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Low Childhood Subjective Social Status and Telomere Length in Adulthood: The Role of Attachment Orientations

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Abstract

Low subjective social status (SSS) in childhood places one at greater risk of a number of health problems in adulthood. Theoretical and empirical evidence indicates that exposure to supportive parenting may buffer the negative effects of low childhood SSS on adult health. Given the importance of supportive caregivers and close others for the development of attachment orientations throughout the lifespan, attachment theory may be important for understanding why some individuals are resilient to the negative effects of low childhood SSS on adult health while others are not. We examined if attachment anxiety and attachment avoidance altered the association between childhood subjective social status (SSS) and length of telomeres in white blood cells in adulthood. Shorter telomere length is associated with increased risk of age-related diseases including cancer, type 2 diabetes, and cardiovascular disease. Participants (N = 128) completed self-report measures of childhood SSS and attachment orientations, as well as a blood draw. We found that among those with low childhood SSS, low attachment anxiety was associated with longer telomere length in white blood cells in comparison to high attachment anxiety controlling for participant age, sex, race, body mass index, and adult SSS. Among those with high childhood SSS, low attachment anxiety was associated with a slight decrease in telomere length. Attachment avoidance was unrelated to length of telomeres. Such findings provide further evidence for the role that close relationships may have on buffering SSS related health disparities.

Keywords

subjective social status; childhood; close relationships; attachment orientations; telomere length

Low childhood socioeconomic status (SES) is a reliable predictor of poor health in adulthood (e.g., Cohen, Janicki-Deverts, Chen, & Matthews, 2010). As a result, those from

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low childhood SES backgrounds are expected to live shorter lives than their higher SES counterparts (Braveman, Cubbin, Egerter, Williams, & Pamuk, 2010; Pudrovska, 2014); however, not all individuals from low SES backgrounds experience negative health outcomes (Chen & Miller, 2012). An improved understanding of the mechanisms of resilience among those from low childhood SES backgrounds is important for enhancing prevention efforts. In the present study, we examined if attachment security buffered the negative effects of low childhood subjective social status (SSS; i.e., an individual's sense of their mother's and/or father's standing in in the social ladder which accounts for wealth, education, and respect associated with their occupation) on length of telomeres.

The evidence on the relation between childhood SSS and telomere length is inconsistent. While several recent studies are supportive of the association (Cohen et al., 2013; Puterman et al., 2016), an early meta-analysis found no relation (see Robertson et al., 2012). Developing a better understanding of the conditions under which childhood SSS is associated with telomere length is important given that telomere length is an indicator of cellular aging. Indeed, chromosomes are capped by telomeres or repetitive sequences of nucleotides that reduce chromosomal deterioration (Barrett et al., 2015). Known as the "end replication problem," telomeres slowly become shorter due to cell division (Chen et al., 2011). Stress can accelerate the shortening of telomeres (Mathur et al., 2016). Shorter telomeres are associated with increased risk of age-related cancers (Wentzensen et al., 2011), cardiovascular disease (Haycock et al., 2014), and type 2 diabetes (Zhao et al., 2013). Accordingly, research examining psychological links with telomere length has potential implications for our understanding of the development of many of the leading causes of early mortality.

Attachment orientations are represented along the dimensions of attachment anxiety and attachment avoidance (Mikulincer & Shaver, 2007). Unsupportive and unresponsive parenting can lead to high attachment anxiety and avoidance (Mikulincer & Shaver, 2009). Those with high attachment anxiety tend to worry about being rejected or abandoned and utilize ineffective emotion regulation strategies (e.g., rumination; Brennan, Clark, & Shaver, 1998). Moreover, individuals high in attachment avoidance are uncomfortable relying on others for support and utilize "deactivating" emotion regulation strategies that inhibit/suppress distressing experiences (Brennan et al., 1998; Fraley & Shaver, 2000). Importantly, there is strong evidence that the same individual differences in attachment orientations that are identified in caregiver-child relationships also characterize attachment orientations towards others in adulthood (Chopik et al., 2013; Hazan & Shaver, 1987). Both high attachment anxiety and avoidance are associated with increased stress (Simpson & Rholes, 2012); however, attachment anxiety is more reliably associated with stress in comparison to attachment avoidance (Dewitte et al., 2010).

As attachment orientations are associated with the regulation of stress, low attachment anxiety and avoidance may provide a buffer against the negative effects of low childhood SSS on adult health. That is, those with supportive caregivers who develop secure attachment styles may be able to appropriately regulate the stressors associated with low childhood SSS. Alternatively, high attachment anxiety and avoidance may enhance the risk associated with low childhood SES on health due to the use of ineffective emotion regulation

strategies that promote stress. Prior research has demonstrated that low childhood SSS and attachment orientations are interrelated predictors of adult health (Murdock & Fagundes, 2017); however, attachment orientations have not been examined as potential factors that may change the association between childhood SSS and adult telomere length. We examined this possibility in the present study and hypothesized that childhood SSS would be less strongly associated with telomere length among those with low attachment anxiety and avoidance.

Methods

Participants and Procedure

The data derive from the Pittsburgh Common Cold Study 3 and were collected by the Laboratory for the Study of Stress, Immunity, and Disease at Carnegie Mellon University under the directorship of Sheldon Cohen, PhD; and were accessed via the Common Cold Project website (www.commoncoldproject.com; grant number NCCIH AT006694). Healthy individuals from the Pittsburgh, Pennsylvania area were recruited for the study via local newspaper advertisements between 2008–2011. The study was approved by the Carnegie Mellon University and University of Pittsburgh Institutional Review Boards. All participants ($N = 128$) provided informed consent prior to completing the self-report measures described below and a blood draw. The full sample included 152 participants; however, we removed individuals who did not have their telomere length measured, a conservative approach for statistical analyses. There were no significant differences between those who had telomere length measured and those who did not in regards to age ($t = -1.18$, $p = .24$), sex ($t = 0.24$, $p = .98$), or race/ethnicity ($t = .05$, $p = .98$). Participants were compensated with $1,000 for completing the full study (see Cohen et al., 2013).

Measures

Subjective social status—Childhood and adult SSS were measured using the MacArthur Scale of Subjective Social Status USA ladder version (Adler, Epel, Castellazzo, & Ickovics, 2000). To measure childhood SSS, participants were asked to separately indicate their mother's and father's social status during the period in which they were children and adolescents on an illustration of a nine step ladder in which the top step represents those with the most education, money, and respected jobs, while the bottom step of the ladder represents those with the least education, money, and respected jobs. Participants were instructed to place an "X" on the step of the ladder that best represented their parents' position. Scores range from 1 (lowest status) to 9 (highest status) on the MacArthur Scale of Subjective Social Status USA ladder version. Ratings for mothers and fathers were averaged to form an overall indicator of childhood SSS. Participants were also asked to indicate their current SSS using the same measure. The Scale of Subjective Social Status has demonstrated acceptable psychometric properties (Operario, Adler, & Williams, 2001) and subjective social status is significantly correlated with objective indicators of SES such as education history, income, and employment status (e.g., Adler, Epel, Castellazzo, & Ickovics, 2000; Goodman, Adler, Kawachi, Frazier, Huang, & Colidtz, 2001).

Attachment orientations—Participants completed the Experiences in Close Relationships Scale (ECR)-short form (Wei et al., 2007) as a measure of attachment anxiety and attachment avoidance. The ECR-short form is a 12-item measure in which six items measure each attachment dimension. Items are characterized by participants responding by indicating the degree to which statements (e.g., "I am uncomfortable being close to people.") are true for them on a scale ranging from 1 (disagree strongly) to 7 (agree strongly). Internal reliability in the present study was good for both attachment anxiety (α = .83) and attachment avoidance (α = .90).

Telomere length—Telomere length in white blood cells (peripheral blood mononuclear cells [PBMCs]) was assessed in whole blood collected into three 15 ml heparinized tubed by standard venipuncture. The Ficoll-Paque™ PLUS protocol (Cat# 17-1440-03, Amersham Biosciences, Pittsburgh, PA; see Cohen et al., 2013) was utilized to separate PBMCs from serum. Standard curves and dilution factors for telomere (T) and single-copy gene (S) were calculated using Applied Biosystems SDS software to calculate a T/S ratio (see O'Callaghan et al., 2008). All samples were run in duplicate and replicate values were averaged to determine a final T/S ratio.

Demographics—Participants provided self-reports of their age, sex, and race/ethnicity. Height and weight were measured in order to calculate a body mass index (BMI).

Emotional stability—The 10-item emotional stability subscale of the International Personality Item Pool (Goldberg et al., 2006) was completed by participants and utilized as a covariate in ancillary analyses. For each item, participants were asked to indicate the extent to which various phrases were accurate about how they are generally or typically (e.g., "am relaxed most of the time) on a scale ranging from 1 (very inaccurate) to 5 (very accurate). Internal reliability for the subscale was good in the current sample (α = .89).

Self-esteem—Participants completed the self-acceptance and environmental mastery subscales from the Ryff Scales of Psychological Well-Being (Ryff, 1989), which were utilized as covariates in ancillary analyses. Each subscale is comprised of 9 items in which participants are asked to indicate the extent of their agreement with statements about themselves (e.g., "In general, I feel I am in charge of the situation in which I live) on a scale ranging from (1) strongly disagree to (6) strongly agree. Internal reliability was acceptable for the self-acceptance subscale (α = .74) and good for the environmental mastery (α = .80) subscale in the present study.

Analytic Strategy

SPSS statistical software (IBM, 2012) was utilized to perform all analyses. Linear regressions were run to examine attachment dimensions as moderators of the association between childhood SSS and telomere length in adulthood using the Process macro (Hayes, 2013). We adjusted for participant age, sex, race, body mass index, and adult SSS. Emotional stability and indicators of self-esteem (i.e., self-acceptance and environmental mastery) were added as covariates in ancillary analyses given that such constructs correlate with SSS (Alfonsi et al., 2011; Gruenewald et al., 2006). Furthermore, we controlled for

attachment avoidance in analyses evaluating the role of attachment anxiety and vice-versa. Variables were mean-centered for the calculation of interaction terms.

Results

Descriptive statistics for study variables are presented in Table 1. Approximately 58.55% of participants reported male sex and the majority of participants (70.40%) reported being non-Hispanic White. Bivariate correlations revealed that higher childhood SSS was associated with lower attachment anxiety ($r = -.17$, $p = .04$) and higher current SSS ($r = .37$, $p < .001$). Higher attachment anxiety was associated with higher attachment avoidance ($r = .46$, $p < .001$) and female sex ($r = .16$, $p = .05$). Higher BMI was associated with shorter telomeres ($r = -.19$, $p = .04$). All other associations among primary study variables were non-significant (see Table 1).

Using linear regression analyses, childhood SSS was not significantly associated with adult telomere length; however, there was an interaction between childhood SSS and attachment anxiety in predicting telomere length (R^2 change = .057, $p = .013$; see Table 2 and Figure 1). Using the Johnson-Neyman technique to identify areas of significance (Johnson & Fay, 1950), it was determined that low childhood SSS was associated with longer adult telomere length if attachment anxiety was below 14.33, representing 17.19% of the sample. Low childhood SSS was associated with shorter adult telomere length if attachment anxiety was at or above 30.33, representing 12.50% of the sample. The interaction between childhood SSS and attachment avoidance was not significantly associated with length of telomeres as shown in Table 2. In ancillary analyses which added emotional stability and indicators of self-esteem as additional covariates, the interaction between childhood SSS and attachment anxiety remained significant in predicting adult telomere length ($b = 004$, $p = .006$).

Discussion

Present study results indicate that low attachment anxiety may be protective against the negative health problems associated with low childhood SSS. Moreover, high childhood SSS was associated with longer adult telomeres if attachment anxiety was high. Such findings provide further evidence supporting psychobiological connections between childhood environments, close relationships, and adult health (Pietromonaco, Uchino, & Dunkel-Schetter, 2013). Prior work has demonstrated that those from low childhood SES backgrounds who were exposed to nurturing mothers had a reduced risk of negative health outcomes (Evans, Kim, Ting, Tesher, & Shannis, 2007; Miller et al., 2011). Nurturing/sensitive parenting is associated with children having more secure attachment orientations (Cassidy, Jones, & Shaver, 2013; Fraley, Roisman, Booth-LaForce, Owen, & Holland, 2013), indicating that there may be interrelated effects of nurturing/sensitive parenting and attachment orientations on later health outcomes.

Individual differences in emotion regulation (i.e., the process by which individuals influence emotions, either automatic or controlled) may be a mechanism linking childhood SSS, attachment anxiety, and telomere length. Indeed, prior work indicates that attachment anxiety is associated with self-reported health via stress (Murdock & Fagundes, 2017).

Individuals with high attachment anxiety tend to engage in ineffective emotion regulation strategies, such as rumination, due to worry about being rejected or abandoned (Brennan et al., 1998). Low childhood SES is also associated with poor stress regulation (Kim et al., 2013), highlighting the potential interplay between childhood SES, attachment anxiety, and emotion regulation in predicting adult health outcomes. Accordingly, future work would benefit from examining the role of emotion regulation, and associated physiological responses, in order to generate a further understanding of our findings. For example, attachment anxiety is associated with cortisol production and cellular immunity (Jaremka et al., 2013), both of which are related to telomere length (Gotlib et al., 2015; Hohensinner, Goronzy, & Weyand, 2011). Attachment avoidance is less reliably associated with stress and health as compared to attachment anxiety (Dewitte et al., 2010; Fagundes, 2012), which is consistent with present study findings. Notably, high attachment avoidance appears to be associated with high stress when respiratory sinus arrhythmia (RSA) is low, but not when RSA is high (Murdock & Fagundes, 2017). RSA is an indicator of the degree to which one is able to engage in effective emotion regulation (e.g., Segerstrom & Nes, 2007). As a result, attachment avoidance may be associated with stress and health under certain conditions that were not evaluated in the present study. Future work should aim to address when attachment avoidance may be associated with telomere length given one's socioeconomic history.

Those who are able to engage in "shift-and-persist" strategies are at lower risk of negative health outcomes due to reduced stress (Chen & Miller, 2012). Shift strategies include acceptance, and/or reappraisal, of stressful situations. Persist strategies include finding meaning, having optimism, and endurance towards accomplishing one's goals. The presence of a stable positive role model who helps the child develop a secure attachment is theorized to promote engagement in shift-and-persist strategies (Chen & Miller, 2012). This "working model" of security is also theorized to shape the quality of subsequent close relationships in adolescence and adulthood (Chopik, Edelstein, & Fraley; Diamond & Fagundes, 2008; Fagundes, Bennett, Derry, & Kiecolt-Glaser, 2011). Present study findings indicate that those who have low attachment anxiety who are also from low SSS backgrounds may be resilient to negative health outcomes, even when compared to high SSS counterparts, perhaps in part due to a keen ability to regulate emotions in stressful circumstances. Future work would benefit from examining the shift-and-persist hypothesis for explaining findings identified in the present study.

Present study results highlight the early environment as a critical period shaping adult health. Indeed, findings were unique to the childhood years given that current SSS was included as a covariate. Recent evidence indicates that family-based training programs may improve outcomes for low SES children (Neville et al., 2013). Specifically, exposure to a training program that included teaching parents to be more responsive, consistent, and predictable was associated with improved cognitive and behavioral outcomes in children. As inconsistent parenting contributes to the development of high attachment anxiety (Ainsworth, Blehar, Waters, & Wall, 1978), it would be interesting to evaluate if family-based training programs are associated with lower attachment anxiety and reduced risk of health problems in adulthood.

The present study is limited by the predominantly non-Hispanic White sample. It will be important to examine associations between childhood SSS, attachment orientations, and telomere length in more diverse populations in future studies. Ethnic differences in cellular immunity, an important correlate of telomere length, have been identified in prior work (Dowd, Zajacova, & Aiello, 2010; Ford & Stowe, 2013). We assessed attachment orientations and telomeres cross-sectionally, which could be viewed as a limitation; however, given that stress and attachment orientation can be fluid based on people's current relationships status (Simpson, Rholes, Campbell, & Wilson, 2003) and evidence that telomeres are slow to change (Chen et al., 2011), a longitudinal investigation over many years would not address present study hypotheses. It is possible, however, to examine changes in telomerase before and after an event as telomerase supports regulation of the telomere structure and is more susceptible to acute changes (Xie et al., 2015). Future research efforts should be devoted to examining this possibility. Furthermore, the present study relied on self-report measures of childhood SSS and attachment orientations and future work may benefit from incorporating objective indicators of SES and utilizing other indicators of attachment such as the Adult Attachment Interview (see Kaplan & Main, 1985).

Conclusions

Present study findings are consistent with prior work indicating that exposure to supportive/nurturing parenting among those from low childhood SSS environments may be protected from negative outcomes. Specifically, we found that low attachment anxiety was associated with longer telomeres among individuals from low childhood SSS backgrounds. Such findings are important for improving our understanding of the psychological links between low childhood SSS and poor adult health as to inform advocacy, prevention, and intervention strategies.

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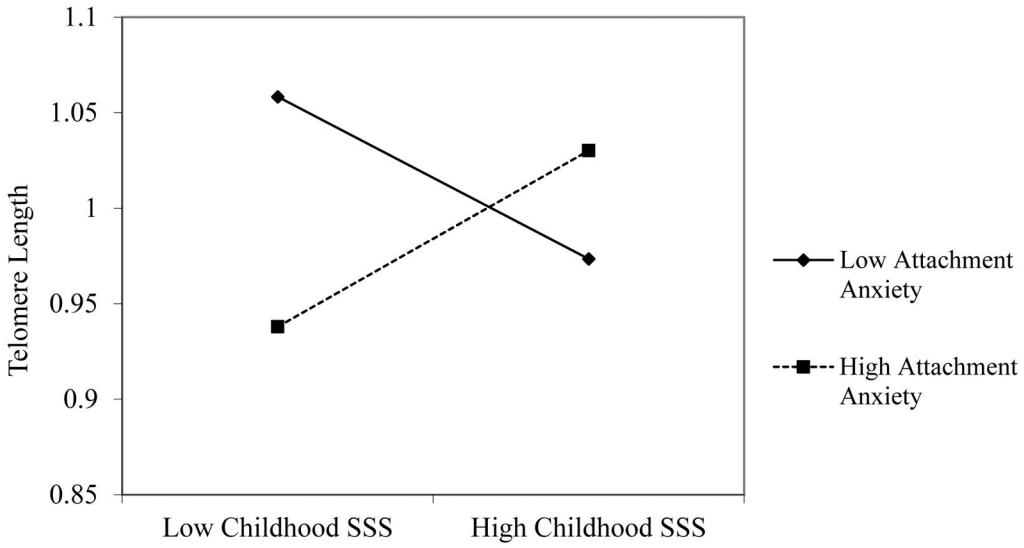

Figure 1.

Telomere length at low (-1 SD) and high (+1 SD) early-life subjective social status and attachment anxiety.

Table 1

Descriptive statistics and zero-order correlations between study variables.

Variable	Mean (SD)	1	2	3	4	5	6	7	8
1. Childhood SSS	5.21 (1.92)	--							
2. Attachment anxiety	21.50 (7.95)	− .08	--						
3. Attachment avoidance	17.27 (7.94)	.04	.44**	--					
4. Telomere length (T/S)	0.82 (0.22)	.04	− .11	− .04	--				
5. Age	29.92 (10.71)	.12	− .05	− .12	− .17	--			
6. Sex	--	.01	.13	− .12	− .08	.17	--		
7. Ethnicity	--	.11	.15	.06	− .07	− .15	− .11	--	
8. Body mass index	26.46 (5.69)	.05	− .04	− .03	− .19*	.40**	.05	− .21*	--
9. Current SSS	4.17 (1.84)	.37**	− .05	− .06	.16	.15	.15	.03	.04

Note. SSS = subjective social status. Sex coded as 0 = male, 1 = female; Ethnicity codes as 0 = non-Hispanic White, 1 = other.

* $p < .05$.

** $p < .01$.

Table 2

Linear regression analyses of childhood subjective social status, attachment orientations, and their interaction in predicting telomere length in adulthood.

Predictors	b	SE	p	95% CI
Childhood SSS	.001	.012	.982	− .025, .024
Attachment anxiety	− .002	.002	.422	− .006, .003
Childhood SSS × attachment anxiety	.003	.001	.013	.001, .005
Age	− .003	.002	.136	− .006, .001
Sex	− .042	.039	.279	− .118, .034
Race/ethnicity	− .054	.041	.189	− .136, .027
Body mass index	− .005	.003	.115	− .012, .001
Adult SSS	.024	.010	.020	.004, .044
F	2.121			
df	(8, 119)			
R^2	.167			
ΔR^2	.057			
Childhood SSS	.001	.012	.928	− .023, .025
Attachment avoidance	− .001	.002	.676	− .005, .004
Childhood SSS × attachment avoidance	.001	.001	.626	− .002, .003
Age	− .003	.002	.141	− .006, .001
Sex	− .048	.039	.217	− .125, .029
Race/ethnicity	− .058	.041	.159	− .139, .023
Body mass index	− .005	.003	.122	− .012, .001
Adult SSS	.024	.010	.023	.003, .062
F	2.063			
df	(8, 119)			
R^2	.109			
ΔR^2	.002			

Note. SSS = subjective social status; Sex coded as 0 = male, 1 = female; Race coded as 0 = non-White, 1 = White.