



Perceived stress, coping, and cortisol reactivity in daily life: A study of adolescents during the first year of college



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ARTICLE INFO

Article history:

Received 27 September 2015

Received in revised form

22 December 2015

Accepted 5 February 2016

Available online 11 February 2016

Keywords:

Perceived stress

Coping

Cortisol

Daily diaries

Adolescents

First year of college

ABSTRACT

Adolescents change how they cope with stress across different situations, but also differ from one another in their general capacity to cope. The current study examined whether cortisol reactivity to perceived daily stress varies with both situational (within-person) and individual (between-person) differences in coping. First-year college students ($N = 63$; $M_{\text{age}} = 18.85$) provided 15 stress-coping diaries and 15 corresponding saliva samples across 3 weekdays. Results from hierarchical linear growth models revealed that perceiving greater stress than usual in the last hour was significantly associated with elevations in cortisol (relative to diurnal patterning) only during situations characterized by greater than usual diary-reported engagement coping. Regarding individual differences, perceiving greater stress than usual was significantly associated with elevations in cortisol only for adolescents below average on trait measures of engagement coping or belief in their ability to handle stress. Findings indicate that cortisol reactivity to daily stress varies with both situational variation and individual differences in coping.

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As they transition to adulthood, many adolescents face novel daily demands in the college environment. These daily stressors have been linked to poor physical and psychological health among college students (O'Neill, Cohen, Tolpin, & Gunthert, 2004), who report notably poor sleep (Lund, Reider, Whiting, & Prichard, 2010), increased alcohol use (Carter, Brandon, & Goldman, 2010), and concerning rates of suicidal ideation (Wilcox et al., 2010). Hypothalamic-pituitary-adrenal (HPA) axis reactivity is one mechanism through which stress can impact health and well-being across development (Gunnar & Quevedo, 2007). Adolescents' psychological responses to stress (e.g., coping skills) influence physiological stress reactivity and also predict well-being (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001).

The impact of daily stress on HPA reactivity likely depends on how adolescents both cope with specific stressful situations (measured through diary reports) and how they typically respond to stress (measured through traditional surveys). Developmental scientists have started collecting salivary biomarkers (e.g., cortisol) in conjunction with diary reports to measure adolescents' physiological responses to daily stress outside of the laboratory (e.g., Adam, 2006), yet little is known about how coping influences cortisol reac-

tivity among adolescents as they navigate the college context. The goals of this study were to examine whether within-person situational and individual differences in coping account for variation in adolescents' cortisol responses to perceptions of daily stress. This research can potentially inform first-year transition programs aimed at improving how adolescents manage daily stress when starting college (see Barefoot, 2005).

1. Perceived daily stress

As they begin the transition to adulthood, many adolescents face demands across multiple domains (e.g., school, work, relationships; Arnett, 2000). Even relatively minor stressful events can contribute to psychological problems. These "daily hassles" predict symptoms of depression and anxiety over and above major life events (Kanner, Coyne, Schaefer, & Lazarus, 1981). In a study of adolescents transitioning from high school to college, daily hassles mediated the relation between major negative events and psychological symptoms (Wagner, Compas, & Howell, 1988). Adolescents who are unable to handle stress during this transition may be particularly vulnerable to adjustment problems (Masten et al., 2004). Thus, it is important to examine mechanisms that might explain why perceptions of stress in daily life negatively influence the physical and mental health of first-year college students.

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2. Cortisol reactivity to perceived daily stress

The HPA axis recruits resources to react to stressors and stimulates release of the hormone cortisol (de Kloet, 2004). When timing is carefully measured in a controlled lab environment, cortisol peaks in saliva approximately 20–25 min following a discrete stressor but may take up to one hour to return to baseline (Nicolson, 2008). In coordination with other biological systems, the production of cortisol allows for adaptive behavioral responses during stressful situations, but chronic activation of this response can be harmful to physical and mental health (McEwen, 2004).

Cortisol is released throughout the day in a pattern characterized by a dramatic increase 30 min after waking (cortisol awakening response, CAR) and then a general decrease across the waking day (Adam & Kumari, 2009; Pruessner et al., 1997). By modeling this diurnal cortisol pattern and utilizing corresponding diary reports of daily experiences, researchers can estimate real-world cortisol responses to stress. Past research has found situational elevations in cortisol from adolescents' typical diurnal rhythms in relation to more worry/stress than usual (Adam, 2006), more loneliness than usual (Doane & Adam, 2010), and more negative affect than usual (Doane & Zeiders, 2014). College students' cortisol levels increased in anticipation of a real-life multiple-choice exam (Nicolson, 1992), were higher the day of an exam compared to a control day (Verschoor & Markus, 2011), and were higher when students were alone compared to when they were not (Matias, Nicolson, & Freire, 2011). Thus, characteristic college stressors have been linked to changes in cortisol. Yet it is unclear how these cortisol changes in daily life might vary with changes in coping in response to specific stressful situations or differences in general coping capacity between students.

3. Coping with perceived daily stress

Coping can be defined as, “conscious volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful events or circumstances” (Compas et al., 2001, pp. 89). There is evidence for two dimensions of adolescents' voluntary coping responses: engagement (directed towards stress or reactions to stress; e.g., problem-solving) and disengagement (oriented away from stress; e.g., avoidance; Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000). Although the utility of engagement coping fundamentally varies with situational factors, this active style is generally linked with adolescents' positive adjustment (Compas et al., 2001).

Given that uncontrollable stressors produce the most pronounced cortisol response (Dickerson & Kemeny, 2004), college students' active coping efforts that enhance their perceived sense of control over stressful situations may attenuate cortisol reactivity. For example, college students who are more likely to adopt problem-focused or engagement coping have exhibited lower cortisol levels in response to psychological stress tasks (Matheson & Anisman, 2009; Rohrmann, Hennig, & Netter, 2002). Similarly, coping by gaining a sense of control has contributed to reduced cortisol reactivity to a pharmacological stress induction and engagement coping style has been associated with lower daily cortisol output in samples of adults (Abelson, Khan, Liberzon, Erickson, & Young, 2008; O'Donnell, Badrick, Kumari, & Steptoe, 2008).

In addition, coping efficacy (the *belief* that one can deal with demands of a stressful situation; Sandler, Tein, Mehta, Wolchik, & Ayers, 2000) has been associated with successful adaptation to various stressors (e.g., Massey, Garnefski, Gebhardt, & van der Leeden, 2009). In our prior work, adolescents who reported increased loneliness from high school to college and also low coping efficacy exhibited poor average diurnal cortisol regulation (flatter slopes)

in college, compared to those with high coping efficacy (Drake, Sladek & Doane, *in press*). A logical extension of this work is to move beyond average diurnal cortisol patterns and consider whether situational (within-person) changes in cortisol in response to perceived daily stress differ for college students at varying levels of coping efficacy.

4. The present study

In order to extend available laboratory evidence, we examined stress, coping, and cortisol reactivity in the daily lives of adolescents during their first year of college. The current goals built upon our work from earlier waves of a longitudinal study, which focused on predicting individual differences in adolescents' average diurnal cortisol patterns as they transitioned from high school to college (Drake et al. *in press*). Using 15 pairs of diary reports and corresponding saliva samples across 3 days, we estimated the concurrent relation between situational (within-person, moment-to-moment) changes in perceived stress and deviations in salivary cortisol from adolescents' typical diurnal profiles (e.g., Adam, 2006). We then examined whether these cortisol responses to daily perceived stress varied with diary-reported engagement coping. We anticipated that perceiving more stress than usual (i.e., within-person increase) would be associated with elevations in cortisol relative to the diurnal rhythm, unless adolescents also used more engagement coping than usual in response to the stressful situation. Finally, we examined whether individual differences in engagement coping and coping efficacy measured via standard surveys accounted for between-person variation in the cortisol response to daily perceived stress. We expected that perceiving more stress than usual would be associated with elevations in cortisol to a lesser extent for adolescents who generally used more engagement coping or reported greater coping efficacy.

5. Method

5.1. Participants

Eighty-two adolescents were recruited for a longitudinal study of the transition from high school to college (e.g., Taylor, Doane, & Eisenberg, 2014). Students in their final year of high school (T1) were contacted through psychology department orientations and email. Participants were required to live within 35 miles of the university and plan to attend in the fall (T2). Present analyses focus on 71 adolescents (23% male; 17–19 years old; $M_{\text{age}} = 18.85$, $SD = 0.54$) who participated a third time in the spring of their first year of college (T3; 87% retention). Participants reflected the university's diversity (52% non-Hispanic White, 25% Latino/Hispanic, 6% African American, 4% Asian American/Pacific Islander, 13% multiracial; 4% of parents completed some high school, 28% high school diploma, 25% some college, 13% associate's degree, 17% bachelor's degree, 13% graduate degree). Participants lost to attrition from T1 to T3 ($n = 11$) had parents who completed more education ($M = 4.55$, $SD = 1.44$) than parents of participants who remained in the study ($M = 3.32$, $SD = 1.44$), $t(80) = -2.58$, $p = 0.01$, but did not differ significantly on focal or other demographic variables at T1.

One participant who did not provide diary data was not included in analyses. Data from seven participants were excluded for not correctly adhering to saliva sampling procedures (analytic $N = 63$; see below). Participants excluded for compliance reasons did not differ from the included sample on focal or demographic variables.

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