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EMPIRICAL RESEARCH

The Effects of Ethnic/Racial Discrimination and Sleep Quality on Depressive Symptoms and Self-Esteem Trajectories Among Diverse Adolescents

Tiffany Yip

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Abstract Ethnic/racial discrimination has persistent negative implications for both physical and mental health. The current study employs a risk and resilience framework to explore the joint effects of ethnic/racial discrimination and sleep disturbance on psychosocial outcomes among adolescents. In a sample of 146 minority and White adolescents (70 % female), changes in depressive symptoms, anxiety, and self-esteem over 3 years are explored using growth curve models. Regardless of ethnic background, adolescents reporting high levels of ethnic/racial discrimination and poor sleep also reported a corresponding increase in depressive symptoms and lower levels of self-esteem over time. Adolescents reporting all other combinations of sleep quality and ethnic/racial discrimination reported more positive adjustment over time. The joint effects of sleep and ethnic/racial discrimination on adolescent psychosocial development are discussed.

Keywords Ethnic/racial discrimination · Sleep · Depressive symptoms · Self-esteem

Introduction

Ethnic/racial discrimination has persistent negative implications for both physical and mental health (Gee et al. 2007; Williams et al. 2008). At the same time, sleep disturbance also has profound effects on adolescent health, daily functioning, and development (Association 2006; Bub et al. 2011). Unfortunately, both ethnic/racial discrimination and sleep disturbance increase during adolescence (Carskadon 1990; Greene et al. 2006). The current study employs a risk and resilience framework to understand the joint effects of discrimination and sleep disturbances on developmental outcomes over time (Matsen et al. 1991). A risk and resilience perspective acknowledges that, while youth may have experiences that place them at risk for poor developmental outcomes, youth also access protective factors that help buffer negative effects. As others have done (El-Sheikh and Kelly 2011), the current study considers sleep as a moderator of the association between risks associated with discrimination and psychological adjustment over time.

As a moderator, sleep can be considered both a risk and protective factor. Sleep disturbances have been considered to include "shorter than average sleep times, higher activity during sleep, several extended night wakings, or sleep schedules that are more variable from night to night" (El-Sheikh and Kelly 2011, p. 4). As a risk factor, sleep disturbance has been observed to be associated with compromised physical and psychological health outcomes (Breslau et al. 1996; Ford and Kamerow 1989; Hamilton et al. 2007; Meerlo et al. 2008; Moore et al. 2002). In addition, sleep disturbance has been linked to key physical health indicators such as daytime sleepiness, fatigue, muscle pain, backache, dizziness, and palpitations (Shaver and Paulsen 1993; Wolfson and Carskadon 1998). Sleep disturbance is also related to increased depressive symptoms, anxiety, and psychological distress (Beatty et al. 2011; Haack and Mullington 2005; Hamilton et al. 2007). At the same time, consistent with conceptualizations of risk and resilience as conceptually-distinct, yet related constructs, rather than one simply representing the absence of the other (Rutter 1993), the current study considers good sleep hygiene to be more than the mere absence of sleep disturbances. Good sleep hygiene refers to behaviors that

T. Yip (✉)
Department of Psychology, Fordham University, 226 Dealy Hall, Bronx, NY, USA
e-mail: tyip@fordham.edu

promote optimal development, and may therefore serve to protect against the negative effects of discrimination on youth development. As such, the current study considers good sleep hygiene as a protective factor (El-Sheikh and Kelly 2011; Keller et al. 2008) for the positive association between racial/ethnic discrimination and psychosocial outcomes. Specifically, as Matsen et al. (1991) state, "protective factors" *moderate* [emphasis added] the effects of individual vulnerabilities…. so that the adaptation trajectory is more positive than would be the case if the protective factors were not operational" (p. 426).

Sleep is essential for daily functioning, health and optimal development. Indeed, the importance of sleep hygiene for health outcomes has been widely cited. Data collected from self-report measures, as well as sophisticated, hospital laboratory polysomnographs find consistent links between poor sleep and health outcomes (Breslau et al. 1996; Hamilton et al. 2007; Mindell et al. 2009). Individual differences in sleep hygiene are thought to reflect differences in physiological reactivity and self-regulation. In part, sleep's regulatory functions are thought to be related to functions in the prefrontal cortex, whereby sleep disturbance interferes with the prefrontal cortex's ability to regulate behaviors and feelings (Dahl 1996). Indeed, evidence suggests that sleep disturbance exacerbates negative affective responses to stressors (Leotta et al. 1997). The current study explores how sleep may moderate the effects of discrimination on trajectories of depressive symptoms, anxiety, and self-esteem among adolescents over a 3-year period.

Ethnic/Racial Discrimination and Psychological Adjustment

Experiences of ethnic/racial discrimination are a risk factor for healthy adolescent development. The negative effects of ethnic/racial discrimination on psychological health among adolescents are robust (Schimitt et al. 2014). For example, researchers have found that ethnic/racial discrimination is associated with more depressive symptoms, lower self-esteem, increased hopelessness, more loneliness, increased anxiety, and higher levels of psychological distress (Branscombe et al. 1999; Gee et al. 2007; Greene et al. 2006; Williams et al. 2008; Yip et al. 2008). In a recent meta-analysis, Schmitt et al. (2014) observed that the effects of discrimination were particularly detrimental for youth as compared to adults. Moreover, discrimination seems to have stronger effects on negative outcome indices (e.g., depressive symptoms, anxiety), compared to positive ones (e.g., self-esteem).

In teasing apart cause and effect associations, longitudinal and repeated measures methods have found that experiences of discrimination precede increases in poor psychological outcomes. For example, in a longitudinal study of minority adolescents, experiences of ethnic/racial discrimination were prospectively associated with worse psychological health outcomes over time (Wong et al. 2003). Among African American adolescents, researchers explored whether discrimination predicted depressive symptoms or vice versa; the results suggested that reports of discrimination preceded increases in depressive mood (Seaton et al. 2011). At a daily level, Torres and Ong (2010) observed that daily experiences of discrimination predicted higher depressive symptoms the next day, a strong indicator that discrimination precedes depressive mood. Taken together, prior research has found that previous experiences with ethnic/racial discrimination predict future youth outcomes. The current study extends this research by exploring the prospective links between discrimination experiences in the 9th grade and subsequent trajectories of depressive symptoms, anxiety, and self-esteem over a 3-year period.

As with any other risk factor, beyond establishing the direct effects of ethnic/racial discrimination on health outcomes, a risk and resilience perspective explores individual differences in how adolescents cope with discrimination (Matsen et al. 1991; Rutter 1993). Exploring such moderators informs why some individuals are more susceptible to the negative influences of discrimination while others are not, which elucidates sources of resilience. To date, resilience related to ethnic/racial identity, acculturation levels and coping strategies have received some attention. Research in these areas has found that ethnic identity moderates the negative effects of discrimination on psychological adjustment. For example, some researchers have observed ethnic identity to be a protective moderator that buffers the negative effects of discrimination (Greene et al. 2006), while others have found it to exacerbate the effects (Yip et al. 2008; Yoo and Lee 2005). In addition, research finds that levels of acculturation may be a risk factor for the effects of discrimination on depressive symptoms (Umaña-Taylor and Updegraff 2007). In particular, among boys, higher levels of acculturation were associated with a stronger positive association between discrimination and depressive symptoms. Finally, coping strategies have also been observed to moderate the effects of ethnic/racial discrimination on depressive symptoms; specifically, individuals reporting suppressive strategies involving avoidance or denial report the strongest positive associations between discrimination and symptoms (Wei et al. 2008). Similarly, the effects of daily discrimination on next-day depressive symptoms depended upon levels of ethnic identity (Torres and Ong 2010). Specifically, individuals who reported high levels of ethnic identity exploration reported a stronger negative association between discrimination and depressive symptoms, whereas

individuals who reported high levels of ethnic identity commitment reported weaker associations.

Sleep as a Moderator for Psychological Adjustment

Taken together, ethnic/racial discrimination is a persistent and powerful risk factor for adolescent development. However, scholars have identified important individual differences that either buffer or exacerbate these negative effects. The existing literature has explored a range of psychological differences that influence the effect of discrimination on health outcomes, but there is much less research exploring other moderators. The current study extends this area of research by exploring sleep as a moderator for the link between the sociocultural experience of discrimination and the psychological outcomes. Specifically, as a key determinant of adolescent health and development (Carskadon 1990), the current study focuses on sleep as a moderator in the associations between discrimination and psychological adjustment. Research finds that sleep helps to regulate stress hormones (Akerstedt and Gillberg 1981); as such, proper sleep hygiene may mitigate the effects of stress related to ethnic/racial discrimination. At the same time, sleep disturbance may deprive youth of the benefits of emotional and behavioral regulation, thereby exacerbating the negative effects of discrimination on depressive symptoms (El-Sheikh and Kelly 2011).

The overarching goal of the study was to explore whether ethnic/racial discrimination and sleep disturbance in the 9th grade prospectively influence trajectories of depressive symptoms, anxiety, and self-esteem. The current study adds significantly to the current literature in this area by examining longitudinal change in a sample of diverse adolescents. This is not the first study to explore sleep as a moderator for youth development. El-Sheikh and Kelly (2011) propose a research model testing sleep disturbance as a moderator for the associations between stress and youth outcomes. As a moderator, proper sleep hygiene was hypothesized to buffer the negative effects of stress, whereas sleep disturbance was proposed to exacerbate already negative effects. Indeed, proper sleep hygiene facilitates adolescents' ability to regulate and cope with the negative emotions related to stress (El-Sheikh and Buckhalt 2005; Keller et al. 2008).

Current Study

Employing a risk and resilience framework, the current study investigates 3-year trajectories of depressive symptoms, anxiety, and self-esteem among a diverse group of adolescents. Considering the integral role of sleep in regulating stress hormones (Miller et al. 2002), sleep disturbances paired with high levels of discrimination are hypothesized to serve as cumulative risks to predict higher initial levels of depression and anxiety in the 9th grade along with increases in depressive symptoms and anxiety. Similarly, a corresponding decrease in self-esteem over 3 years is expected. In contrast, low levels of discrimination and proper sleep hygiene are hypothesized to be associated with the lowest initial levels and no changes in depressive symptoms, anxiety, or self-esteem over time. Proper sleep hygiene is expected to buffer the negative effects of high discrimination. Finally, adolescents reporting low discrimination regardless of levels of sleep disturbances are not expected to report changes in psychosocial outcomes over time.

Methods

Participants

The data presented here come from a larger longitudinal study of ethnic identity development. Adolescents were recruited from five New York City public high schools. The study was approved the appropriate Institutional Review Boards as well as the NYC Department of Education Review Board. Sampling occurred at the school level to include schools that were comparable in size, academic standing, and selectivity, but differing in racial composition. Schools included: a predominantly Asian, predominantly Latino, predominantly White, and two racially heterogeneous schools with 20, 12, 42, 8, 18 % of the current subsample selected from each school respectively. At each of the schools, invitation letters were sent home to all 9th grade students to participate. Only students with signed parental consent and assent forms participated. The full sample includes 405 adolescents ranging in age from 13 to 16 years old ($M = 14.18$, $SD = .46$). The current study includes nested data that require the use of multilevel analytical models such as Hierarchical Linear Models (Bryk and Raudenbush 1992a). Although the full sample including 405 adolescents was included in all analyses, the HLM software automatically weighs cases such that those with insufficient data are omitted from analyses. In this case, of the full sample, only 146 adolescents were retained by HLM for the analyses presented here (range = 14–15 years old, $M = 14.17$, $SD = .38$). The subsample presented here is racially diverse (9 % African American, 25 % Hispanic/Latino, 42 % Asian, and 25 % White). Females are over-represented in the sample (70 %). The sample is predominantly United States-born (82 %) with those who were not born in the United States coming from countries such as China, Brazil, Columbia, and Poland.

Procedure

As part of this study, adolescents completed surveys about their depressive symptoms, anxiety, and self-esteem for 3 years. Each year, adolescents completed surveys in the early fall, mid-fall, and spring for a total of 9 data points. Participants completed surveys about experiences of discrimination once in the fall of the first year (T1). Groups of participants ranging in size from 5 to 25 students met with a research team to complete surveys. In addition to these surveys, participants were also given cellular phones on which they were instructed to complete daily diary surveys for 1 week each night before going to bed between the fall and mid-fall surveys. Participants used the cellular phone to access an online survey which included questions about sleep quality and quantity. Completing surveys online allowed the research team to monitor compliance by observing the time stamp for each survey entry. On average, participants completed 6.90 (range from 5 to 7) surveys over the course of the week. Since the current study was interested in prospective associations and due to the omission of the item in subsequent years, only year 1 (T1) sleep data are included. For each year of the study, participants were compensated $50, $70 and $90 respectively.

Measures

Racial Discrimination

In the fall of the first year, participants responded to the Daily Life Experiences scale which includes 18 items describing discriminatory experiences (Harrell 2010). For example, participants were asked to indicate how often the past year "been treated rudely or disrespectfully because of your race?" on a scale from 0 = never to 5 = very often. Next, participants were asked "how much did this bother you?" on a scale from 0 = has never happened to me to 5 = bothered me extremely. Scores for the two parts of the question were multiplied then averaged (T1: M = 3.38, SD = 3.95, α = .91).

Depressive Symptoms

The Center for Epidemiological Studies-Depression Scale includes 20 items assessing depressive symptoms (Radloff 1977). Participants were asked to indicate how often the in the past week they experienced symptoms such as "I felt depressed" on a scale of 1 = never to 5 = all the time. Scores were summed such that higher scores indicate more depressive symptoms. Adolescents completed the measures three times per year for a total of nine data points. Descriptive statistics are reported in Table 1.

Trait Anxiety

Anxiety was assessed using 20 items such as "I have disturbing thoughts" rated on a 4-point scale from 1 = almost never to 4 = almost always (Spielberger et al. 1970). Items were averaged such that higher scores indicate higher levels of anxiety. Adolescents completed the measures three times per year for a total of nine data points. Descriptive statistics are reported in Table 1.

Self-Esteem

Self-esteem was assessed with 10 items such as "I take a positive attitude towards myself" rated on a 5-point scale from 1 = strongly disagree to 5 = strongly agree (Rosenberg, 1986). Items were averaged such that higher scores indicate higher levels of self-esteem. Adolescents completed the measures three times per year for a total of nine data points. Descriptive statistics are reported in Table 1.

Daily-Level Sleep Quality

In the fall of the first year, each night, for one week, participants responded to a single item "How would you rate the quality of your sleep last night?" on a 5-point scale ranging from 0 = very bad to 4 = very good (T1: M = 2.32, SD = .86). Because daily diaries were completed each night before going to bed, respondents were asked to report on the previous night's sleep. To create a between-person score, as others have done, a mean was computed for each adolescent across the 7 days of the data (e.g., Keller et al. 2008). Due to the prospective interests of the current paper and omission of the item in subsequent years, only T1 data are included in the analyses.

Daily-Level Sleep Quantity

Similarly, measures of sleep quantity were also administered in the fall of the first year, each night, for 1 week. To assess sleep quantity participants responded to two items. The first item asked "what time did you go to sleep last night?" with seven response options in hourly increments ranging from "before 8 pm" to "after 1 am". The second question asked "What time did you wake up today?" with nine response options in hourly increments ranging from "before 5 am" to "after 12 pm". To code sleep quantity, the number of hours elapsed between when participants reported going to sleep and when they woke up was summed (M = 8.97, SD = 2.44). Because diary surveys were completed each night, respondents were instructed to

Table 1 Descriptives

	T1	T2	T3	T4	T5	T6	T7	T8	T9
Depressive sym									
Mean	40.29	42.36	42.54	41.72	41.98	43.63	40.53	41.86	42.26
SD	10.58	12.97	12.01	12.87	12.50	14.79	11.52	13.08	12.47
α	.83	.87	.85	.86	.87	.86	.83	.86	.82
Trait anxiety									
Mean	2.05	2.08	2.05	2.06	2.07	2.08	2.10	2.09	2.11
SD	.28	.27	.26	.26	.26	.25	.26	.28	.28
α	.88	.89	.89	.89	.86	.91	.91	.91	.93
Self-esteem									
Mean	3.77	3.77	3.76	3.74	3.72	3.77	3.72	3.75	3.72
SD	.31	.23	.21	.26	.14	.21	.29	.21	.19
α	.88	.87	.88	.87	.89	.89	.88	.91	.91

Table 2 Correlations among variables

	1.	2.	3.	4.	5.	6.
1. Mean of depressive symptoms	–	.83***	−.68***	.38***	−.34***	−.07
2. Mean of anxiety		–	−.73***	.38***	−.31***	.00
3. Mean of self-esteem			–	−.23***	.30***	.04
4. Discrimination				–	−.17**	−.03
5. Daily sleep quality					–	.20*
6. Daily sleep quantity						–

* $p < .05$; ** $p < .01$; *** $p < .001$

indicate their previous night's sleep hours. Again, as with the sleep quality variable, each adolescent's data for 7 days was averaged to represent a single measure of sleep quantity.

Results

Descriptive statistics for all study variables are reported in Table 1. Correlations indicate that mean depressive symptoms was positively associated with anxiety and discrimination, but negatively associated with self-esteem and sleep quality (Table 2). Discrimination was negative related to sleep quality; while sleep quality and quantity were positively correlated. Descriptive differences in discrimination experiences across the five schools were explored. Results of Tukey's posthoc tests suggest that discrimination levels were higher in the predominantly Latino school compared to the predominantly White school (D = −.98, SE = .24). In addition, descriptive differences in racial discrimination were explored between minority and White adolescents, not surprisingly with minority adolescents reporting higher levels ($t = -2.23$, SE = .18). Finally, there was no evidence of differences in sleep quality ($t = 1.52$, SE = .15) or quantity ($t = -.76$, SE = .46) between minority and White adolescents.

Data Analyses Overview

As mentioned above, due to the nested nature of these data, hypotheses were tested using Hierarchical Linear Models (Bryk and Raudenbush 1992b) which accounts for how longitudinal reports of depressive symptoms, anxiety, and self-esteem are nested within adolescents. Specifically, growth curve analyses were conducted to estimate within-person trajectories at Level 1 using the nine data points. Level 1 variables were not centered to allow for an interpretable intercept representing initial values in the fall of the 9th grade. Between-person effects, including individual differences in sleep quality and quantity and ethnic/racial discrimination were modeled at Level 2. Although similar studies with repeated measures of students nested within schools typically employ a third level to account for possible school-level differences, with the current subsample, there was inadequate power to do so (Raudenbush et al. 2011). The effects of gender (0 = male, 1 = female), nativity status (0 = first generation, 1 = latter generation) and a dummy variable comparing ethnic minority to white students (0 = white, 1 = ethnic minority) were included as controls at Level 2. Because the bivariate correlations indicated that the three outcomes of interest were highly correlated with each other, in order to isolate their effects, analyses for each outcome controls for the effects of the other two indices. The equation for depressive symptoms is

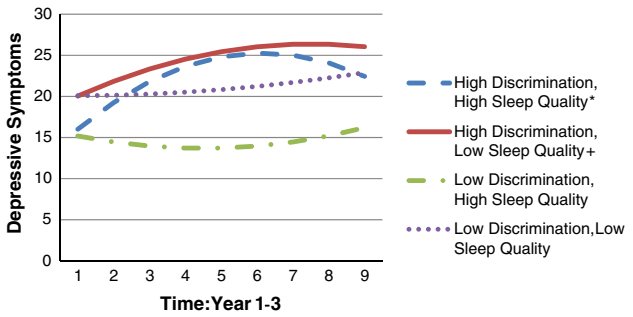

Fig. 1 Depressive symptom trajectories by ethnic/racial discrimination and sleep quality. *Note* $+p < .10$, $*p < .05$

presented below, however, parallel analyses were conducted for anxiety and self-esteem.

Level 1 (Individual Growth Curve, Within Person):

$$\begin{aligned}\text{Depressive symptoms} = {} & \text{P0} + \text{P1} * (\text{Linear Time}) + \text{P2} \\ & * (\text{Quadratic Time}) + \text{P3} \\ & * (\text{Trait Anxiety}) + \text{P4} \\ & * (\text{Self-esteem}) + \text{E}\end{aligned}$$

Level 2 (Individual Differences, Between Person):

$$\begin{aligned}\text{P0} = {} & \text{B00} + \text{B01} * (\text{Discrimination}) + \text{B02} \\ & * (\text{Mean Daily Sleep Quality}) \\ & + \text{B03} * (\text{Discrimination} \times \text{Sleep Quality}) \\ & + \text{B04} * (\text{Mean Daily Sleep Quantity}) \\ & + \text{B05} * (\text{Gender}) + \text{B06} * (\text{Ethnicity}) \\ & + \text{B07} * (\text{Nativity Status}) + \text{R0}\end{aligned}$$

$$\begin{aligned}\text{P1} = {} & \text{B10} + \text{B11} * (\text{Discrimination}) + \text{B12} \\ & * (\text{Mean Daily Sleep Quality}) \\ & + \text{B13} * (\text{Discrimination} \times \text{Sleep Quality}) \\ & + \text{B14} * (\text{Mean Daily Sleep Quantity}) \\ & + \text{B15} * (\text{Gender}) + \text{B16} * (\text{Ethnicity}) \\ & + \text{B17} * (\text{Nativity Status}) + \text{R1}\end{aligned}$$

$$\begin{aligned}\text{P2} = {} & \text{B20} + \text{B21} * (\text{Discrimination}) + \text{B22} \\ & * (\text{Mean Daily Sleep Quality}) \\ & + \text{B23} * (\text{Discrimination} \times \text{Sleep Quality}) \\ & + \text{B24} * (\text{Mean Daily Sleep Quantity}) \\ & + \text{B25} * (\text{Gender}) + \text{B26} * (\text{Ethnicity}) \\ & + \text{B27} * (\text{Nativity Status}) + \text{R2}\end{aligned}$$

$$\text{P3} = \text{B30}$$

$$\text{P4} = \text{B40}$$

Depressive Symptoms

Before between-person effects were included into the model, an unconditional model exploring depressive symptom trajectories over time was estimated for the full sample (i.e., Level 1 model only). The linear effect ($b = .90$, $SE = .47$, $p < .10$) was marginally significant while the quadratic effect ($b = -.08$, $SE = .05$) was not significant suggesting slight increases in depressive symptoms over the 3-year period (Fig. 1).

Next, between-person effects of discrimination, sleep quality and quantity were included (Table 3). Interactions between discrimination with both of the sleep indices were explored; however, interaction effects of discrimination and sleep quantity were not significant and therefore not retained in the final model. Consistent with existing literature, discrimination was associated with higher levels of initial values of depressive symptoms (B01). Conversely, daily sleep quality was associated with lower initial values of depressive symptoms (B02). In addition, the between-person effects of discrimination and sleep yielded a

Table 3 Within-person depressive symptoms growth curves as a function of between-person differences in discrimination, sleep quality and quantity

		B	SE
Depressive symptoms (L1)	B00, G000	21.66***	5.98
Discrimination (L2)	B01, G010	0.57*	0.28
Sleep quality (L2)	B02, G020	−2.75*	1.32
Discrimination × quality (L2)	B03, G030	−0.41	0.31
Sleep quantity (L2)	B04, G040	0.28	0.35
Gender (L2)	B05, G050	1.22	1.89
Ethnicity (L2)	B06, G060	−0.83	0.71
Nativity status (L2)	B07, G070	1.15	2.16
Linear effect (L1)	B10, G100	0.74	2.70
Discrimination (L2)	B11, G110	−0.14	0.13
Sleep quality (L2)	B12, G120	0.58	0.60
Discrimination × quality (L2)	B13, G130	0.34*	0.15
Sleep quantity (L2)	B14, G140	−0.13	0.17
Gender (L2)	B15, G150	−0.27	1.02
Ethnicity (L2)	B16, G160	0.64	1.08
Nativity status (L2)	B17, G170	0.07	1.16
Quadratic effect (L1)	B20, G200	0.01	0.27
Discrimination (L2)	B21, G210	0.02	0.01
Sleep quality (L2)	B22, G220	−0.08	0.06
Discrimination × quality (L2)	B23, G230	−0.04*	0.02
Sleep quantity (L2)	B24, G240	0.01	0.02
Gender (L2)	B25, G250	0.06	0.10
Ethnicity (L2)	B26, G260	−0.02	0.13
Nativity status (L2)	B27, G270	1.15	2.16
Trait anxiety (L1)	B30, G300	10.43***	1.19
Self-esteem (L1)	B40, G400	−1.53+	0.83

$+p < .10$; * $p < .05$; *** $p < .001$. L1 indicates that the variable was included in Level 1 of the model. L2 indicates that the variable was included in Level 2 of the model

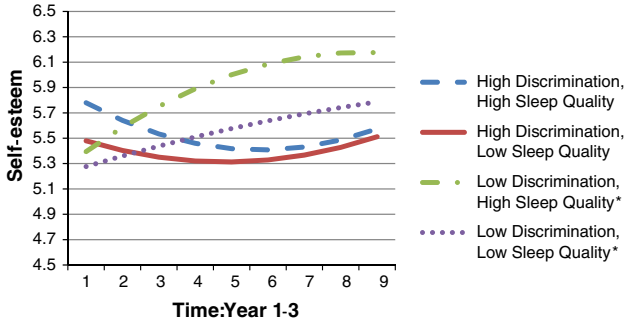

Fig. 2 Self-esteem trajectories by ethnic/racial discrimination and sleep quality. *Note* *$p < .05$

Table 4 Within-person self-esteem growth curves as a function of between-person differences in discrimination, sleep quality and quantity

		B	SE
Self-esteem (L1)	B00, G000	5.23***	0.29
Discrimination (L2)	B01, G010	0.00	0.01
Sleep quality (L2)	B02, G020	0.11	0.09
Discrimination × quality (L2)	B03, G030	0.04*	0.02
Sleep quantity (L2)	B04, G040	0.00	0.02
Gender (L2)	B05, G050	−0.17	0.11
Ethnicity (L2)	B06, G060	−0.03	0.12
Nativity status (L2)	B07, G070	0.09	0.13
Linear effect (L1)	B10, G100	−0.06	0.14
Discrimination (L2)	B11, G110	0.00	0.01
Sleep quality (L2)	B12, G120	0.02	0.04
Discrimination × quality (L2)	B13, G130	−0.02**	0.01
Sleep quantity (L2)	B14, G140	0.01	0.01
Gender (L2)	B15, G150	0.05	0.05
Ethnicity (L2)	B16, G160	−0.01	0.05
Nativity status (L2)	B17, G170	−0.01	0.07
Quadratic effect (L1)	B20, G200	0.01	0.02
Discrimination (L2)	B21, G210	0.00	0.00
Sleep quality (L2)	B22, G220	0.00	0.00
Discrimination × quality (L2)	B23, G230	0.01*	0.00
Sleep quantity (L2)	B24, G240	0.00	0.00
Gender (L2)	B25, G250	−0.01	0.00
Ethnicity (L2)	B27, G260	0.00	0.01
Nativity status (L2)	B27, G270	0.00	0.01
Trait anxiety (L1)	B30, G300	−0.58***	0.06
Depressive symptoms (L1)	B40, G400	0.00	0.00

* $p < .05$; ** $p < .01$; *** $p < .001$. L1 indicates that the variable was included in Level 1 of the model. L2 indicates that the variable was included in Level 2 of the model

significant interaction effect (B23, Fig. 2). To probe the nature of this interaction, simple slopes tests were conducted (Shacham 2009). As hypothesized, adolescents reporting high levels of discrimination and poor sleep quality reported increases in depressive symptoms over time ($t = 1.85$, $p = .06$). Adolescents reporting high levels discrimination combined with high sleep quality also reported increases in depressive symptoms over time ($t = 2.15$, $p < .05$), but their levels remained below those reported by adolescents reporting poor sleep quality. The two profiles representing low levels of discrimination did not report significant changes in depressive symptoms over time.

Self-Esteem

Next, analogous analyses were conducted with self-esteem. The unconditional model exploring self-esteem trajectories over time was estimated for the full sample (i.e., Level 1 model only). Neither the linear effect ($b = .01$, $SE = .02$) nor the quadratic effect ($b = .00$, $SE = .00$) was significant suggesting no changes in self-esteem over the 3-year period.

Next, between-person effects of discrimination, sleep quality and quantity were included (Table 4). Interactions between discrimination with both of the sleep indices were explored; however, interaction effects of discrimination and sleep quantity were not significant and therefore not retained in the final model. Unlike depressive symptoms, neither discrimination nor sleep quality observed to be related to initial levels of self-esteem. However, the between-person effects of discrimination and sleep yielded a significant interaction effect for both the linear and quadratic terms (B13, B23, Fig. 2). To probe the nature of this interaction, simple slopes tests were conducted (Shacham 2009). Adolescents reporting high levels of discrimination and poor sleep quality reported consistently low levels of self-esteem over time. Adolescents reporting high levels of discrimination and high sleep quality also reported low levels of self-esteem, but were higher than their low sleep quality counterparts. Interestingly, the two profiles characterized by low discrimination reported increases in self-esteem over time, with the low discrimination, high sleep quality adolescents reporting the highest increases ($t = 2.67$, $p < .01$) and the low sleep quality adolescents reporting more modest increases ($t = 2.36$, $p < .05$).

Anxiety

Finally, an unconditional model exploring anxiety trajectories over time was estimated for the full sample (i.e., Level 1 model only). Neither the linear effect ($b = .00$, $SE = .02$) nor the quadratic effect ($b = .00$, $SE = .00$) was significant suggesting no changes in anxiety over the 3-year period.

Next, between-person effects of discrimination, sleep quality and quantity were explored. Interactions between discrimination with both of the sleep indices were explored; however, interaction effects of discrimination and sleep quantity were not significant and therefore not retained in the final model. Discrimination was not found to be associated with higher initial levels of anxiety ($b = .01$, $SE = .01$) while daily sleep quality was observed to be associated with lower levels of initial anxiety ($b = -.09$, $SE = .04$). Unlike depressive symptoms and self-esteem, the between-person effects of discrimination and sleep did not yield a significant interaction over time.

Discussion

We spend approximately one-third of our life sleeping. Indeed, sleep is essential for health, daily functioning, and development (National Sleep Association 2006). Yet, as a group, adolescents are chronically sleep-deprived (Carskadon 1990). Nearly 80 % of adolescents in grades 9–12 are not sleeping the recommended 9 h per night (National Sleep Association 2006). Even more disturbing, starting in the 9th grade, sleep time shows a consistent, downward trend throughout high school with 97 % of 12th graders getting insufficient sleep (National Sleep Association 2006). In addition to decreased sleep quantity, nearly half of adolescents report poor sleep quality such as having problems falling asleep and staying asleep at night. Adolescents are not sleeping as much and as well as they need for optimal development, but what are the consequences for developing youth? An increasing appreciation of the importance of sleep for youth growth and development has been accompanied by an increase in scholarly attention to the topic. The current study investigates the joint influence of ethnic/racial discrimination and sleep disturbance in the 9th grade on subsequent trajectories of depressive symptoms, anxiety and self-esteem. Consistent with existing research citing the direct effects of discrimination on depressive symptoms (Greene et al. 2006; Umaña-Taylor and Updegraff 2007), the current study found that ethnic/racial discrimination was associated with higher initial levels of depressive symptoms. Interestingly, however, unlike existing research (Greene et al. 2006), the effects of ethnic/racial discrimination in the 9th grade were not associated with growth trajectories of depressive symptoms over the next 3 years. One critical difference between the current study and previous research is that the current study only measures ethnic/racial discrimination in the 9th grade to predict trajectories of depressive symptoms prospectively. Other research finding that discrimination is associated with increase in depressive symptoms over time have explored the concurrent associations between discrimination and depressive symptoms. Therefore, it is possible that the effects of discrimination on depressive symptoms are isolated to more concurrent processes, rather than predictive of future health 1 and 2 years later.

Importantly, this study contributes to a burgeoning area of research on risk and resilience related to sleep. Specifically, neither discrimination alone, nor sleep disturbances alone, predicted trajectories of psychosocial outcomes over time, rather sleep quality and discrimination seemed to interact jointly. As predicted, poor sleep quality coupled with high levels of ethnic/racial discrimination in the first year of high school was associated with consistently high levels of depressive symptoms into adolescents' 3rd year of high school. Similarly, adjusting for levels of depressive symptoms, the combination of high discrimination and low sleep quality was also associated with consistently low levels of self-esteem over time. Sleep is restorative and helps to regulate reactions to psychological stressors. Indeed, sleep is important for emotion regulation (Dahl 1999) and coping with external stressors (El-Sheikh and Kelly 2011). In fact, insufficient sleep has been suggested to exacerbate how adolescents cope with stress (Dahl 1999). Without the health-enhancing benefits of proper sleep hygiene, the effects of ethnic/racial discrimination were particularly detrimental for adolescents' depressive symptoms and self-esteem. Consistent with a cumulative risk approach (Matsen et al. 1991; Rutter 1999), adolescents reporting high levels of discrimination and sleep disturbance are in essence coping with the interactive effects of more than one risk factor. As predicted, these adolescents fared the worst compared to all other combinations of discrimination and sleep. Discrimination alone has been observed to predict more depressive symptoms (Greene et al. 2006; Seaton et al. 2008); the current study adds to this literature by observing that, coupled with sleep disturbance, adolescents are at particularly high risk for levels of depressive symptoms over time.

Despite reporting high levels of discrimination, adolescents who reported high quality sleep reported consistently lower levels of depressive symptoms over time compared to their low sleep quality counterparts. As predicted, and consistent with existing literature, the data suggest that high quality sleep may serve as a protective factor that buffers the negative effects of ethnic/racial discrimination on youth outcomes. The regulatory and restorative benefits of sleep seem to compensate the known negative effects of discrimination. Perhaps similar to psychological buffers, like ethnic identity (Greene et al. 2006), good quality sleep helps to dampen the detriments of discrimination. Specifically, it has been suggested that sleep promotes youth's capacity to regulate negative emotions related to stress (El-Shiekh and Kelly 2011; Keller et al. 2008), a theory supported by the current data. To our knowledge, this is one of

the first studies to explore the possible protective functions of sleep quality for the effects of ethnic/racial discrimination on psychosocial outcomes. The data suggest that sleep may be a useful avenue for targeting preventive interventions to mitigate the effects of ethnic/racial discrimination on youth outcomes.

Similarly, poor sleep quality without high levels of discrimination was also associated with relatively high levels of depressive symptoms. While poor sleep quality has been found to be related to increased depressive feelings and negative affect (Beatty et al. 2011; Haack and Mullington 2005; Hamilton et al. 2007; Wolfson and Richards 2011), most studies exploring this link have investigated much shorter time lags between sleep and depressive symptoms. Similar to the patterns observed for the effects of discrimination on subsequent depressive symptoms, the independent effects of sleep disturbance on depressive symptoms may be a more proximal process whose influence does not predict future outcomes. Indeed, recent daily diary research among adolescents has found that sleep disturbance predicts next day depressive mood (Huynh and Fuligni 2010). Relatedly, it is important to consider the difference between chronic versus acute sleep disturbance (Dahl and Lewin 2002). Since the current study only measured sleep at one time point, more longitudinal data is required before we can ascertain if the one-week sample here is indicative of the former or the latter. Interestingly, the same adolescents reported modest increases in self-esteem over time, although the mean levels of self-esteem were relatively low. It is possible that, while it may contribute to mental health indicators such as depressive symptoms, low sleep quality may be less likely to influence more stable characteristics such as self-construal.

Finally, adolescents who were hypothesized to show optimal outcomes, the low discrimination and low sleep quality, did indeed report the lowest levels of depressive symptoms and the highest increase in self-esteem over time. This observation is wholly in line with a risk and resilience framework such that these adolescents reported the lowest risk and the highest resilience resources. Although not a central focus of this study, it is not likely that these adolescents have no experiences with risk and resilience; however, they reported low levels of risk in both areas of sleep and discrimination as measured in the current study.

Notably, the current study converges with existing research to find that sleep quality, not quantity, was associated with health outcomes. Although sleep quality and quantity were positively correlated in the current study, consistent with existing research with adult populations (Beatty et al. 2011; Hale et al. 2012; Lewis et al. 2012; Steffen and Bowden 2006), only the effects of sleep quality were observed to influence depressive symptoms. Why might this be? Experts have observed considerable variability in sleep quantity based on environmental factors, ambient temperature, and individual differences in genetics and circadian rhythms (Carskadon and Dement 2011). As such, the amount of sleep needed for optimal functioning varies from person to person, and within person, from one evening to the next. This inherent variability may make it more difficult to detect systematic differences attributable to sociocultural influences such as ethnic/racial discrimination. Sleep quality, on the other hand, tends to be more subjective; however, that very subjectivity may be better able to assess the more subtle nuances of sleep not typically captured by quantitative measures of sleep quantity. Furthermore, the effects of psychological health on sleep quantity may involve opposing patterns such that depression has been observed to be associated with increased sleep quantity for some, but decreased sleep quantity for others (Riemann et al. 2001). As such, the divergent associations between sleep quantity and psychological adjustment may render it particularly difficult to tease apart a stable relationship between the two variables over time. Indeed, given these difficulties, some have argued that sleep quality may be a more accurate measure of sleep in relation to health outcomes (Krystal and Edinger 2008). The observed importance of sleep quality for depressive symptoms identifies a potential avenue to mitigate the effects of ethnic/racial discrimination. While there may be less a clinician can do to influence experiences of discrimination, sleep treatments and interventions might help to mitigate the negative effects of discrimination on youth development. The current data suggest that sleep quality interventions not only could have an immediate influence on youth outcomes, but also could have the potential to influence development 1 and 2 years later.

While the current study represents an important contribution to the developmental literature on the effects of discrimination on youth health outcomes, additional considerations would benefit the continued growth of this literature. First, while the use of daily sleep self-reports provide more nuanced information compared to one-time measures of sleep, future research would benefit from exploring same-day, within-person associations between sleep (quality and quantity) and daily discrimination experiences. For example, to our knowledge, there are no studies to date that explore how daily sleep may moderate or mediate the daily-level effects of discrimination on daily mood. Analyses of this nature would provide important insight into the on-line associations between ethnic/racial discrimination, sleep, and psychological well-being. More importantly, these studies would serve to complement existing research observing between-person mediation effects (Thomas et al. 2006; Tomfohr et al. 2012).

Specifically, as observed in the literature on adults, it is possible that daily sleep disturbances would serve to mediate the association between discrimination and subsequent psychological adjustment outcomes (Thomas et al. 2006; Tomfohr et al. 2012). Unfortunately, since discrimination and sleep disturbance were measured concurrently, mediated pathways could not be tested reliably in the current study. In addition, despite being a common method for assessing sleep quantity and quality, the current study employed only a single, self-report item to measure sleep quality and another to measure sleep quantity (Krystal and Edinger 2008). Building upon existing research, future research should combine diary techniques with actigraphy wristbands to collect subjective and objective measures of daily sleep quality and quantity (Beatty et al. 2011; El-Sheikh et al. 2013). Finally, the current study was unable to adjust for concurrent levels of discrimination and sleep disturbance for all 3 years of the study since these variables were omitted from surveys beyond the first year. As such, we are unable to decipher how concurrent experiences of discrimination and sleep might be related to depression and self-esteem independent of the prospective analyses presented here. Based on existing research, which finds that both reports of ethnic/racial discrimination (Greene et al. 2006) and sleep disturbance (Carskadon 1990; National Sleep Association 2006) increase during the adolescent years, we would expect similar, if not stronger, patterns. In addition, sleep patterns are influenced by a host of factors such as environmental characteristics, genetics, caffeine intake, and sleep disorders (Carskadon and Dement 2011) and socioeconomic status (Buckhalt et al. 2007; Moore et al. 2002); which the current study does not explore. Future research would benefit from this consideration. As well, it is worth noting that the predominantly female sample places restrictions on the generalizability of the current study. In addition, while the adolescents in the current study were recruited from several schools, the final sample was not sufficient to conduct analytical models that partition the effects of school-level characteristics from individual-level ones. Analyses observing school-level differences in discrimination suggest that there may be systematic differences in the associations between discrimination and outcomes depending upon adolescent's school contexts. Finally, because ethnic identity has been observed to serve important moderating effects for the associations between stress and psychological adjustment (Yip et al. 2008; Yoo and Lee 2005), it is worth mentioning that the current study did not have sufficient power to consider additional moderating effects such as those potentially offered by differing levels of ethnic identity.

Conclusion

The current study illuminates how ethnic/racial discrimination, sleep and depressive symptoms are related over time. The study employs a risk and resilience framework to contribute to a developing literature on the role of discrimination and sleep for psychological health outcomes. Researchers have long recognized the importance of sleep for developmental outcomes (Carskadon et al. 1998; Wolfson and Carskadon 2008), but have only recently applied this knowledge to studying the effects of ethnic/racial discrimination. In fact, research has begun to implicate sleep disturbance as a major cause of health and academic disparities among racial/ethnic minority adolescents (Dewald et al. 2010; Wolfson and Carskadon 2008). Census projections for the next three decades suggest that ethnic/racial minorities will soon occupy a numerical majority in the United States (Bureau 2012). These shifting demographics will likely change the nature and consequences of ethnic/racial discrimination for youth of all backgrounds, highlighting the need to identify risk and protective factors in diverse populations.

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References

Akerstedt, T., & Gillberg M. (1981). The circadian pattern of unrestricted sleep and its relation to body temperature, hormones, and alertness. In *Biological rhythms, sleep and shift work* (pp. 481–498).

Beatty, D. L., Hall, M. H., Kamarck, T. A., Buysse, D. J., Owens, J. F., Reis, S. E., et al. (2011). Unfair treatment is associated with poor sleep in African American and Caucasian adults: Pittsburgh SleepSCORE project. *Health Psychology, 30*(3), 351–359. doi:10.1037/a0022976.

Branscombe, N., Schmitt, M., & Harvey, R. (1999). Perceiving pervasive discrimination among African Americans: Implications for group identification and well-being. *Journal of Personality and Social Psychology, 77*, 135–149.

Breslau, N., Roth, T., Rosenthal, L., & Andreski, P. (1996). Sleep disturbance and psychiatric disorders: A longitudinal epidemiological study of young adults. *Biological Psychiatry, 39*(6), 411–418.

Bryk, A. S., & Raudenbush, S. W. (1992a). *Hierarchical linear models for social and behavioral research: Applications and data analysis methods*. Newbury Park, CA: Sage Publications Inc.

Bryk, A. S., & Raudenbush, S. W. (1992b). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage Publications Inc.

Bub, K. L., Buckhalt, J. A., & El-Sheikh, M. (2011). Children's sleep and cognitive performance: A cross-domain analysis of change over time. *Developmental Psychology, 47*(6), 1504.

Buckhalt, J. A., El-Sheikh, M., & Keller, P. (2007). Children's sleep and cognitive functioning: Race and socioeconomic status as moderators of effects. *Child Development, 78*(1), 213–231.

Bureau, United States Census. (2012). U.S. Census bureau projections show a slower growing, older, more diverse nation a half century from now. Retrieved March 15 2013.

Carskadon, M. A. (1990). Patterns of sleep and sleepiness in adolescents. *Pediatrician, 17*(1), 5–12.

Carskadon, M. A., & Dement, W. C. (2011). Monitoring and staging human sleep. In M. H. Kryger, T. Roth, & W. C. Dement (Eds.), *Principles and practice of sleep medicine* (pp. 16–26). St. Louis: Elsevier Saunders.

Carskadon, M. A., Wolfson, A. R., Acebo, C., Tzischinsky, O., & Seifer, R. (1998). Adolescent sleep patterns, circadian timing, and sleepiness at a transition to early school days. *Sleep, 21*, 871–881.

Dahl, R. E. (1996). The regulation of sleep and arousal: Development and psychopathology. *Development and Psychopathology, 8*, 3–27.

Dahl, R. E. (1999). The consequences of insufficient sleep for adolescents. *Phi Delta Kappan*, *80*(5), 354–359.

Dahl, R. E., & Lewin, D. S. (2002). Pathways to adolescent health sleep regulation and behavior. *Journal of Adolescent Health*, *31*(6), 175–184.

Dewald, J. F., Meijer, A. M., Oort, F. J., Kerkhof, G. A., & Bögels, S. M. (2010). The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review. *Sleep Medicine Reviews, 14*(3), 179–189.

El-Sheikh, M., Bub, K. L., Kelly, R., & Buckhalt, J. A. (2013). Children's sleep and adjustment: A residual change analysis. *Developmental Psychology, 49*(8), 1591–1601.

El-Sheikh, M., & Buckhalt, J. A. (2005). Vagal regulation and emotional intensity predict children's sleep problems. *Developmental Psychobiology*, *46*(4), 307–317.

El-Sheikh, M., & Kelly, R. J. (2011). Sleep in children: Links w marital conflict and child development. In M. El-Sheikh (Ed.), *Sleep and development: Familial and socio-cultural considerations* (pp. 3–28). Oxford: New York, NY.

Ford, D. E., & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders. *JAMA: The Journal of the American Medical Association*, *262*(11), 1479–1484.

Gee, G. C., Spencer, M., Chen, J., Yip, T., & Takeuchi, D. T. (2007). The association between self-reported racial discrimination and 12-month DSM-IV mental disorders among Asian Americans nationwide. *Social Science and Medicine, 64*(10), 1984–1996. doi:10.1016/j.socscimed.2007.02.013.

Greene, M. L., Way, N., & Pahl, K. (2006). Trajectories of perceived adult and peer discrimination among black, latino and asian american adolescents: Patterns and psychological correlates. *Developmental Psychology, 42*(2), 218–238.

Haack, M., & Mullington, J. M. (2005). Sustained sleep restriction reduces emotional and physical well-being. *Pain*, *119*(1), 56–64.

Hale, Lauren, Hill, Terrence D., Friedman, Elliot, Nieto, F., Javier, Galvao, Loren, W., et al. (2012). Perceived neighborhood quality, sleep quality, and health status: Evidence from the survey of the Health of Wisconsin. *Social Science & Medicine, 79*, 16–22.

Hamilton, N. A., Nelson, C. A., Stevens, N., & Kitzman, H. (2007). Sleep and psychological well-being. *Social Indicators Research, 82*(1), 147–163.

Harrell, S. P. (2010). A multidimensional conceptualization of racism, Äêrelated stress: Implications for the well, Äêbeing of people of color. *American Journal of Orthopsychiatry, 70*(1), 42–57.

Keller, P. S., El-Sheikh, M., & Buckhalt, J. A. (2008). Children's attachment to parents and their academic functioning: Sleep disruptions as moderators of effects. *Journal of Developmental & Behavioral Pediatrics*, *29*(6), 441–449.

Krystal, A. D., & Edinger, J. D. (2008). Measuring sleep quality. *Sleep Medicine, 9*(Supplement 1), S10–S17.

Leotta, C., Carskadon, M. A., Acebo, C., Seifer, R., & Quinn, B. (1997). Effects of acute sleep restriction on affective response in adolescents: Preliminary results. *Sleep Research*, *26*, 201.

Lewis, T. T., Troxel, W. M., Kravitz, H. M., Bromberger, J. T., Matthews, K. A., & Hall, M. H. (2012). Chronic exposure to everyday discrimination and sleep in a multiethnic sample of middle-aged women. *Health Psychology,*. doi:10.1037/a0029938.

Matsen, A. S., Best, K. M., & Garmezym, N. (1991). Resilience and development: Contributions from the study of children who overcome adversity. *Development and Psychopathology, 2*, 425–444.

Meerlo, P., Sgoifo, A., & Suchecki, D. (2008). Restricted and disrupted sleep: Effects on autonomic function, neuroendocrine stress systems and stress responsivity. *Sleep medicine reviews*, *12*(3), 197–210.

Miller, G. E., Cohen, S., & Ritchey, A. K. (2002). Chronic psychological stress and the regulation of pro-inflammatory cytokines: A glucocorticoid-resistance model. *Health Psychology, 21*(6), 531.

Mindell, Jodi A., Meltzer, Lisa J., Carskadon, Mary A., & Chervin, Ronald D. (2009). Developmental aspects of sleep hygiene: findings from the 2004 National Sleep Foundation Sleep in America Poll. *Sleep medicine, 10*, 771–779.

Moore, P. J., Adler, N. E., Williams, D. R., & Jackson, J. S. (2002). Socioeconomic status and health: The role of sleep. *Psychosomatic Medicine, 64*(2), 337–344.

NS Association. (2006). *2006 sleep in America poll*. Washington, DC: National Sleep Association.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385–401.

Raudenbush, S. W., Spybrook, J., Congdon, R., Liu, X., Martinez, A., Bloom, H., & Hill, C. (2011). Optimal design software for multilevel and longitudinal research (version 3.01). http://www.wtgrantfoundation.org: William T. Grant Foundation.

Riemann, D., Berger, M., & Voderholzer, U. (2001). Sleep and depression—results from psychobiological studies: An overview. *Biological Psychology, 57*(1), 67–103.

Rosenberg, M. (1986). *Conceiving the self*. Melbourne, FL: Kreiger.

Rutter, M. (1993). Psychosocial resilience and protective mechanisms. In J. Rolf, A. S. Masten, & D. Cicchetti (Eds.), *Risk and protective factors in the development of psychopathology* (pp. 181–214). Cambridge: Cambridge University Press.

Rutter, M. (1999). Resilience concepts and findings: Implications for family therapy. *Journal of family therapy*, *21*(2), 119–144.

Schmitt, M. T., Branscombe, N. R., Postmes, T., & Garcia, A. (2014). The consequences of perceived discrimination for psychological well-being: A Meta-analytic review. *Psychological Bulletin*. doi:10.1037/a0035754.

Seaton, E. K., Caldwell, C. H., Sellers, R. M., & Jackson, J. S. (2008). The prevalence of perceived discrimination among African American and Caribbean Black youth. *Developmental Psychology*, *44*(5), 1288.

Seaton, E. K., Neblett, E. W., Upton, R. D., & Hammond, W. P. (2011). The moderating capacity of racial identity between perceived discrimination and psychological well-being over time among African American youth. *Child Development, 82*(6), 1850–1867.

Shacham, R. (2009). A utility for exploring HLM 2 and 3-way interactions [Computer software].

Shaver, J. L., & Paulsen, V. M. (1993). Sleep, psychological distress, and somatic symptoms in perimenopausal women. *Family Practice Research Journal*, *13*(4), 373–384.

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *State-trait anxiety inventory*. Palo Alto, California: Consulting Psychologists Press.

Steffen, P. R., & Bowden, M. (2006). Sleep disturbance mediates the relationship between perceived racism and depressive symptoms. *Ethnic Groups, 5*(6), 8–11.

Thomas, K. S., Bardwell, W. A., Ancoli-Israel, S., & Dimsdale, J. E. (2006). The toll of ethnic discrimination on sleep architecture and fatigue. *Health Psychology, 25*(5), 635–642. doi:10.1037/0278-6133.25.5.635.

Tomfohr, L., Pung, M. A., Edwards, K. M., & Dimsdale, J. E. (2012). Racial differences in sleep architecture: The role of ethnic discrimination. *Biological Psychology, 89*(1), 34–38. doi:10.1016/j.biopsycho.2011.09.002.

Torres, L., & Ong, A. D. (2010). A daily diary investigation of latino ethnic identity, discrimination, and depression. *Cultural Diversity and Ethnic Minority Psychology, 16*(4), 561.

Umaña-Taylor, A. J., & Updegraff, K. A. (2007). Latino adolescents' mental health: Exploring the interrelations among discrimination, ethnic identity, cultural orientation, self-esteem, and depressive symptoms. *Journal of Adolescence, 30*(4), 549–567.

Wei, M., Ku, T.-Y., Russell, D. W., Mallinckrodt, B., & Liao, K. Y.-H. (2008). Moderating effects of three coping strategies and self-esteem on perceived discrimination and depressive symptoms: A minority stress model for Asian international students. *Journal of Counseling Psychology*, *55*(4), 451.

Williams, D. R., Neighbors, H. W., & Jackson, J. S. (2008). Racial/ethnic discrimination and health: Findings from community studies. *American Journal of Public Health, 98*(Suppl 9), S29–S37.

Wolfson, A. R., & Carskadon, M. A. (2008). Sleep schedules and daytime functioning in adolescents. *Child Development, 69*(4), 875–887.

Wolfson, A. R., Richards, M., & El-Sheikh, M. (2011). *Young adolescents. Sleep and development familial and socio-cultural considerations* (pp. 265–298). Oxford University Press.

Wong, C. A., Eccles, J. S., & Sameroff, A. (2003). The influence of ethnic discrimination and ethnic identification on African American adolescents' school and socioemotional adjustment. *Journal of Personality, 71*(6), 1197–1232.

Yip, T., Gee, G. C., & Takeuchi, D. T. (2008). Racial discrimination and psychological distress: The impact of ethnic identity and age among immigrant and United States-born Asian adults. *Developmental Psychology, 44*(3), 787–800. doi:10.1037/0012-1649.44.3.787.

Yoo, H. C., & Lee, R. M. (2005). Ethnic identity and approach-type coping as moderators of the racial discrimination/well-being relation in Asian Americans. *Journal of Counseling Psychology, 52*(4), 497.

Tiffany Yip is an Associate Professor at Fordham University. She received her doctorate in Community Psychology with concentrations in Developmental and Quantitative methods from New York University. Her major research interests include: ethnic identity development, psychological outcomes, discrimination, context and sleep.