology*, 28, 1–51. [https://doi.org/10.1016/S0065-2601\(08\)60235-X](https://doi.org/10.1016/S0065-2601(08)60235-X)
- Boehmer, U., Miao, X., Linkletter, C., & Clark, M. A. (2012). Adult health behaviors over the life course by sexual orientation. *American Journal of Public Health*, 102(2), 292–300. <https://doi.org/10.2105/AJPH.2011.300334>
- Brewster, M. E., & Moradi, B. (2010). Perceived experiences of anti-bisexual prejudice: Instrument development and evaluation. *Journal of Counseling Psychology*, 57(4), 451–468. <https://doi.org/10.1037/a0021116>
- Caceres, B. A., Makarem, N., Hickey, K. T., & Hughes, T. L. (2019). Cardiovascular disease disparities in sexual minority adults: An examination of the Behavioral Risk Factor Surveillance System (2014–2016). *American Journal of Health Promotion*, 33(4), 576–585. <https://doi.org/10.1177/0890117118810246>
- Chan, R. C. H., Operario, D., & Mak, W. S. (2020). Bisexual individuals are at greater risk of poor mental health than lesbians and gay men: The mediating role of sexual identity stress at multiple levels. *Journal of Affective Disorders*, 260, 292–301. <https://doi.org/10.1016/j.jad.2019.09.020>
- Crocker, J., & Major, B. (1989). Social stigma and self-esteem: The self-protective properties of stigma. *Psychological Review*, 96(4), 608–630. <https://doi.org/10.1037/0033-295X.96.4.608>
- Dyar, C., Taggart, T. C., Rodriguez-Seijas, C., Thompson, R. G., Elliott, J. C., Hasin, D. S., & Eaton, N. R. (2019). Physical health disparities across dimensions of sexual orientation, race/ethnicity, and sex: Evidence for increased risk among bisexual adults. *Archives of Sexual Behavior*, 48(1), 225–242. <https://doi.org/10.1007/s10508-018-1169-8>
- Feinstein, B. A., & Dyar, C. (2017). Bisexuality, minority stress, and health. *Current Sexual Health Reports*, 9(1), 42–49. <https://doi.org/10.1007/s11930-017-0096-3>
- Flentje, A., Heck, N. C., Brennan, J. M., & Meyer, I. H. (2019). The relationship between minority stress and biological outcomes: A systematic review. *Journal of Behavioral Medicine*, 43(5), 673–694. <https://doi.org/10.1007/s10865-019-00120-6>
- Fricke, J., Gordon, N., & Downing, J. (2019). Sexual orientation disparities in physical activity: Results from insured adults in California. *Medical Care*, 57(2), 138–144. <https://doi.org/10.1097/MLR.0000000000001017>
- Gordon, A. M., & Mendes, W. B. (2021). A large-scale study of stress, emotions, and blood pressure in daily life using a digital platform. *Proceedings of the National Academy of Sciences of the United States of America*, 118(31), Article e2105573118. <https://doi.org/10.1073/pnas.2105573118>
- Hamer, M., Taylor, A., & Steptoe, A. (2006). The effect of acute aerobic exercise on stress related blood pressure responses: A systematic review and meta-analysis. *Biological Psychology*, 71(2), 183–190. <https://doi.org/10.1016/j.biopsycho.2005.04.004>
- Hatzenbuehler, M. L., McLaughlin, K. A., & Slopen, N. (2013). Sexual orientation disparities in cardiovascular biomarkers among young adults. *American Journal of Preventive Medicine*, 44(6), 612–621. <https://doi.org/10.1016/j.amepre.2013.01.027>
- Hatzenbuehler, M. L., Nolen-Hoeksema, S., & Dovidio, J. (2009). How does stigma “Get under the skin”? The mediating role of emotion regulation. *Psychological Science*, 20(10), 1282–1289. <https://doi.org/10.1111/j.1467-9280.2009.02441.x>
- Hatzenbuehler, M. L., Phelan, J. C., & Link, B. G. (2013). Stigma as a fundamental cause of population health inequalities. *American Journal of Public Health*, 103(5), 813–821. <https://doi.org/10.2105/AJPH.2012.301069>
- Herd, J. A. (1991). Cardiovascular response to stress. *Physiological Reviews*, 71(1), 305–330. <https://doi.org/10.1152/physrev.1991.71.1.305>
- Juster, R.-P., Doyle, D. M., Hatzenbuehler, M. L., Everett, B. G., DuBois, L. Z., & McGrath, J. J. (2019). Sexual orientation, disclosure, and cardiovascular stress reactivity. *Stress*, 22(3), 321–331. <https://doi.org/10.1080/10253890.2019.1579793>
- Kamarck, T. W., Shiffman, S., & Wethington, E. (2011). Measuring psychosocial stress using ecological momentary assessment methods. In R. Contrada & A. Baum (Eds.), *The handbook of stress science: Biology, psychology, and health* (pp. 597–617). Springer.
- Kaniasty, K., & Norris, F. H. (1993). A test of the social support deterioration model in the context of natural disaster. *Journal of Personality and Social Psychology*, 64(3), 395–408. <https://doi.org/10.1037/0022-3514.64.3.395>
- Kwon, P. (2013). Resilience in lesbian, gay, and bisexual individuals. *Personality and Social Psychology Review*, 17(4), 371–383. <https://doi.org/10.1177/1088868313490248>
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer.
- Lick, D. J., Durso, L. E., & Johnson, K. L. (2013). Minority stress and physical health among sexual minorities. *Perspectives on Psychological Science*, 8(5), 521–548. <https://doi.org/10.1177/1745691613497965>
- Link, B. G. (2023). On the history and growth of the stigma concept: A reflection on the positioning of social relationships in stigma research. *Journal of Social Issues*, 79(1), 528–535. <https://doi.org/10.1111/josi.12582>
- Major, B., & O'Brien, L. T. (2005). The social psychology of stigma. *Annual Review of Psychology*, 56(1), 393–421. <https://doi.org/10.1146/annurev.psych.56.091103.070137>
- Matthews, K. A., Katholi, C. R., McCreath, H., Whooley, M. A., Williams, D. R., Zhu, S., & Markovitz, J. H. (2004). Blood pressure reactivity to psychological stress predicts hypertension in the CARDIA study. *Circulation*, 110(1), 74–78. <https://doi.org/10.1161/01.CIR.0000133415.37578.E4>
- Mays, V. M., & Cochran, S. D. (2001). Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *American Journal of Public Health*, 91(11), 1869–1876. <https://doi.org/10.2105/AJPH.91.11.1869>
- Mays, V. M., Juster, R.-P., Williamson, T. J., Seeman, T. E., & Cochran, S. D. (2018). Chronic physiologic effects of stress among lesbian, gay, and bisexual adults: Results from the National Health and Nutrition Examination Survey. *Psychosomatic Medicine*, 80(6), 551–563. <https://doi.org/10.1097/PSY.0000000000000600>
- Mendes, W. B., & Muscatell, K. A. (2018). Affective reactions as mediators of the relationship between stigma and health. In B. Major, J. F. Dovidio, & B. G. Link (Eds.), *The Oxford handbook of stigma, discrimination, and health* (pp. 265–283). Oxford University Press.
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin*, 129(5), 674–697. <https://doi.org/10.1037/0033-2909.129.5.674>
- Milkman, K. L., Gromet, D., Ho, H., Kay, J. S., Lee, T. W., Pandiloski, P., Park, Y., Rai, A., Bazerman, M., Beshears, J., Bonacorsi, L., Camerer, C., Chang, E., Chapman, G., Ciardini, R., Dai, H., Eskreis-Winkler, L., Fishbach, A., Gross, J. J., ... Duckworth, A. L. (2021). Megastudies improve the impact of applied behavioural science. *Nature*, 600(7889), 478–483. <https://doi.org/10.1038/s41586-021-04128-4>

- Newman, D. B., Gordon, A. M., Prather, A. A., & Mendes, W. B. (2023). Examining daily associations among sleep, stress, and blood pressure across adulthood. *Annals of Behavioral Medicine*, 57(6), 453–462. <https://doi.org/10.1093/abm/kaac074>
- Newman, D. B., Trujillo, M. A., & Mendes, W. B. (2024, October 1). *Sexual orientation differences in response to daily stress*. <https://osf.io/4m695>
- Pachankis, J. E. (2007). The psychological implications of concealing a stigma: A cognitive-affective-behavioral model. *Psychological Bulletin*, 133(2), 328–345. <https://doi.org/10.1037/0033-2909.133.2.328>
- Pachankis, J. E., Rendina, J. H., Restar, A., Ventuneac, A., Grov, C., & Parsons, J. T. (2015). A minority stress-emotion regulation model of sexual compulsivity among highly sexually active gay and bisexual men. *Health Psychology*, 34(8), 829–840. <https://doi.org/10.1037/hea0000180>
- Perrin, P. B., Sutter, M. E., Trujillo, M. A., Henry, R. S., & Pugh, M. (2020). The minority strengths model: Development and initial path analytic validation in racially/ethnically diverse LGBTQ individuals. *Journal of Clinical Psychology*, 76(1), 118–136. <https://doi.org/10.1002/jclp.22850>
- Pressman, S. D., Jenkins, B. N., & Moskowitz, J. T. (2019). Positive affect and health: What do we know and where next should we go? *Annual Review of Psychology*, 70(1), 627–650. <https://doi.org/10.1146/annurev-psych-010418-102955>
- Reimers, A., Knapp, G., & Reimers, C.-D. (2018). Effects of exercise on the resting heart rate: A systematic review and meta-analysis of interventional studies. *Journal of Clinical Medicine*, 7(12), Article 503. <https://doi.org/10.3390/jcm7120503>
- Rosario, M., Corliss, H. L., Everett, B. G., Reisner, S. L., Austin, S. B., Buchting, F. O., & Birkett, M. (2014). Sexual orientation disparities in cancer-related risk behaviors of tobacco, alcohol, sexual behaviors, and diet and physical activity: Pooled Youth Risk Behavior Surveys. *American Journal of Public Health*, 104(2), 245–254. <https://doi.org/10.2105/AJPH.2013.301506>
- Surachman, A., Wardecker, B., Chow, S.-M., & Almeida, D. (2019). Life course socioeconomic status, daily stressors, and daily well-being: Examining chain of risk models. *The Journals of Gerontology: Series B*, 74(1), 126–135. <https://doi.org/10.1093/geronb/gby014>
- Timmins, L., Rimes, K. A., & Rahman, Q. (2020). Minority stressors, rumination, and psychological distress in lesbian, gay, and bisexual individuals. *Archives of Sexual Behavior*, 49(2), 661–680. <https://doi.org/10.1007/s10508-019-01502-2>
- Trujillo, M. A., & Mendes, W. B. (2021). An ignored minority status: Consequences for sexual minorities living in a biased society. *Social and Personality Psychology Compass*, June 2020, 15(10), Article e12638. <https://doi.org/10.1111/spc3.12638>
- Warburton, D. E. R., Nicol, C. W., & Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, 174(6), 801–809. <https://doi.org/10.1503/cmaj.051351>
- Wardecker, B. M., Surachman, A., Matsick, J. L., & Almeida, D. M. (2022). Daily stressor exposure and daily well-being among sexual minority and heterosexual adults in the United States: Results from the National Study of Daily Experiences (NSDE). *Annals of Behavioral Medicine*, 56(6), 536–550. <https://doi.org/10.1093/abm/kaab062>
- Weber, J., Angerer, P., & Apolinário-Hagen, J. (2022). Physiological reactions to acute stressors and subjective stress during daily life: A systematic review on ecological momentary assessment (EMA) studies. *PLOS ONE*, 17(7), Article e0271996. <https://doi.org/10.1371/journal.pone.0271996>
- Wichers, M., Peeters, F., Rutten, B. P. F., Jacobs, N., Derom, C., Thiery, E., Delespaul, P., & Van Os, J. (2012). A time-lagged momentary assessment study on daily life physical activity and affect. *Health Psychology*, 31(2), 135–144. <https://doi.org/10.1037/a0025688>
- Williams, D. R., Yu, Y., Jackson, J. S., & Anderson, N. B. (1997). Racial differences in physical and mental health: Socioeconomic status, stress, and discrimination. *Journal of Health Psychology*, 2(3), 335–351. <https://doi.org/10.1177/135910539700200305>

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