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**Title: Adult Attachment Avoidance is Associated with Cortisol Awakening Response
among Young Black Sexual Minority Men as Compared to Young White Sexual Minority
Men**

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Abstract

Research suggests that young sexual minority men (YSMM), particularly YSMM of color, are more likely to have dysregulated physiological stress responses as compared to their heterosexual counterparts. In addition, the quality of social relationships has been demonstrated to impact physiological stress patterns among young adults. One key indicator of social relationships is that of adult attachment, which refers to the types of socioemotional bonds that individuals form with peers, family, and romantic partners. However, the association between adult attachment and physiological stress functioning among diverse samples of YSMM has been underexplored. Thus, the current study sought to bridge this gap in the literature by exploring how race/ethnicity moderates the association between adult attachment and physiological stress patterns among Black versus White YSMM. $N = 63$ YSMM participated in a 5-day daily diary study in which they completed a baseline survey and provided saliva samples over the 5-day period in order to measure diurnal cortisol. Three-level hierarchical linear modeling was used in order to examine the association between race/ethnicity, adult attachment, and diurnal cortisol over the 5-day period. Results suggest that adult attachment avoidance was associated the cortisol awakening response (CAR) among YSMM. In addition, race/ethnicity moderated the association between adult attachment avoidance and the CAR such that YSMM who identified as Black had evidence of a more dysregulated physiological stress response as compared to YSMM who identified as White. Future research should focus on further unpacking the drivers of physiological stress patterns among White and Black YSMM.

1. Introduction

1.1 Overview

Young sexual minority populations are more likely to experience high levels of stress and a more dysregulated stress response as compared to their heterosexual counterparts (Austin et al., 2016; Hatzenbuehler, 2009). Young sexual minority men (YSMM) of color face a multitude of social stressors throughout the life-course, including exposure to both sexual orientation and racial/ethnic-related stigma and discrimination, which may impact physiological stress. However, there has been little research aimed at understanding the how social stressors are related to physiological stress for YSMM of color who may experience stress based on the intersection of their race and sexual minority status (Cook et al., 2017).

A critical feature that may impact biological stress functioning is that of adult attachment (Adams et al., 2020; Pietromonaco & Beck, 2019; Pietromonaco et al., 2013). Adult attachment theorists posit two overarching styles of adult attachment – anxiety and avoidance (Mikulincer & Shaver, 2007). Those high in anxiety tend to desire closeness to other individuals and worry about their needs not being met (Mikulincer & Shaver, 2007). On the other hand, those high in avoidance tend to avoid closeness to others and rely on themselves in times of stress (Mikulincer & Shaver, 2007). Attachment has been shown to predict how individuals perceive and respond to interpersonal relationships and how they seek social support (Mikulincer & Shaver, 2007). Moreover, attachment has been shown to be associated with daily cortisol patterns as well as overall health outcomes (Ketay & Beck, 2017; McWilliams & Bailey, 2010; Markus Quirin et al., 2008). Further, experiencing discrimination and prejudice related to sexual orientation and/or race/ethnicity is posited to negatively influence adult attachment (Cook & Calebs, 2016). However, little is known about the mechanisms underpinning adult attachment and physiological

stress among YSMM of color, who are at the intersection of multiple marginalized identities (i.e., sexual orientation and race/ethnicity).

1.2 Attachment, Minority Stress, and Biological Stress Functioning

Stress associated with sexual identity has been shown to influence biological stress processes. Hatzenbuehler and McLaughlin (2014) found that LGB individuals raised in highly stigmatizing environments had more blunted cortisol slopes in response to the stress-inducing task as compared to LGB individuals raised in low-stigmatizing environments. In another study examining the relationship between sexual orientation and biological differences in HPA-axis reactivity, Juster et al. (2015) found that lesbian and bisexual women who were exposed to a lab-based stressor (i.e., the Trier Social Stress Test [TSST]) exhibited greater cortisol reactivity compared to their heterosexual counterparts. Alternatively, gay and bisexual men who were exposed to the same lab-based stressor exhibited lessened cortisol reactivity as compared to their heterosexual counterparts.

Much research documents that adult attachment influences the ways in which individuals perceive and respond to stress (Mikulincer & Shaver, 2007). In stressful situations, individuals who are securely attached often turn to those they are attached to for social support, security, and stress relief. In contrast, individuals with insecure attachment styles often hold a more negative view of themselves and/or others and find it difficult to form these deep and critical bonds that may help to mitigate the impact of stressors on their health (Feeney, 2000). Insecure individuals with attachment avoidance are typically uncomfortable with interdependence and avoid intimacy, often withdrawing from others, even in stressful times of need (Feeney, 2000). Alternately, insecure individuals with attachment anxiety are hypervigilant for fear of rejection and tend to experience amplified negative experiences (Kidd et al., 2013) and blunted diurnal

cortisol responses (Hicks & Diamond, 2011; M. Quirin et al., 2008) as compared to insecure individuals with attachment avoidance. Research further suggests that individuals with a more insecure adult attachment style experience increased biological responses to stress (e.g., more cortisol reactivity) as compared to those who are securely attached (Pietromonaco et al., 2013). For instance, studies show that insecure attachment styles significantly alter young adult's HPA-axis activity, resulting in elevated cortisol responses to stress and elevated cortisol awakening responses (M. Quirin et al., 2008).

The majority of the extant literature focuses on White heterosexual populations, excluding those with lived experiences unique from the mainstream, such as YSMM. However, theorists argue that exposure to sexual orientation-related prejudice and discrimination impacts attachment and biological stress mechanisms throughout the life-course (Cook & Calebs, 2016). In their integrated attachment and sexual minority stress model (IASMS), Cook and Calebs (2016) contend that exposure to sexual orientation-related social stress may influence YSMM's ability to develop and maintain critical bonds with attachment figures and peers. Additionally, such social stress may be even more significant among YSMM of color who navigate a world where they face both racism and homophobia. In turn, these men may persistently experience a decreased capacity to cope with stressors and which, in turn, could negatively influence their biological stress systems. Indeed, emerging research suggests that exposure to sexual orientation and racial/ethnic-related discrimination is associated with greater cortisol reactivity and higher stress levels among sexual minority populations (Austin et al., 2016), an association that is even more pronounced among sexual minorities who are also racial/ethnic minorities (Cook et al., 2017; Juster et al., 2015).

Thus, exposure to sexual orientation and racial/ethnic-related stigma and discrimination may negatively modulate individuals' biological stress systems (Hatzenbuehler & McLaughlin, 2014; Juster et al., 2015). Nevertheless, there is, to date, minimal research examining YSMM's of color diurnal cortisol profiles. To bridge this gap, we sought to explore the relationship between adult attachment insecurity and diurnal cortisol profiles among Black and White YSMM. Based on the existing research literature, we hypothesized that YSMM who report greater adult attachment anxiety and avoidance would be associated with a flatter diurnal cortisol pattern and a steeper CAR compared to YSMM who report being more secure. Secondly, we hypothesized that race would moderate the relationship between attachment insecurity and cortisol (CAR and diurnal cortisol) in such a way that insecurely attached (greater reported anxiety and avoidance) Black YSMM would have a flatter diurnal cortisol curve and steeper CAR as compared to insecurely attached (greater reported anxiety and avoidance) White YSMM.

2. Methods

2.1 Participants

Data for this study came from a larger daily diary project examining how attachment insecurity is associated with biological stress functioning among YSMM. Study participants were recruited from a Midwest location via a convenient sampling approach using both online and offline techniques, including study advertisements posted on websites, cafes, and university posting boards. Interested participants were directed to an online screening survey to assess eligibility. To be eligible for the study, participants had to (a) be between the ages of 18-29 years, inclusive, at the time of screening, (b) be cisgender male, (c) identify as gay or bisexual, and (d) have a working smartphone with internet access. Eligible participants were asked to

provide written informed consent at a baseline study visit. At baseline, participants also completed a one-hour computer-assisted survey that assessed demographics, physical and mental health, and several other behavioral and psychosocial constructs. After completion of the baseline survey, trained research assistants provided participants with instructions regarding the 5-day diary period including saliva collection.

Participants provided four saliva samples a day over the course of five consecutive days to assess diurnal cortisol (Hoyt et al., 2016). They were instructed to provide samples upon awakening, 30 minutes after awakening, around lunchtime, and around bedtime (see *Salivary Sampling* section). Participants were also instructed to take a brief diary survey after providing each saliva sample. After participants collected their first three saliva samples, they received a link to an additional “momentary” diary survey via text message or email that took about 2 minutes to complete. This momentary survey assessed variables associated with cortisol (e.g., caffeine consumption) as well as other psychosocial variables (e.g., current mood). Finally, after each bedtime saliva sample, participants received a link via text message or email, depending on preference, to a longer “nightly” diary survey. To increase adherence to sample collection and surveys, participants received text message reminders to provide their sample that also contained the appropriate survey link. All surveys were administered via Qualtrics®. On the day after the last day of the daily diary component, participants returned their collected samples to researchers and were debriefed. Participants received up to \$115 for study participation, depending on compliance with the protocol. Statistical analyses were completed using Hierarchical Linear Modeling version 7 (HLM; Raudenbush et al., 2019; Raudenbush et al., 2011).

2.2 Biological Measures

2.2.1 Salivary Sampling

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For each day of the 5-day study period, participants were instructed to provide four 1 mL saliva samples per day via passive drool into collection tubes provided by the study staff in order to measure salivary cortisol. Participants were instructed to collect samples at the following four times each day: immediately upon waking (0600 h -1000 h), 30 minutes after waking (0630 h - 1030 h), around midday (1200 h - 0200 h), and in the evening (0900 h - 1200 h). Participants recorded sample collection times on the sample collection tubes. If participants reported sample collection times deviated by more than 60 minutes from the protocol's intended time frame, their cortisol data analysis was not used. Participants were instructed to abstain from eating or brushing their teeth for one hour before sample collection. They were also instructed to avoid food or beverages with high caffeine, sugar, and/or acidity content within the 30 minutes prior to sample collection. Participants were also instructed to rinse their mouth with water 10 minutes before sample collection, and to store their samples either in a freezer or in a provided lunchbox with a frozen ice pack until they could freeze the samples.

Saliva samples were tested for salivary cortisol. Cortisol samples were assayed in duplicates. Assays were carried out at the University of Michigan's Core Assay Facility using Salimetrics Cortisol Enzyme Immunoassay Kits (Salimetrics, LLC, Carlsbad, CA, US). Before analysis, saliva samples remained frozen at -20°C. Saliva samples were subsequently thawed and centrifuged with the enzyme immunoassay at 500 rpm for 5 minutes, and later incubated for an hour at room temperature. Afterward, plates were washed and centrifuged for 5 minutes at 500 rpm, then allowed to incubate once more at room temperature for 25 minutes. Stop solution was added to the samples, which were then centrifuged for 3 minutes at 500 rpm, and measurements were recorded within 10 minutes after adding the stop solution. Individual samples with a

coefficient of variability (CV) greater than 15% were re-run. The inter-assay CV was 9.31%. The intra-assay CV was 5.44%.

2.3 Demographic and Psychosocial Stress Measures

2.3.1 Demographics

Participant's self-reported demographics during the baseline survey, which included age, race, and BMI. BMI was calculated using the self-reported height (in inches)/weight (in pounds) for each participant. For the purposes of these analyses, we coded race/ethnicity as White/non-Hispanic = 0, and Black (Hispanic or non-Hispanic) = 1. Table 1 displays the demographics of the study sample.

2.3.2 Adult Attachment

Participants took the Experiences in Close Relationships–Relationship Structures (ECR-RS; Fraley et al., 2011) scale at baseline in order to assess adult attachment orientation. The ECR-RS asks participants to evaluate the level of agreement with statements about interactions with and attitudes about an array of close relationships (i.e., with one's mother-figure, father-figure, dating or marital partner, and best friend). The ECR-RS contains 36-items measured on a 7-point Likert-scale ranging from 1 = *Strongly Disagree* and 7 = *Strongly Agree*. The scale contains two subscales for attachment anxiety and attachment avoidance. An example item for the attachment anxiety subscale is “*I often worry that this person doesn't really care for me*” while an example item for the attachment avoidance subscale is “*I prefer not to show this person how I feel deep down.*”

2.4 Statistical Analysis

We utilized aggregated moment data from three weekdays and two weekend days to enhance ecological validity (Diener & Larsen, 1984). Raw values and time-dependent scores,

described below, were examined. A normal diurnal cortisol rhythm is comprised of a sharp increase in cortisol during the first hour upon awakening – known as the cortisol awakening response (CAR; Stalder et al., 2016) – succeeded by steady decreases during the day, until it reaches its lowest levels before bedtime.

To determine whether race moderates the association between attachment and diurnal cortisol, we conducted linear mixed modeling. HLM version 7 (Raudenbush et al., 2019; Raudenbush et al., 2011) was utilized to account for the nested nature of the repeated observations (Bauer et al., 2013). Further, linear mixed models are especially useful for the calculation of diurnal cortisol given missing data in non-laboratory studies (Kwok et al., 2008). Thus, we ran three-level mixed models, with moments (Level 1) nested within days (Level 2) nested within individuals (Level 3).

The Level 1 model predicted natural log cortisol levels using data from all 20 cortisol sampling occasions. The slope of the natural log of cortisol was predicted by the time of day (number of hours since waking) of each sample controlling for eating and/or drinking (Yes/No) anything other than water within the 30 minutes prior to providing a saliva sample (Kirschbaum & Hellhammer, 1989). Because the change in cortisol across the day is nonlinear, we included a quadratic term for hours since waking at Level 1. To reduce the risk of multicollinearity by including a quadratic term, we centered the time variable at waking. At Level 1, cortisol awakening response (CAR) was added as a dichotomous (0/1) predictor of the Level 1 coefficients with 1 = CAR. Finally, at Level 3, differences between participants were examined. White and Black YSMM were analyzed together by using a dummy variable with 1 = Black. To examine if race moderated the association between attachment anxiety and attachment avoidance and cortisol, we added two interaction terms (attachment anxiety and race; attachment avoidance

and race) into the equation at Level 3 in the same model. Age and BMI, centered around the grand mean, was also entered as a control variable at Level 3.

In order to illustrate how race/ethnicity and attachment style are associated with cortisol patterns throughout the day, we created plots by first calculating mean cortisol (averaged across the five days) at high, medium, and low levels of avoidant or anxious attachment for both black and white participants. Having high, medium, or low levels of avoidant or anxious attachment were classified as 1 SD above the mean, the mean, and 1 SD below the mean values for avoidant or anxious attachment, respectively. Mean cortisol levels throughout the day were then plotted for each level attachment among Black and White participants using the ggplot2 package in R Studio (Wickham, 2016).

3. Results

3.1 Descriptive Statistics

There were originally 70 participants, however we used the estimation sample for these analyses which included 63 participants who had information on all study variables. There was no statistically significant difference between the full sample and the estimation sample on key study variables. Participants were a range of 18 to 29 years old ($M = 22.9$, $SD = 3.3$). 61.8% identified as White, while the 38.2% identified as Black/African American. Over half of participants were single (55.9%) and the remaining participants (44.1%) were in a relationship or married. 61.8% identified as White, 38.2% identified as Black. Regarding education level, 47.1% received some college education while 47.1% received at least college education. Regarding employment, the majority of the sample consisted of students 69.1%, while 26.5% were employed. Nearly half of participants earned \$10,000 or less per year (47.1%), and nearly one-

fourth (23.5%) earned between \$11,000 and \$20,000/ year. See Table 1 for demographic characteristics.

3.2 Hierarchical Linear Models

Results indicated our HLM model was significant ($\chi^2=360.86, p<.0001$). For the $N=63$ participants, the average number of cortisol samples per participant was 17.4 out of 20 (87.2%), resulting in a total of 1,033 observations. Participant's cortisol levels were highest in the morning 30 minutes after awakening, dropped rapidly thereafter and then continued to decline, as indicated by the significant quadratic hours term. Using this model, 54% of the variation in cortisol levels was accounted for by linear and quadratic time of day since waking, with cortisol dropping 5.63% on average every hour. The cortisol awakening response significantly influence cortisol levels such that after awakening, there was a .31 increase in cortisol ($p<.001$). Table 2 shows the results of the HLM. Plots showing the diurnal cortisol patterns for each subgroup and race and attachment style are shown in Figures 1 and 2. Plots showing the diurnal cortisol patterns for each subgroup and race and attachment style are shown in Figures 1 and 2. In order to illustrate how race and attachment (Fig. 1) as well as their interactions (Fig. 2) relate to diurnal cortisol, we used the results of the HLM model to calculate mean cortisol at each time point, with age, BMI and having eaten or drank anything as covariates. For the main effects graphs, race (Black: $n = 23$, White: $n = 40$), avoidant attachment (high: $n = 7$; medium: $n=44$; low: $n=12$), and anxious attachment (high: $n= 11$; medium: $n=40$; low: $n=12$) were entered separately in Fig. 1.

Based on the graphs generated from aggregated data, for both Black and White participants, cortisol increases 30 minutes after awakening, then sharply decreases by mid-afternoon, before experiencing a milder decrease by bedtime (see Figure 1). However, the decrease in cortisol

between waking and mid-afternoon is sharper for white than for Black participants, and White participants arrive at a lower cortisol level by bedtime than Black participants. On the other hand, those with low avoidant attachment experience a decrease in cortisol shortly after awakening, while those with highest avoidant attachment have a sharper increase after waking and remain higher in cortisol levels than those of medium or low avoidant attachment. Figure 2 depicts the effect of interaction of race and avoidance attachment style on cortisol levels. White participants with high avoidance have a stark increase in cortisol shortly after awakening but end up with the lowest levels of cortisol by bedtime. On the other hand, black participants with high avoidance have higher levels of cortisol upon awakening than white and black participants with medium avoidance and white participants with low avoidance. However, at bedtime, Black participants with high avoidance retain the highest levels of cortisol than Whites and Black participants with medium and low avoidant attachment.

3.3 Main Effects of Attachment Style and Race on Cortisol Levels

Neither attachment anxiety ($b=.02, p=.90$) nor avoidance ($b= -.14, p=.26$) alone were significantly associated with cortisol levels. However, avoidant attachment style was significantly associated with the cortisol awakening response's (CAR) effect on cortisol such that every 1 scale point increase in avoidant attachment results in a .23 increase in the effect of CAR on average cortisol level, for a Black YSMM of average age who had average avoidant attachment ($p=.018$). Race/ethnicity was only marginally significantly associated with the linear effect of time on cortisol ($b=.02, p=.096$) such that among Black YSMM, cortisol increases by .002 for every 1 hour since awakening, whereas for White YSMM, cortisol decreases by .020 per hour.

3.4 Interaction Effects between Attachment Style and Race

As discussed previously, there was a significant effect of attachment avoidance on the CAR's effect on cortisol level ($b=.229, p=.018$). However, no significant main effect of race was found on the CAR ($b=-.21, p=.102$). Race/ethnicity significantly moderated the association between attachment avoidance and the cortisol awakening response's slope such that Black YSMM with higher attachment avoidance had a lower CAR as compared to White individuals, controlling for the other variables in the model ($b= -.425, p=.002$).

4. Discussion

The current study sought to understand the association between attachment, race/ethnicity, and HPA-axis functioning between Black and White young sexual minority men. First, we sought to understand how adult attachment functioning influences HPA-axis functioning among YSMM. We hypothesized that more insecurely attached YSMM (i.e., higher on adult attachment anxiety and/or avoidance) would be associated with a more dysregulated physiological stress response (i.e., higher CAR as well as a flatter diurnal curve) as compared to YSMM who are more secure. We further hypothesized that race would moderate the association between adult attachment insecurity and physiological stress patterns such that Black YSMM who are more insecure would have a flatter diurnal cortisol curve and a steeper CAR as compared to White YSMM who are more insecure. Our hypotheses were partially supported by our research findings. We did not find enough evidence to suggest that adult attachment anxiety or avoidance were associated with HPA-axis functioning among our sample of YSMM as the main effects of both anxiety and avoidance did not reach statistical significance. These findings are somewhat supported by the research literature. In general, research suggests that adult attachment anxiety is associated with a greater overall cortisol response whereas there have been inconsistent findings with respect to adult attachment avoidance (Pietromonaco & Beck, 2019).

Future longitudinal research should be conducted with larger sample sizes in order to further unpack the association between adult attachment and HPA-axis functioning.

Although adult attachment anxiety and avoidance on diurnal cortisol did not reach statistical significance, we did find evidence to suggest that adult attachment avoidance influenced the CAR in our study sample. This is consistent with previous studies examining the impact of adult attachment on the CAR, which suggests that those who possess an avoidant adult attachment style have a higher CAR as compared to individuals who possess a more secure attachment style (Adams et al., 2020). Evidence suggests that the CAR is an important aspect of physiological stress functioning as it is a preparative response to an individual's daily activities (Adams et al., 2020; Stalder et al., 2016). In addition, research shows that the CAR is affected by socioemotional processes (Adams et al., 2020; Chida & Steptoe, 2009). It may be that attachment processes are activated in preparation for daily activities, such as in anticipation of personal interactions, which, in turn, influences the CAR. Future research should be conducted in order to better understand the impact that adult attachment, particularly avoidant attachment, has on the CAR specifically minoritized individuals such as young sexual minority men.

Our second hypothesis, that race/ethnicity would moderate the association between attachment and HPA-axis functioning, was also partially supported by our study findings. We found that among Black YSMM who are more avoidantly attached have a more dysregulated stress response as compared to White YSMM who are more avoidantly attached. Although the CAR is considered separate from diurnal cortisol patterns, the CAR has been shown to be a reliable indicator of HPA-axis functioning as it is associated with adrenocorticotropin stimulation (Meinlschmidt & Heim, 2005; Pruessner et al., 1997; Wust et al., 2000). In particular, research demonstrates that those who are chronically stressed have a lower CAR as

compared to individuals who are not chronically stressed (Fries et al., 2009). Thus, it may be that Black YSMM experience more stress on a daily basis as compared to White YSMM and, as such, may experience a more dysregulated physiological stress pattern. Moreover, our findings with respect to differences in the CAR are in line with the IASMS model laid out by Cook and Calebs (2016). The IASMS model posits that sexual minorities are exposed to a number of distal (e.g., discrimination) and proximal (e.g., internalized homophobia) stressors pertaining to their sexual minority identity which, in turn, may negatively influence attachment processes.

However, those who are racial/ethnic minorities may also face additional stress in the form of stigma and discrimination based on their racial/ethnic identity. This, in turn, can lead to dysregulated HPA-axis functioning among Black YSMM as compared to White YSMM. While this study did not examine exposure to discrimination, our findings suggest that Black YSMM who are more avoidantly attached experience more dysregulated HPA-axis functioning (i.e., lowered CAR) as compared to White YSMM who are more avoidantly attached. Future research should examine how patterns of discrimination influence attachment processes and HPA-axis functioning among diverse samples of YSMM utilizing longitudinal study designs.

The current study has several strengths that are worth noting. First, the study was longitudinal in nature with participants engaging in a 5-day daily diary protocol in which they provided four saliva samples per day in order to assess HPA-axis functioning (i.e., the CAR and diurnal cortisol). This allowed us to examine the association between race/ethnicity, adult attachment, and daily HPA-axis functioning. Second, the study sample was diverse in nature with nearly 40% of the participants identifying as a racial/ethnic minority. This is noteworthy as the majority of studies examining HPA-axis functioning among sexual minority populations are predominately White. Lastly, our study protocol was innovative in that we collected cortisol

samples across at least two days over the weekday and weekend. Thus, we were able to account for differences in HPA-axis functioning across the weekend and weekdays (Kunz-Ebrecht et al., 2004).

While the current study has several strengths, it does not come without limitations. First, the study sample only consisted of individuals who were recruited from one Midwest location. As such, our results may not be generalizable to YSMM residing in other areas within the United States. However, this is one of the first studies to examine the association between adult attachment and physiological stress among a racially/ethnically diverse sample of YSMM. Another limitation is with regards to the study protocol in which participants were provided with a take home saliva collection kit. While the study team provided extensive training and instructions with regard to the saliva protocol, it is impossible to determine the accuracy of the time that each participant provided their saliva samples. This, in turn, could lead to inaccurate results with respect to the CAR and diurnal cortisol. Third, we did not account for variables such as mood which could also alter HPA-axis activity. Future research should be conducted that controls for state variables such as mood when examining processes of adult attachment, race/ethnicity, and HPA-axis activity.

5. Conclusions and future directions

In summary, our results provide evidence that avoidantly attached Black YSMM have more dysregulated HPA-axis functioning as compared to White YSMM. In particular, our study results suggest that avoidant attachment in adulthood has significant implications for the CAR among YSMM. In particular, our results also suggest that the CAR is more dysregulated among Black YSMM who are avoidantly attached as compared to White YSMM who are avoidantly attached. On the other hand, we did not find evidence to suggest that anxious attachment in adulthood

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alters HPA-axis activity among YSMM among our study sample. Future research should further focus on understanding disparities in HPA-axis functioning within- different racial/ethnic groups of young sexual minority men as a means to better understanding the potential influence of differing social conditions for these communities.

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Table 1. Socio-demographic characteristics (N=63)

	M(SD) / %(N)
Age [range = 18 to 29]	22.78(2.30)
Race	
White	60.32(38)
Black	39.68(25)
Attachment Anxiety	2.21(.85)
Attachment Avoidance	3.01(.87)
BMI [range = 17 to 53]	23.67(5.21)

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Table 2.

Race and attachment predicting diurnal cortisol trajectory.

Fixed Effect	Estimate	SE	<i>p</i>
Cortisol Level			
Intercept	-1.331	.113	<0.001
Race	-.182	.172	.295
Avoidance	-.144	.127	.260
Anxious	.019	.142	.896
Avoidance * Race	.012	.188	.948
Anxious * Race	.010	.191	.958
Linear Slope (Hours since waking)			
Intercept	-.020	.008	.019
Race	.022	.013	.096
Avoidance	-.004	.009	.635
Anxious	.000	.013	.987
Avoidance * Race	.000	.014	.991
Anxious * Race	-.001	.017	.928
Curvature Across Diurnal Trajectory (Hours²)			
Intercept	-.004	.001	<0.001
Race	.001	.001	.398
Avoidance	.000	.001	.785
Anxious	.000	.001	.851
Avoidance * Race	.000	.001	.760
Anxious * Race	.001	.001	.533
CAR			
Intercept	.308	.082	<0.001
Race	-.209	.127	.102
Avoidance	.229*	.096	.018
Anxious	.125	.105	.235
Avoidance * Race	-.425**	.137	.002
Anxious * Race	.002	.140	.987

Note: Results controlled for eating or drinking 30 minutes prior to sample being taken, as well as for participant age and BMI. Race 1 = Black. *p* < .05, ** *p* < .01, ****p* < .001

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Figure 1. Plots of mean Cortisol at each Sample Time by (A) Race, (B) Anxious Attachment, and (C) Avoidant Attachment. Values are adjusted for age and having eaten or drank anything.

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Figure 2. Plot of Cortisol at each Sample Time by (A) Avoidant Attachment and Race, and (B) Anxious Attachment and Race. Values are adjusted for age and having eaten or drank anything.

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Figure 3. Interaction of race and attachment avoidance on the effect of CAR on average cortisol levels across the 5-day period.

Supplement

The Level 1 equation is shown below.

$$\begin{aligned} \text{LNCORT}_{ijk} = & \pi_{0jk} + \pi_{1jk}*(\text{DRINK}_{ijk}) + \pi_{2jk}*(\text{EAT}_{ijk}) + \pi_{3jk}*(\text{HOURS}_{ijk}) + \pi_{4jk}*(\text{HOURS}^2_{ijk}) \\ & + \pi_{5ij}*(\text{CAR}_{tij}) + e_{ijk} \end{aligned}$$

where i indicates time of day (repeated measure), j indicates day of study, and k indicates individual participants.

Level 2

$$\text{Equation for the intercept: } \pi_{0jk} = \beta_{00k} + r_{0jk}$$

$$\text{Equation for DRINK: } \pi_{1jk} = \beta_{10k}$$

$$\text{Equation for EAT: } \pi_{2jk} = \beta_{20k}$$

$$\text{Equation for HOURS: } \pi_{3jk} = \beta_{30k} + r_{3jk}$$

$$\text{Equation for HOURS}^2: \pi_{4jk} = \beta_{40k}$$

$$\text{Equation for CAR: } \pi_{5ij} = \beta_{50j}$$

The Level 3 model for each Level 2 β are as follows:

$$\begin{aligned} \beta_{00k} = & \gamma_{000} + \gamma_{001}(\text{AGE}_j) + \gamma_{002}(\text{RACE}_j) + \gamma_{003}(\text{BMI}_j) + \gamma_{004}(\text{Avoidance_C}_j) \\ & + \gamma_{005}(\text{Anxiety_C}_j) + \gamma_{006}(\text{Avoidance} * \text{Race}_j) + \gamma_{007}(\text{Anxiety} * \text{Race}_j) + u_{00j} \end{aligned}$$

Note: Hours represents hours since waking. Age, BMI, Avoidance, and Anxiety have been grand mean centered. For race, 1= Black.