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Familial Social Support Predicts a Reduced Cortisol Response to Stress in Sexual Minority Young Adults

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Abstract

Social support has been repeatedly associated with mental and physical health outcomes, with hypothalamic-pituitary-adrenocortical (HPA) axis activity posited as a potential mechanism. The influence of social bonds appears particularly important in the face of stigma-related stress; however, there is a dearth of research examining social support and HPA axis response among members of a stigmatized group. To address this gap in the literature, we tested in a sample of 70 lesbian, gay, and bisexual (LGB) young adults whether family support or peer support differentially predict cortisol reactivity in response to a laboratory stressor, the Trier Social Stress Test. While greater levels of family support were associated with reduced cortisol reactivity, neither peer support nor overall support satisfaction was associated with cortisol response. These findings suggest that the association between social support and neuroendocrine functioning differs according to the source of support among members of one stigmatized group.

Keywords

Salivary cortisol; HPA axis; Stigma; Stress; Social support

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Conflict of interest statement
The authors declare no conflict of interest.

Contributors
Charles L. Burton assisted with data collection, conducted the data analysis, and contributed to writing the manuscript. Mark L. Hatzenbuehler designed the study, contributed to writing the manuscript, and was the recipient of grant number K01 DA032558 from the National Institute on Drug Abuse. George A. Bonanno also contributed to writing the manuscript.

1. Introduction

Given the robust linkages between social support and health, researchers have sought to establish the physiological mechanisms that explain this relationship (see Uchino, 2006). A number of these studies examined neuroendocrine functioning as a pathway between social characteristics and health, particularly hypothalamic-pituitary-adrenal (HPA) axis functioning. Although the pathways between social support and health are only beginning to be understood, it is hypothesized that certain social resources mitigate the immunosuppressive effects of cortisol in stress-evoking situations. A limitation of these studies is that they have relied on global indices of support, such that a person's total social network size or overall satisfaction is used to predict HPA axis activity (e.g., Eisenberger et al., 2007). However, an accumulating body of research employing both animal and human models suggests that the source and quality of social ties modulate the ability to buffer a stress response (Hennessy et al., 2009). Prior studies, for example, have suggested that emotional support from family is a stronger predictor of cardiovascular response to stress compared to emotional support from friends (see Uchino et al., 1996). The use of specific indices of support may thus be more informative for neuroendocrine research than traditional global measures of social support.

Studies of social support buffering and physiological stress reactivity have examined a variety of stressors, including social stressors and degree of controllability. Some classes of stressors, however, have received comparatively less attention. For instance, the influence of social bonds appears particularly important in the face of stigma-related stress. In a daily diary study, African-American young adults were more likely to seek social support on days when they experienced stigma-related stressors than when they did not experience these stressors (Hatzenbuehler et al., 2009); furthermore, social support mediated the association between stigma and distress in the LGB subsample. This and other studies draw interest because of the potentially distinct social network profile of stigmatized groups, where the stigmatized individual may have limited access to certain sources of social support (D'Augelli et al., 1998). However, we are unaware of studies that have specifically examined social support and HPA axis reactivity among members of a stigmatized group.

To address this gap in the literature, we focused on lesbian, gay, and bisexual (LGB) individuals because some of the earliest studies charting the biological mechanisms of social support have relied on LGB samples. For example, Persson et al. (1994) observed greater immune functioning in HIV+ gay and bisexual men who reported high levels of support, compared to their less supported peers. Disclosing one's sexual minority status also poses the risk of eliciting rejection or disapproval from family members (D'Augelli et al., 1998), which may limit the extent to which certain support networks are available. Indeed, one recent study observed that sexual minority women were more likely to seek support from friends rather than family as compared to their heterosexual counterparts (Friedman & Morgan, 2009). Combined, this research suggests that peer and family social support may have differential neuroendocrine profiles in LGB persons.

In the current investigation, we evaluated whether the extent and source of LGB young adults' social support differentially predicted HPA axis activity in response to a well-

validated laboratory-induced stressor. We hypothesized that greater support from both peers and family, as well as overall satisfaction with support, would predict lower cortisol reactivity. Moreover, as LGB individuals often supplement or replace the support that they would receive from family members (Oswald, 2002), we anticipated that peer-based support would be the strongest predictor of cortisol response.

2. Methods

2.1 Sample and procedure

Seventy-seven young adults were recruited from local colleges and the broader LGB community in a large metropolitan city, and immediately signed a consent form outlining study procedures which were approved by the Columbia University Institutional Review Board. Three participants declined participation in the laboratory stressor (described below) and four did not complete the social support measures. Participants were geographically diverse in their states of origin, with a total of 24 states being represented in the final sample. Approximately 56% of the sample was raised within the local tristate area, indicating adequate variation in the sample with respect to access to parental support. The final sample (n=70) was evenly split across gender (56% female), was racially diverse (62% non-White), and had ages ranging from 18 to 30 (M=23.68, SD =4.12). Participants completed procedures only between 1400h and 2100h and were emailed 24 hours prior to their scheduled visit instructing them to refrain from exercise, brushing their teeth, drinking caffeinated beverages, and other activities that could influence their cortisol levels at the time of the experiment. After providing informed consent, participants sat for a 5-minute rest period and then provided their first saliva sample. They then completed a packet of questionnaires including the social support scale. Participants then underwent the Trier Social Stress Test (TSST), a social-evaluative threat context requiring participants to provide a 5-minute speech and then completed a 5-minute math task, following standard procedures (Kirschbaum et al., 1993). The speech component of the task was designed to be identity-relevant, such that participants were asked to recall a time they were discriminated against because of their sexual orientation. The second saliva sample was obtained 20 minutes after the initiation of the speech task and the third saliva sample 20 minutes following the conclusion of the math task.

Cortisol was acquired using the drool method. Participants provided approximately 1 ml of saliva into a cryovial tube using a plastic straw. Samples were stored at −80°C until they were shipped to be assayed for salivary free cortisol. We used a commercially available luminescence immunoassay (CLIA; IBL-Hamburg, Hamburg, Germany), which yielded acceptable intra-assay (2.73%) and inter-assay (9.22%) coefficients of variance.

2.2 Measures

Social support was measured with the Social Support Questionnaire-Short Form (Sarason et al., 1987), a measure that has demonstrated strong psychometric properties and been previously used in samples of LGB youths/young adults. Respondents were asked 6 questions regarding their social support (e.g., “Who accepts you totally, including both your worst and best points?”); after each of questions, participants listed the names and roles of

any persons who provided that social support, and then provided a rating of their overall satisfaction with that form of support. We created separate indices of availability of family and peer support by calculating the average number of responses falling into these respective categories across all six items, where greater scores indicate more available social support. We also created an index of satisfaction with support by averaging the level of satisfaction participants reported across the six items.

2.3. Statistical Analysis

Cortisol reactivity was operationalized as Area Under the Curve (AUC) using two standard calculations of this variable. The first, AUC with Respect to Increase (AUC_I), represents change in cortisol across time relative to baseline levels, where task non-responders were coded with a score of 0 (Pruessner et al., 2003).[1] The second, AUC with Respect to Ground (AUC_G) represents the total area under the curve and is more closely associated with total hormonal outputs. Initially, we used linear regression to independently test family support, peer support, and global support satisfaction as predictors of cortisol AUC_I. We then repeated these analyses to predict cortisol AUC_G. All analyses included a standard set of covariates used in cortisol studies (Mendes et al., 2007), including sex, age, waking time on morning of the experiment, time since waking (calculated as time at run – waking time), and smoking, exercise, and caffeine use on the day of the experiment.[2]

3. Results

The sample reported significantly more non-familial social support (M=2.61, SD=1.44, range = 0–6.67) than family support (M=1.37, SD=0.82, range = 0–4), $t = -6.69$, $p < 0.001$. However, nearly all participants reported receiving support from a family member at least once (98.6%). There was a marginal positive correlation between family and non-family support, $r = 0.223$; $p = 0.064$. Overall, participants reporting feeling “fairly satisfied” with their support (M=5.22, SD=0.82, range = 2–6).

To examine the relationship between social support and cortisol reactivity (Table 1), we regressed cortisol AUC_I on family-based social support, controlling for covariates. Familial support was significantly inversely associated with cortisol reactivity ($\beta = -0.307$, $p = 0.014$). Peer social support was not associated with cortisol reactivity, $\beta = -0.121$, $p = 0.342$, nor was overall support satisfaction ($\beta = -0.071$, $p = 0.556$). Family support remained significantly associated with reduced cortisol response in models controlling for covariates, peer support, and global support satisfaction ($\beta = -0.296$, $p = 0.023$). Repeating these analyses using AUC_G demonstrated identical results: familial support was significantly associated with reduced cortisol reactivity ($\beta = -0.291$, $p = 0.014$), whereas peer support ($\beta = 0.035$, $p = 0.769$) and support satisfaction ($\beta = 0.055$, $p = 0.628$) were not.

[1]We re-ran the results using the non-transformed version of AUC_I (i.e., non-responders retain their negative values rather than being assigned a value of 0); importantly, the direction and magnitude of the results remained unaltered.

[2]We likewise considered the potential that differences in perceived discrimination might influence the cortisol reactivity or “dose” of the stress task. Post-hoc analyses indicated that self-reported discrimination, measured by Williams et al.’s (1997) Everyday Discrimination Scale, was not associated with cortisol reactivity (r = .038, $p = .751$), nor did it influence the results of the primary analyses if included as a covariate. These results are available upon request.

4. Discussion

The aim this study was to investigate the relationship between social support and cortisol reactivity in LGB young adults. LGB participants with greater parental support evidenced reduced cortisol reactivity during a laboratory stress task compared to those with less parental support. In contrast to our hypotheses, peer support was not associated with cortisol response. Our results are consistent with previous studies among heterosexual individuals associating social support with reduced cortisol response (e.g., Eisenberger, et al., 2007). Although such findings have been interpreted as potentially adaptive, we acknowledge that the interpretation of whether a particular pattern of cortisol reactivity is adaptive or maladaptive is challenging; thus, we cannot definitively state that the reduced pattern of reactivity observed here represents an adaptive stress response among LGB respondents with greater parental support.

Cultural and political attitudes have grown increasingly accepting of homosexuality and bisexuality in the past decade, such that peer social support profiles of LGB young adults may increasingly resemble that of heterosexual individuals. Ueno et al. (2009) observed that LGB person's interactions with heterosexual and non-heterosexual friends did not differ in contact frequency, emotional closeness, or hassles, and support received from both types of friends was equivalently associated with mental health. Thus, individual differences in peer support may impart less influence on physiological stress response in this comparatively young LGB sample than among older LGB persons where such support may have been less available from peers. The marginally positive relation between peer and family support in the current study seems to contradict the idea that LGB persons "replace" family members who have rejected them by increasing the support received by close friends (Oswald, 2002). To definitively test this hypothesis, future research will need more detailed social support instruments.

A limitation of the current study is that it does not allow us to compare past with current levels of family support, as past support during critical stressors (e.g., disclosure of sexual orientation) may be more important than current support in shaping HPA axis functioning. Further, it is possible that family support's influence on cortisol reactivity operates independently of minority status or stress and is simply the result of the quality of general upbringing. Although the lack of a heterosexual control group prevents us from testing this hypothesis, the role of the biological family in LGB person's support network appears central to their health and has been linked to several other indicators of wellbeing. For instance, rejection from family members reported by LGB young adults is associated with suicidal behavior, depression, and illegal substance use (Ryan et al., 2009).

A number of other limitations should be considered in interpreting our results. First, we relied on a convenience sample drawn from a single metropolitan area. A second consideration that poses risk for most social support research is that levels of support were not manipulated, such that other underlying variables (e.g., personality) may potentially account for the association between perceived support and HPA response. Relatedly, although the current design included a number of commonly-used covariates, both basal and reactivity cortisol levels may have been influenced by variables that were not measured.

Additionally, social support was measured prior to stress exposure; because perceived support availability may differ before and after exposure to a stressful event, the timing of assessments may influence the relationship between support and stress response. Further, although we examined two important dimensions of social support, other forms (e.g., instrumental support) were not included and should be explored in future studies. Also, we followed standard procedures for the TSST but included only one recovery measure 20 minutes after the stressor ended, which prevented us from examining whether social support influenced the speed of stressor recovery, which remains an important area for future study. Finally, the discrimination-based topic of the speech task precluded us from generalizing our findings to non-identity related stressors. However, as research has implicated parental support in adaptive adjustment to stigma-related stress, the selection of this topic was especially relevant for the specific study hypotheses and is a strength of the present design.

In summary, the current study provides evidence for the link between social support and neuroendocrine functioning in the face of stigma. Although peer-based support has been implicated in mental and physical health outcomes of LGB persons, these data suggest that the quality of familial relationships may play a more important role in neuroendocrine processes involved in stress responding. To our knowledge, this is the first study examining the relationship between cortisol reactivity and different forms of social support in the context of stigma-related stress. Further research examining LGB individuals' family-based social support should determine what specific characteristics of these relationships are most influential in shaping HPA axis activity.

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Table 1

Models of Family Support, Peer Support, and Support Satisfaction Among LGB Young Adults Predicting Cortisol Area Under the Curve With Respect to Increase

Models of Family Support	**B**	**SE(B)**	**β**	***t***	**Sig. (*p*)**	***Models of Peer Support***	**B**	**SE(B)**	**β**	***t***	**Sig. (*p*)**	***Models of Satisfaction***	***B***	***SE(B)***	**β**	***t***	**Sig. (*p*)**
Unadjusted Model						**Unadjusted Model**						**Unadjusted Model**					
Family Support	−39.1	17.0	−.269	−2.30	.025	Peer Support	−9.4	9.9	−.114	−.95	.348	Satisfaction	−4.5	17.8	−.030	−.25	.801
Adjusted Model						**Adjusted Model**						**Adjusted Model**					
Family Support	−46.8	18.4	−.307	−2.54	014	Peer Support	−11.1	11.6	−.121	−.96	.342	Satisfaction	−11.1	18.8	−.071	−.59	.556
Gender[1]	−90.7	33.0	−.359	−2.75	.008	Gender[1]	−81.6	34.5	−.323	−2.37	.022	Gender[1]	−94.7	33.7	−.363	−2.81	.007
Age	6.0	3.7	.196	1.59	.118	Age	5.0	3.9	.163	1.26	.212	Age	4.43	3.9	.139	1.15	.256
Waking Time	−18.9	12.9	−.307	−1.47	.148	Waking Time	−25.6	13.3	−.416	−1.93	.059	Waking Time	−29.6	12.9	−.494	−2.30	.025
Time since Waking	−17.5	13.5	−.271	−1.30	.200	Time since waking	−24.5	14.0	−.380	−1.75	.086	Time since waking	−22.5	14.2	−.345	−1.58	.119
Smoking[2]	66.3	59.3	.159	1.12	.269	Smoking[2]	62.3	63.3	.149	.98	.330	Smoking[2]	60.7	64.6	.136	.94	.351
Exercise[2]	−107.0	54.5	−.305	−1.96	.055	Exercise[2]	−117.9	58.0	−.337	−2.03	.047	Exercise[2]	−114.1	58.5	−.305	−1.95	.056
Caffeine Use[2]	61.4	37.3	.235	1.64	.106	Caffeine Use[2]	62.6	39.2	.239	1.60	.117	Caffeine Use[2]	56.9	39.8	.206	1.43	.158

[1] Coded as (0 = male, 1 = female)

[2] Self-reported activity on day of experiment (0 = no, 1 = yes)