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Justice for All? Beliefs About Justice for Self and Others and Telomere Length in African Americans

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Objective: Believing in justice can protect health. Among marginalized racial minorities however, both endorsing and rejecting beliefs about justice might be critical. The current research examined links between African Americans' beliefs about justice for self and for others and telomere length (TL)—an indicator of biological aging that is increasingly implicated in racial health disparities, with shorter telomeres indicating poorer health. ***Method:*** Healthy African Americans ($N = 118$; 30% male; M age = 31.63 years) completed individual differences measures of justice beliefs for self and others and then provided dried blood spot samples that were assayed for TL. ***Results:*** We expected that a belief in justice for self would be positively associated with TL, whereas a belief in justice for others would be negatively associated. A significant 3-way interaction with chronological age confirmed this hypothesis—among older African Americans, TL was positively associated with believing in justice for self, but only when this belief was accompanied by a weak endorsement of the belief in justice for others. ***Conclusion:*** Findings underscore that for racial minorities, health might be best protected when justice beliefs are both endorsed and rebuffed.

Keywords: justice, telomere length, health disparities, African Americans

Psychosocial factors contribute to numerous racial and ethnic health disparities including cardiovascular disease, metabolic illness, and cancer (Major, Mendes, & Dovidio, 2013; Penner, Albrecht, Orom, Coleman, & Underwood, 2010; Williams & Jack-

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son, 2005). This influence persists even after accounting for structural and economic differences, such as exposure to harmful environments and access to health care (Institute of Medicine, 2003). Among behavioral scholars, a key area of interest concerns identifying the ways in which psychosocial factors "get under the skin" to affect racial health disparities. This encompasses understanding how individual differences affect health and well-being, including through moderating the effects of social context on biological processes.

The current research examined whether believing in justice is linked to a biological process that might fundamentally contribute to racial health disparities. Specifically, we examined links between African Americans' beliefs about justice for self and for others and telomere length (TL)—an indicator of biological aging that is increasingly implicated in racial health disparities through indicating susceptibility to age-related illnesses. A pervasive view in psychological and public health literatures is that believing in justice promotes health and well-being by affording protection against illness (Jackson, Kubzansky, & Wright, 2006; Kivimäki et al., 2005). Yet, the potential for believing in justice to uniquely impact racial minorities has only recently begun to receive attention. Our research was conducted with an eye toward an emerging literature that highlights a potential for justice beliefs to both prevent and promote wellness among racial minorities, depending on how such beliefs are contextualized (e.g., Major & Townsend, 2012). Furthermore, we consider that relationships between justice beliefs and TL might be evident in older African Americans, given that biological weathering processes gain momentum as individuals age, including telomere shortening (Clark, Anderson, Clark, & Williams, 1999; Geronimus, 1992; Jackson, Knight, & Rafferty, 2010).

Justice Beliefs and Illness Protection

Positive associations between perceptions of justice and health are largely attributed to the capacity of believing in justice to afford protection against illness (Elovainio, Kivimäki, & Vahtera, 2002; Jackson et al., 2006). Most evident are links between perceived fairness and better mental health, including indices of negative emotion such as depression (for review, Lucas & Wendorf, 2012). Justice perceptions might also protect physical health, as noted in a prospective association between perceived fairness and reduced incidence of cardiovascular illness (De Vogli, Ferrie, Chandola, Kivimäki, & Marmot, 2007; Kivimäki et al., 2005). Protective connections further include links to insomnia, metabolic risk (Greenberg, 2006; Levine, Basu, & Chen, 2016), and pain tolerance (McParland & Eccleston, 2013). Believing in justice might also aid in recovery from health-related misfortune, such as spinal cord injury (Monden, Trost, Scott, Bogart, & Driver, 2016).

Mechanistically, protective effects of believing in justice are thought to be transmitted through links to stress. Stress connections are empirically supported through studies linking perceived fairness to stress reactivity, including activation of the sympathetic adrenal-medullary axis (Tomaka & Blascovich, 1994; Vermunt & Steensma, 2003), the hypothalamic-pituitary-adrenal axis (Lucas, Hayman, Blessman, Asabigi, & Novak, 2016; Vermunt, Peeters, & Berggren, 2007), and the inflammatory stress response system (Lucas et al., 2016). Stress connections are also intertwined with health behavior, which might comprise an additional pathway linking justice beliefs to health and illness (Lucas, Alexander, Firestone, & Lebreton, 2008). Accompanying theory holds that evaluations of justice affect stress appraisal by directing individuals to consider both the threat value of an unfair event, and whether personal resources are adequate to cope with unfairness (Vermunt & Steensma, 2005).

Inconsistency, Individual Differences, and Implications for Racial Minority Health

Although believing in justice can protect health, the potential for racial differences in this relationship has only recently begun to receive attention (e.g., Major & Townsend, 2012). In turn, recent studies reveal a potential for cultural differences in connections between justice perceptions and health and well-being (e.g., Lucas, Kamble, Wu, Zhdanova, & Wendorf, 2016). A better understanding of cultural nuance might be critical to explicating how justice perceptions affect health disparities, especially to the extent that justice-related thoughts and emotions might be particularly salient among marginalized minorities. This includes African Americans, for whom justice-related evaluations might be prominent and reflective of both historical and ongoing experiences with social injustice (e.g., Hall, Hall, & Perry, 2016; Institute of Medicine et al., 2003). Justice evaluations are also intertwined with other known psychosocial predictors of health among African Americans, notably including perceived racism (Lucas et al., 2016; Lucas et al., 2016).

Presently, we consider a hitherto largely overlooked possibility suggested by recent literature that might be paramount to explicating the role of justice beliefs in racial health disparities—in addition to protective health effects of believing in justice, rejecting some forms of this belief might simultaneously confer salutogenic benefits for marginalized individuals, such as African Americans. Support for this parallel and seemingly paradoxical association can be gleaned from two literatures. First, inconsistency frameworks have gained momentum in highlighting that well-being is principally governed by the extent to which individual-level social expectations are concordant with actual social experience (Major & Townsend, 2012; Proulx, Inzlicht, & Harmon-Jones, 2012). With respect to justice, such models hold that concordance between one's justice beliefs and justice-related experiences, rather than a rote endorsement of justice, fundamentally determines physical and mental health. Inconsistency frameworks hold that among individuals who have experienced a high degree of hardship, concordance might be hindered by endorsing some beliefs that reflect justice. That is, although there might be broad health benefits from believing in some forms of justice, individuals whose lived experience reflects marginalization or hardship might also reap benefits from simultaneously rejecting some forms of this belief. That justice beliefs might be uniquely associated with health among African Americans is further buttressed by the weathering hypothesis (Geronimus, 1992), which holds that racial differences in chronic disease result from the qualitatively different life experiences, exposure to stressors, and access to coping resources. It follows that justice beliefs might portend cultural differences in compensatory coping strategies that reflect variation in lived experiences. In further support, recent research suggests that health effects of internalizing or repressing injustice-related emotions might indeed differ between African

Americans and White Americans (Assari, 2016; Assari & Lankarani, 2016).

A second area of theoretical support is provided by studies of individual differences, which highlight that justice beliefs are multidimensional (for reviews, Dalbert, 2009; Hafer & Sutton, 2016), and that simultaneously held justice beliefs might both positively and negatively affect health and wellness. One particularly important distinction separates one's general belief in justice (i.e., *justice for others*) from the belief that one personally gets what one deserves (i.e., *justice for self*). Beliefs about justice for self and others are conceptually and empirically distinguished in part by unique relationships with health and social attitudes; whereas personal justice beliefs are related to indices of health and well-being, general justice beliefs better predict measures of social callousness (e.g., Bègue & Bastounis, 2003; Lipkus, Dalbert, & Siegler, 1996; Sutton & Douglas, 2005; Sutton et al., 2008). However, recent studies show that general and personal justice beliefs might also simultaneously and divergently predict some forms of wellness. For example, whereas believing in justice for oneself is positively associated with forgiveness and recovery from interpersonal transgression, believing in justice for others is negatively associated (Lucas, Young, Zhdanova, & Alexander, 2010; Strelan & Sutton, 2011).

Justice beliefs might also be partitioned by distinguishing between distributive and procedural justice. Distributive justice refers to the perceived fairness of outcomes or resource allocations (Adams, 1963), whereas procedural justice refers to the perceived fairness of decision processes used to determine outcomes (Lind & Tyler, 1988; Thibaut & Walker, 1975). Similar to self-other differences, justice theory holds that distributive and procedural justice beliefs might also connect to health in well-being in unique ways, and for unique reasons. With respect to distributive justice, equity theory has shown that perceiving outcomes to be unfair might be associated with tension and resentment toward others (Adams, 1963). Over time, a prolonged sense of resentment might be experienced as chronic stress, which can deleteriously influence health (Tepper, 2001; Vermunt & Steensma, 2005). Alternatively, procedural justice beliefs might be associated with health because of the *relational function* of procedural justice—believing in fair processes is important to individuals because fair treatment communicates that one is seen as a valued and respected member of the larger society, which can reduce stress (for a recent review, Lucas, in press). Procedural justice beliefs might also play a prominent role in linking justice evaluations to health disparities, especially to the extent that evaluations of procedural justice become highly important when resource allocations are inequitable (Lind & Tyler, 1988). Furthermore, available literature supports that procedural justice beliefs might play a more prominent role in stress-related health disparities than distributive justice through associations with lower perceived stress and better health behavior (Lucas, Alexander, Firestone, & LeBreton, 2008), reduced negative affect (Lucas, 2009; Weiss, Suckow, & Cropanzano, 1999), and receptivity to preventative health messages (Lucas, Alexander, Firestone, & LeBreton, 2009). Of current interest, a growing literature suggests that the general-personal and distributive-procedural justice distinctions can be concurrently specified to describe four unique justice tendencies (i.e., beliefs about distributive and procedural justice for oneself and others). Doing so can be used to enhance the precision with which justice beliefs are linked to indices health and well-being, and also consider the simultaneous or relative importance of specific justice beliefs to health and wellness (Lucas, Zhdanova, & Alexander, 2011; Lucas & Wendorf, 2012).

Similar to inconsistency theoretical frameworks, individual differences research highlights that justice beliefs might be both positively and negatively associated with health and wellness, and that cultural differences in links between justice beliefs and health might be observed by considering multiple individual differences tendencies (Lucas et al., 2016). One specific possibility is that for marginalized minorities, such as African Americans, beliefs about justice for self might be positively associated with health and wellness whereas beliefs about justice for others might be negatively associated, especially when these beliefs are operationalized as beliefs about procedural justice for self and others. In tandem to an empirical literature that suggests personal justice beliefs are generally health enhancing, just-world theory suggests that believing that the world is fair to oneself provides a universal coping resource by reassuring individuals that the world is orderly and predictable (Lerner, 1980). The belief in a personally just world might be similarly helpful to racial minorities, who are also likely to reap some benefit from a sense of personal control that seeing the world as fair to oneself can provide. However, marginalized individuals might also benefit from not endorsing a general belief that the world, especially to the extent that rejecting this belief might more accurately reflect a lived experience of social marginalization. Empirical support for divergent links from personal and general justice beliefs to wellness can be gleaned from studies that show racial minorities more readily acknowledge social mistreatment for others than for self (e.g., Taylor, Wright, Moghaddam, & Lalonde, 1990), suggesting that African Americans might be more apt to deflect personal than general instances of injustice. Among African Americans, believing in justice for others might also be associated with a psychological attempt to deny rather than acknowledge personal discrimination, or with augmented feelings of group-level discrimination (Taylor et al., 1990), both of which might negatively impact health (for review, Brondolo, Brady Ver Halen, Pencille, Beatty, & Contrada, 2009). Finally, some coping strategies that are particularly salient among African Americans suggest that justice might be both accepted and refuted. Of note, John Henryism (James, Keenan, Strogatz, Browning, & Garrett, 1992) is a culturally enshrined coping strategy that encourages grit and personal accountability (i.e., a belief in justice for self) to overcome unfair life obstacles and hardship (i.e., belief in general injustice).

Telomere Length as an Indicator of Disease and Disparity

Although several physiological pathways have been established in the racial health disparities literature (McEwen, 2012; Institute of Medicine et al., 2003), one biological marker that has been increasingly attended to is telomere length (TL). Telomeres are repetitive sequences of DNA at the ends of chromosomes that protect against degradation during transcription. Telomeres lose base pairs (shorten) with cell division until chromosomes are functionally impaired and become genetically unstable, resulting in cell death or senescence (Blackburn, Greider, & Szostak, 2006). TL thus serves as a useful marker of health by indicating biological

aging. The most important determinant of TL is chronological age—telomeres invariably shorten as individuals age (for recent review, Blackburn, Epel, & Lin, 2015). However, numerous studies now document that TL is also impacted by chronic stress, such that rates of telomere shortening might differ between individuals depending in part on exposure to psychological and environmental stressors (e.g., Epel et al., 2004, 2006; Kotrschal, Ilmonen, & Penn, 2007). Evaluating TL as a health outcome in psychosocial research thus reveals a vital pathway through which adversity get under the skin to contribute to illness (Epel et al., 2004). Furthermore, TL might provide a useful means of observing how psychosocial stress affects health across the life span, including both protective and detrimental psychosocial influences.

Of present interest, there is the potential for race differences in TL (Diez Roux et al., 2009; Geronimus et al., 2015), and racial stressors are also implicated in telomere shortening (Chae et al., 2016; Chae et al., 2014; Liu & Kawachi, 2017). Moreover, shorter telomeres are associated with an increased risk of stress-related illnesses that occur disproportionately in racial minorities (D'Mello et al., 2015; Epel et al., 2004; Wentzensen, Mirabello, Pfeiffer, & Savage, 2011; Zhao, Miao, Wang, Ding, & Wang, 2013). To better understand stress-related health disparities, it appears critical to decipher how psychosocial factors influence TL among minority individuals. This includes identifying individual differences associated with deleterious telomere shortening and those that afford protection.

The Present Study

The current study examined associations between believing in justice and TL in a community sample of healthy African Americans. On the basis of the inconsistency framework and individual differences literatures, we hypothesized that believing in justice would be both positively and negatively associated with TL among African Americans, depending on how these beliefs are operationalized. To test this hypothesis, we distinguished between beliefs about justice for self and others using a recently available individual differences theoretical framework and measure (Lucas, Alexander, Firestone, & LeBreton, 2007; Lucas et al., 2011). This framework also permitted further distinguishing general and personal justice beliefs according to *distributive justice content* (i.e., the perceived fairness of outcomes or resource allocations) and *procedural justice content* (i.e., fair rules and respectful interpersonal treatment). Of secondary interest, we also explored whether distinguishing between the distributive and procedural justice aspects of beliefs about justice for self and others could further clarify predicted connections to TL. Finally, chronological age was evaluated not only because it is an essential covariate of TL, but also to illuminate the potential for differences in associations of justice beliefs and TL across the life span.

We hypothesized that associations between chronological age and TL would be moderated by beliefs about justice for self and for others. Specifically, we expected that among older African Americans, TL would be longest when beliefs about justice for self were strongly endorsed and beliefs about justice for others were weakly endorsed. We further expected that among older African Americans, TL would be shortest when beliefs about justice for self were weakly endorsed and beliefs about justice for others were strongly endorsed. Finally, and based on prior literature that has shown procedural justice can play a prominent role in stress and negative affect, we expected that these effects would be clearest when justice beliefs for self and others were specified as procedural justice beliefs.

Method

Participants

Participants were recruited from metropolitan Detroit via posted and online advertisements. A sample of 118 healthy African Americans (82 women, 36 men; aged 18 to 63, $M = 31.63$, $SD = 13.82$) provided informed consent and enrolled in an ancillary laboratory study concerning social stress (Lucas et al., 2016). All participants received modest financial compensation for attending a single face-to-face session. Table 1 reports sample sociodemographic characteristics.

Measures

Table 2 presents the means, standard deviations, and their bivariate correlations and reliability coefficients for study measures.

Trait justice beliefs. Individual differences in beliefs about justice for self and others were measured during an online prescreen that took place approximately 1 week prior to the laboratory session. Both justice tendencies were measured using an expanded version of the Procedural and Distributive Justice Beliefs scale (Lucas et al., 2011). In its original form, this measure captures tendencies to see rules and treatment (procedural justice beliefs) and outcomes and allocations (distributive justice beliefs) as deserved (Lucas et al., 2007). Beliefs about justice for self and others are measured as higher order constructs by expanding the original measure to include four lower order subscales, each indicated by four items. Procedural justice beliefs for self (PJ-self) and others (PJ-others) assess beliefs about the deservedness of rules, processes, and treatment toward oneself or toward others (e.g., "I am/Others are generally subjected to processes that are fair"). Similarly, distributive justice beliefs for self (DJ-self) and others (DJ-others) assess beliefs about the deservedness of outcomes or allocations for self and others (e.g., "I/Others usually receive outcomes that I/they deserve"). All items were rated from 1 (*strongly disagree*) to 7 (*strongly agree*), with higher scores indicating a stronger belief in justice. Higher order subscales for beliefs about justice for self and others were created by averaging items representing the two appropriate lower order subscales.

Positive and negative trait affectivity. Dispositional tendencies toward experiencing positive and negative affect (i.e., affectivity) were also collected during prescreening, in order to consider whether links to justice beliefs and TL could instead be explained by positive and negative emotion. We measured affectivity using the Positive and Negative Affect Scale–Expanded Form (PANAS-X; Watson & Clark, 1994). Participants were asked to indicate how often they generally experienced seven positively valenced (excited, enthusiastic, proud, strong, alert, attentive, and determined) and eight negatively valenced feelings (afraid, scared, nervous, jittery, hostile, irritable, guilty, and ashamed). Response options ranged from 1 (*very slightly or not at all*) to 5 (*extremely*). Separate PA and NA scores were calculated

Table 1
Sample Characteristics and Beliefs About Justice for Self and Others

Characteristic	Justice for self ascendant (n = 24)	Justice equilibrium (n = 67)	Justice for others ascendant (n = 27)	Total (N = 118)
Gender				
Male	7 (29.17)	22 (32.84)	7 (25.93)	36 (30.51)
Female	17 (70.83)	45 (67.16)	20 (74.07)	82 (69.49)
Age				
18 to 20	6 (25.00)	15 (22.39)	7 (25.93)	28 (23.73)
21 to 30	10 (41.67)	27 (40.30)	7 (25.93)	44 (37.29)
31 to 40	4 (16.67)	5 (7.46)	5 (18.52)	14 (11.86)
41 to 50	0 (.00)	7 (10.45)	2 (7.41)	9 (7.63)
51 to 60	3 (12.50)	13 (19.40)	5 (18.52)	21 (17.80)
Over 60	1 (4.17)	0 (.00)	0 (.00)	1 (.85)
Missing	0 (.00)	0 (.00)	1 (3.70)	1 (.85)
Income				
Less than $15,000	6 (25.00)	24 (35.82)	13 (19.40)	43 (36.44)
$15,000 to $24,999	4 (16.67)	12 (17.91)	5 (18.52)	21 (17.80)
$25,000 to $34,999	3 (12.50)	7 (10.45)	4 (14.81)	14 (11.86)
$35,000 to $49,999	6 (25.00)	5 (7.46)	2 (7.41)	13 (11.02)
$50,000 to $74,999	2 (8.33)	10 (14.93)	2 (4.41)	14 (11.86)
$75,000 to $99,999	2 (8.33)	6 (8.96)	1 (3.70)	9 (7.63)
$100,000 and above	1 (4.17)	2 (2.99)	0 (.00)	3 (2.54)
Missing	0 (.00)	1 (1.49)	0 (.00)	1 (.85)
Education				
Less than high school	0 (.00)	0 (.00)	1 (3.70)	1 (.85)
High school/GED	9 (37.50)	33 (49.25)	12 (44.44)	54 (45.76)
Some college or trade school	6 (25.00)	17 (25.37)	10 (37.04)	33 (27.97)
College graduate	6 (25.00)	10 (14.93)	3 (11.11)	19 (16.10)
Professional/advanced degree	3 (12.50)	7 (10.45)	1 (3.70)	11 (9.32)

Note. Ascendancy indicates .50 or greater standard deviation difference between beliefs about justice for self and others. Percentages in parentheses might add to less than 100 because of rounding. GED = graduate equivalency diploma.

by averaging scale items, with higher scores indicating greater PA and NA tendencies.

Telomere length. Telomere length was measured through a dried bloodspot sample that was collected in the laboratory after a brief rest period and before participating in the social stress study (Lucas et al., 2016). Following a recommended research protocol (McDade, 2014), finger pricks entailed wiping the middle finger of the participant's nondominant hand with an alcohol wipe, pricking the finger with a lancet, wiping away the first drop of blood, then collecting three to five blood spots dropped onto filter paper. The blood spot collection cards were allowed to dry before being stored at −80 degrees C until they were shipped frozen by overnight delivery to the Blackburn Lab (San Francisco, CA). Total genomic DNA was purified using QIAamp DNA Investigator kit (QIAGEN, Cat#56504) from dry blood spots and quantified by measuring OD260. The telomere length assay is adapted from the published original method (Cawthon, 2002). Details of the adapted method can be found in Lin et al. (2010). Values were expressed as telomere abundance to single copy gene (T/S) ratio. The average coefficient of variation for this study was 2.9%.

Table 2
Means, Standard Deviations, Intercorrelations, and Reliability Coefficients for Study Variables

Variable	M	SD	1	2	3	4	5	6	7	8	9
1. Justice for self	5.037	1.220	**.919**								
2. Justice for others	4.427	1.161	.762***	**.894**							
3. DJ-Self	5.102	1.327	.890***	.706***	**.886**						
4. DJ-Others	4.655	1.304	.639***	.832***	.716***	**.910**					
5. PJ-Self	4.973	1.398	.901***	.662***	.605***	.436***	**.886**				
6. PJ-Others	4.199	1.432	.654***	.863***	.491***	.439***	.676***	**.936**			
7. Positive affectivity	4.054	.652	.187*	.163†	.180*	.136	.156†	.141	**.870**		
8. Negative affectivity	1.657	.742	−.043	−.045	−.011	−.020	−.065	−.055	−.334***	**.830**	
9. Telomere length	1.307	.225	.050	.023	−.031	.006	.118	.031	.046	.089	**2.9**

Note. Internal consistencies presented in boldface type on diagonal (Cronbach's alpha for measures and coefficient of variation for telomere length). DJ = distributive justice; PJ = procedural justice.
† $p < .10$. * $p < .05$. *** $p < .001$.

Statistical Analyses

Prior to evaluating the hypothesized effects, and after establishing that the distribution of T/S ratio was acceptable with respect to skew and kurtosis, we considered the extent to which discrepancies between beliefs about justice for self and others were present in our sample, and whether sociodemographic characteristics presented in Table 1 would vary as a function of them. Using a recommended descriptive approach (Fleenor, McCauley, & Brutus, 1996; see also, Zhdanova & Lucas, 2016), we calculated standardized scores for beliefs about justice for self and others. A participant was categorized as possessing self-ascendant justice beliefs if these beliefs exceeded their belief about justice for others by 0.5 standard deviation or greater. Likewise, a participant was categorized as possessing other-ascendant justice beliefs if these beliefs exceeded their belief about justice for self by 0.5 standard deviation or greater. Participants whose justice beliefs did not differ by more than 0.5 standard deviation were classified as possessing equilibrium justice beliefs. Socioeconomic differences across categories were evaluated using one-way analyses of variance.

We assessed main and interactive effects of age and justice beliefs on TL by performing three-step hierarchical multiple regressions. Significance was assessed using R^2 change and individual regression weights of predictors newly entered at each step. To assess main effects, individual difference subscales and age were mean centered and entered at the first step. The two-way interactions of justice beliefs with age were entered and assessed at the second step, as was the two-way interaction between beliefs about justice for self and others. The hypothesized three-way interaction of age with beliefs about justice for self and others was assessed on the third and final step. Significant interactions were probed separately for individuals one standard deviation above and below the mean on justice beliefs (Aiken, West, & Reno, 1991). We also conducted a regions of significance probe of significant interactions using the Johnson-Neyman approach so as to consider the age at which self and other justice beliefs affected TL (Hayes & Montoya, 2017). Prior to conducting multiple regressions, we considered the potential to include socioeconomic variables presented in Table 1 and affectivity measures as covariates in multiple regression models by first examining associations with TL. These associations were considered using partial correlations, which covaried for the effect of chronological age on both TL and each socioeconomic variable. We also evaluated possible multicollinearity between beliefs about justice for self and others before conducting multiple regressions, which was not evident (variance inflation factor = 1.315).

Results

Preliminary Analyses of Sociodemographic Characteristics and Affectivity

Table 1 also presents sociodemographic characteristics according to justice ascendency and equilibrium categories. Twenty-four participants (20.34%) possessed self-ascendant justice beliefs, whereas 27 participants (22.88%) possessed other-ascendant justice beliefs. The remaining 67 participants (56.78%) possessed equilibrium justice beliefs. Educational attainment was highest in the self-ascendant group ($M_{\text{self-ascendant}} = 4.375$, $SD_{\text{self-ascendent}} = 1.974$ vs. $M_{\text{other-ascendant}} = 3.593$, $SD_{\text{other-ascendent}} = 1.782$ vs. $M_{\text{equilibrium}} = 3.746$, $SD_{\text{equilibrium}} = 1.933$), though education differences were not significant, $F(2, 114) = 1.251$, $p = .290$. Household income was also highest in the self-ascendant group ($M_{\text{self-ascendant}} = 3.958$, $SD_{\text{self-ascendent}} = 2.100$ vs. $M_{\text{other-ascendant}} = 2.889$, $SD_{\text{other-ascendent}} = 1.783$ vs. $M_{\text{equilibrium}} = 3.621$, $SD_{\text{equilibrium}} = 2.095$), though income differences were also not significant, $F(2, 114) = 1.854$, $p = .161$. Finally, age was lowest in the self-ascendent group ($M_{\text{self-ascendant}} = 30.458$, $SD_{\text{self-ascendent}} = 13.994$ vs. $M_{\text{other-ascendant}} = 32.692$, $SD_{\text{other-ascendent}} = 13.859$ vs. $M_{\text{equilibrium}} = 32.149$, $SD_{\text{equilibrium}} = 14.128$), though age differences were not significant, $F(2, 114) = 0.178$, $p = .837$.

Partial correlations revealed that controlling for age, TL was not associated with educational attainment ($r = -.073$, $p = .436$) or household income ($r = .008$, $p = .928$). Moreover, an analysis of covariance that controlled for age suggested no gender differences in TL ($M_{\text{male}} = 1.249$, $SD_{\text{male}} = 0.240$ vs. $M_{\text{female}} = 1.336.$, $SD_{\text{female}} = 0.215$), $F(1, 114) = 2.127$, $p = .147$. Controlling for age, TL was also not significantly associated with positive affectivity ($r = .003$, $p = .973$) or negative affectivity ($r = .010$, $p = .918$). Thus, the multiple regression models presented subsequently were conducted without including any socioeconomic variables or affectivity measures as covariates other than age.

Higher Order Justice Beliefs for Self and Others in the Prediction of TL

As seen in Table 3, there was a significant main effect of age on TL. As expected, age was strongly negatively associated with TL ($\beta = -.50$, $p < .001$). Main effects of believing in justice on TL were not significant for beliefs about justice for self ($\beta = -.10$, $p = .429$) or beliefs about justice for others ($\beta = .03$, $p = .821$). On the second step, only the interaction between age and self-justice beliefs was significant ($\beta = .30$, $p = .030$). An analysis of simple slopes revealed that age had a nonsignificant, near zero association with TL for African Americans who endorsed a high belief in justice for self ($b = -.004$, $SE = .003$, $p = .115$, 95% CI [–.01, .001]). However, among participants with a low belief in justice for self, there was a significant negative association between age and TL ($b = -.01$, $SE = .003$, $p < .001$, 95% CI [–.02, –.01]). Thus, the two-way interaction suggested a buffering effect of self-justice beliefs against the effects of age on TL.

Of primary interest, the hypothesized three-way interaction was significant, suggesting that the interactive effect of age and beliefs about justice for self on TL was further moderated by beliefs about justice for others ($\beta = -.24$, $p = .038$). Specifically, the interaction between age and self-justice was significant when participants also weakly endorsed a belief in justice for others ($b = .005$, $SE = .002$, $p = .007$, 95% CI [.001, .01]), but not when participants strongly endorsed a belief in justice for others ($b = .002$, $SE = .002$, $p = .444$, 95% CI [–.002, .01]). Thus, the buffering effect self-justice beliefs against effects of age on telomere shortening was evident only when individuals simultaneously had a relatively low belief in justice for others. The regions of significance probe showed that the self x other justice interaction was positive and significant when age was 35.89 years or younger but not significant above this age.

Because the hypothesized associations with justice beliefs were expected for older African Americans, we also plotted predicted TL values separately for younger (-1 *SD*, ≤21 years)

Table 3
Chronological Age and Justice Beliefs Predicting Telomere Length (N = 117)

Variable	Model 1			Model 2			Model 3		
	B	*SE* B	β	*B*	*SE* B	β	*B*	*SE* B	β
Higher order: Justice for self and others									
Age	–.01**	.001	–.50**	–.01**	.001	–.52**	–.01**	.002	–.43**
Self	–.02	.02	–.10	–.02	.03	–.13	–.02	.03	–.10
Others	.01	.03	.03	.01	.02	.05	.00	.02	.001
Age × Self				.004*	.002	.31*	.003†	.002	.26†
Age × Others				–.002	.002	–.18	–.003	.002	–.22
Self × Others				.02†	.01	.17†	.02*	.01	.24*
Age × Self × Others							–.001*	.001	–.24*
Total R^2		.23**			.29**		.31**		
ΔR^2		.23**			.06*		.03*		
Lower order: Distributive justice for self and others									
Age	–.01**	.001	–.51**	–.01**	.001	–.51**	–.01**	.002	–.50**
DJ-Self	–.03	.02	–.19	–.04†	.02	–.23†	–.04†	.02	–.23†
DJ-Others	.01	.02	.06	.02	.02	.13	.02	.02	.13
Age × DJ-Self				.002†	.001	.22†	.002†	.001	.21†
Age × DJ-Others				–.001	.001	–.10	–.001	.002	–.11
DJ-Self × DJ-Others				.01	.01	.15	.01	.01	.15
Age × DJ-Self × DJ-Others							–.002	.003	–.04
Total R^2		.25**			.28**		.28**		
ΔR^2		.25**			.04		.001		
Lower order: Procedural justice for self and others									
Age	–.01***	.001	–.47**	–.01**	.001	–.49**	–.01*	.002	–.35*
PJ-Self	.002	.02	.02	.01	.02	.06	.01	.02	.06
PJ-Others	–.004	.02	–.02	–.02	.02	–.09	–.02	.02	–.14
Age × PJ-Self				.003*	.001	.28*	.002	.001	.14
Age × PJ-Others				–.002	.002	–.21	–.002	.002	–.13
PJ-Self × PJ-Others				.01	.01	.12	.02*	.01	.27*
Age × PJ-Self × PJ-Others							–.02*	.01	–.37*
Total R^2		.23**			.26**		.32**		
ΔR^2		.23**			.04		.06*		

Note. Model 2 includes two-way interactions. Model 3 includes three-way interactions. DJ = distributive justice; PJ = procedural justice.
† $p < .10$. * $p < .05$. ** $p < .01$.

versus older (+1 *SD*, ≥47 years) African Americans as a function of strong and weak endorsement of beliefs about justice for self and others. As seen in Figure 1, the hypothesis for older African Americans was supported. Specifically, TL was highest among older African Americans who strongly endorsed a belief in justice for self but weakly endorsed a belief in justice for others. Moreover, TL was lowest among older African Americans who weakly endorsed a belief in justice for self but strongly endorsed a belief in justice for others. Somewhat unexpectedly, a notable difference in TL among younger African Americans was also evident; in contrast to older African Americans, TL was shorter among younger African Americans who strongly endorsed a belief in justice for self but weakly endorsed a belief in justice for others.

Low-Order Distributive and Procedural Justice Beliefs for Self and Others

The analysis of higher order beliefs about justice for self and others was repeated using lower order distinctions between distributive versus procedural justice for self and others. Specifically, we considered whether interactive associations with TL could be parsimoniously accounted for by distinguishing beliefs about procedural justice for self and others from beliefs about distributive justice for self and others. For clarity, we considered distributive and procedural justice beliefs separately by performing two hierarchical multiple regressions.

As seen in Table 3, the hypothesized three-way interaction was not significant for distributive justice ($\beta = -.04$, $p = .781$). However, this interaction was significant for procedural justice ($\Delta R^2 = .060$; $F(7, 109) = 9.71$, $p = .002$; $\beta = -.37$). Consistent with the higher order pattern, the interaction between age and procedural justice for self was significant when the belief in procedural justice for others was low ($b = .004$, $SE = .001$, $p = .006$, 95% CI [.001, .01]) but not when this belief was high ($b = -.001$, $SE = .002$, $p = .610$, 95% CI [–.004,.003]). Thus, beliefs about fair rules and treatment for self and others, rather than beliefs about fair outcomes for self and others, accounted for the interactive effect of self and other justice beliefs on TL. A regions of significance probe showed that the self x other interaction for procedural justice beliefs was positive and significant below 36.08 years and not above this point.

Discussion

Emerging theoretical and empirical work increasingly suggests that justice-related thoughts might be uniquely associated with

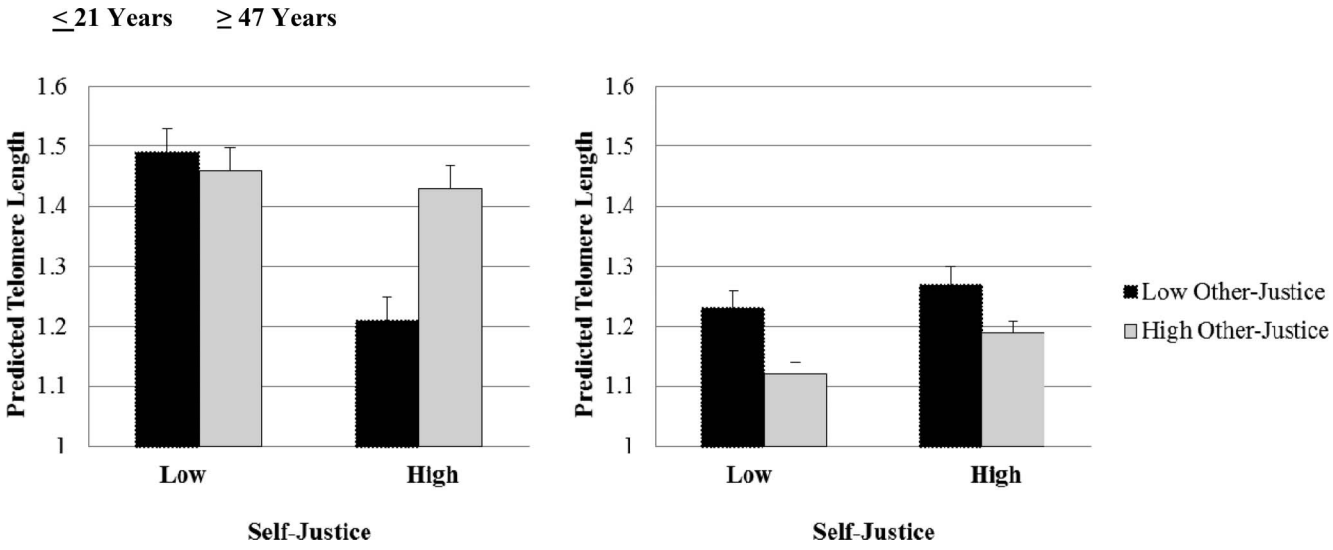

Figure 1. Predicted telomere length (T/S ratio) as a function of chronological age and beliefs about justice for self and others.

health and well-being among racial minorities (e.g., Lucas et al., 2016; Major & Townsend, 2012). Guided by this literature, we examined whether TL would be predicted by beliefs about justice for self and for others in a community sample of healthy African Americans. We expected that among older African Americans, TL would be longest when beliefs about justice for self were strongly endorsed and beliefs about justice for others were weakly endorsed. We further expected that among older African Americans, TL would be shortest when beliefs about justice for self were weakly endorsed and beliefs about justice for others were strongly endorsed. Our findings were consistent with these predictions, suggesting that simultaneously strong and weak endorsement of justice beliefs might be associated with more resilient biological aging among older African Americans.

Exploring lower order formulations of justice individual differences provided additional precision—the interactive association of age with justice beliefs was observed when assessed as procedural justice beliefs for self and others, but not when assessed as distributive justice beliefs for self and others. Such findings are consistent with available literature that suggests procedural justice beliefs might be more strongly connected to indices of stress and negative affect than distributive justice beliefs (e.g., Lucas et al., 2008). This perhaps suggest that relational rather than equity concerns might be paramount to the effects of justice on healthy aging. Namely, justice theory suggests that procedural justice might be psychologically important to individuals to the extent that fair rules and treatment play a central role in communicating social belonging and respect (e.g., Lind & Tyler, 1988), which might be health enhancing (Contrada & Ashmore, 1999). One important direction for future study is to further consider underlying procedural versus distributive justice content in linking beliefs about justice for self and others to TL. In doing so, future research might explicate whether social belonging communicated by the absence or presence of procedural justice plays a significant role in biological aging processes that contribute to racial health disparities. To our knowledge, almost no available studies have considered whether cross-cultural differences in relational functions of justice beliefs exist and are intertwined with racial health disparities.

Somewhat unexpected, our findings also revealed effects of believing in justice on TL among younger African Americans. Whereas strongly endorsing beliefs about justice for self but not for others was associated with longer TL among older African Americans, this pattern was associated with shorter TL among younger African Americans. One possibility is that associations between justice beliefs and TL change as African Americans age—a potentially novel contribution to justice literature, which has largely suggested static connections between individual differences and health outcomes across the life span. Considering the life course trajectory of associations between justice beliefs and indicators of health and wellness such as TL comprises a highly important future direction. For example, the combination of believing in justice for self but not for others might suggest the use effortful coping strategies. Early in life, a vociferous use of effortful coping might increase psychological and physical stress, as younger African American individuals exert personal will to overcome life obstacles. Although effortful coping might be psychologically and physically demanding early on, these costs are perhaps recouped later in life through social advancement and other successes that protect against harmful effects of stress. Indeed, some literature suggests that overcoming hardship through personal will is a culturally enshrined coping approach among African Americans, and that such coping might both positively and negatively affect health and well-being (Bonham, Sellers, & Neighbors, 2004; Neighbors, Hudson, & Bullard, 2012). Importantly, however, this and other possible interpretations are limited by the cross-sectional nature of the present research. Future research utilizing prospective designs is needed.

Limitations

Several limitations suggest both a cautious interpretation and other future directions. First, only African Americans were stud-

ied. This group has experienced generally intense and long-lasting injustice in the United States, such that focusing on African Americans was sensible for initially considering links between justice beliefs and TL. Nonetheless, future research must consider whether justice beliefs similarly affect TL in other marginalized groups. Second, compared with large-scale epidemiological and individual difference studies, this study is characterized by a relatively small sample size. Although we are reassured to some extent by robust statistical significance and effect sizes that were comparable to previous individual differences research on TL, our findings should nonetheless be interpreted cautiously. Related, classifying African Americans as older versus younger for the purpose of probing interactions was largely sample dependent and there were a greater number of younger than older individuals in our sample. Future studies that recruit broader age ranges might reveal additional strength or nuance in interactions between age and justice beliefs. Larger studies could also consider a broader range of covariates that might impact associations between justice beliefs and TL, as well as cohort effects that could encompass these relationships. Related, larger studies could better examine the potential for gender differences in links to justice beliefs, which have been reported for TL (for review, Gardner et al., 2014). A third limitation is that we measured a nonspecific belief in justice for others. This conceptual approach is consistent with the individual differences literature; however, it is possible to measure perceptions of justice for specific others (Sutton et al., 2008), which could reveal important nuance in health disparities contexts. Most crucially, links to TL could depend on beliefs about justice for other African Americans, but not on beliefs about justice for other Americans more generally, or vice versa. Finally, although this study used a previously validated structure and instrument for measuring individual differences in justice beliefs, alternative conceptualizations of justice are available and could provide additional insight (see Hafer & Sutton, 2016, for a review). For example, inconsistency frameworks have suggested that the influence of justice individual differences on well-being might be moderated by contextual features of justice, which were not presently evaluated.

Implications for Public Health and Psychology

Our findings are consistent with available psychological and public health literatures, and suggest that believing in justice for oneself might be health-enhancing for racial minority individuals. However, and somewhat contrary to this literature, our findings also suggest that personal justice might be beneficial to health and well-being only when a belief in justice for others is weakly endorsed. In illuminating the double-edged nature of believing in justice for African Americans, the present study carries important implications for advancing psychological and public health consideration of racial health disparities. Notably, the current research aligns with a burgeoning perspective that suggests the convergence of justice beliefs with one's justice-related life experience, rather than a rote endorsement of justice, might determine health and wellness. Future theoretical and empirical work on associations between justice beliefs and indices of health and wellness must attend to potential cultural differences not only to advance justice theory, but also to better explicate an important psychosocial cause of racial health disparities.

With an eye toward reducing health disparities, our findings also carry implications for considering psychosocial interventions. Some literature has suggested that perceived fairness might comprise the basis of a formal health intervention—a possibility that is buoyed in part by the relative ease with which justice cognitions can be deliberately activated (e.g., Lucas, Rudolph, Zhdanova, Barkho, & Weidner, 2014; Lucas et al., 2018). The present study suggests that developing effective justice interventions for use with racial minorities might require attending to injustice-related thoughts and cognitions, as well as those related to justice. Indeed, some research has shown that acknowledging injustices might be an effective vehicle for promoting health and social wellness in underserved communities (e.g., Kwate, 2014). Importantly, our findings also suggest caution in developing and deploying health interventions that strive only to augment justice cognitions for use with African Americans, and perhaps other racial minorities. Caution is warranted not only because such an approach might be ineffective, but also because imprecisely altering justice cognitions might produce ironic, unintended, and potentially harmful consequences, (e.g., Lucas et al., 2009).

Conclusion

Our findings align with an emerging body of evidence that suggests thoughts about justice can both protect and detract from health and well-being of racial minority individuals. Crucially, this study also provides new insight in revealing that biological aging, as defined by TL, might be a vital pathway through which thoughts about justice "get under the skin" to affect health and illness. The double-edged effect of believing in justice on health and well-being arises when beliefs about justice for oneself are parsed from a belief that the world in general is fair and might be especially evident among racial minority groups such as African Americans, whose experiences with social justice might forge unique and culture-specific wellness-promoting connections. Better understanding how justice-related thoughts and emotions connect to health and well-being among minority groups and individuals might be critical to advancing psychological theory and to developing social policy that can effectively address racial and ethnic health disparities.

References

Adams, J. S. (1963). Towards an understanding of inequity. *Journal of Abnormal and Social Psychology, 67,* 422–436. http://dx.doi.org/10.1037/h0040968

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: SAGE.

Assari, S. (2016). Hostility, anger, and cardiovascular mortality among Blacks and Whites. *Research in Cardiovascular Medicine, 6,* 2. http://dx.doi.org/10.5812/cardiovascmed.34029

Assari, S., & Lankarani, M. M. (2016). Chronic medical conditions and negative affect; racial Variation in reciprocal associations over time. *Frontiers in Psychiatry*. Advance online publication. http://dx.doi.org/10.3389/fpsyt.2016.00140

Bègue, L., & Bastounis, M. (2003). Two spheres of belief in justice: Extensive support for the bidimensional model of belief in a just world. *Journal of Personality, 71,* 435–463. http://dx.doi.org/10.1111/1467-6494.7103007

Blackburn, E. H., Epel, E. S., & Lin, J. (2015). Human telomere biology: A contributory and interactive factor in aging, disease risks, and protec-

tion. *Science, 350,* 1193–1198. http://dx.doi.org/10.1126/science.aab3389

Blackburn, E. H., Greider, C. W., & Szostak, J. W. (2006). Telomeres and telomerase: The path from maize, Tetrahymena and yeast to human cancer and aging. *Nature Medicine, 12,* 1133–1138. http://dx.doi.org/10.1038/nm1006-1133

Bonham, V. L., Sellers, S. L., & Neighbors, H. W. (2004). John Henryism and self-reported physical health among high-socioeconomic status African American men. *American Journal of Public Health, 94,* 737–738. http://dx.doi.org/10.2105/AJPH.94.5.737

Brondolo, E., Brady Ver Halen, N., Pencille, M., Beatty, D., & Contrada, R. J. (2009). Coping with racism: A selective review of the literature and a theoretical and methodological critique. *Journal of Behavioral Medicine, 32,* 64–88. http://dx.doi.org/10.1007/s10865-008-9193-0

Cawthon, R. M. (2002). Telomere measurement by quantitative PCR. *Nucleic Acids Research, 30,* e47. http://dx.doi.org/10.1093/nar/30.10.e47

Chae, D. H., Epel, E. S., Nuru-Jeter, A. M., Lincoln, K. D., Taylor, R. J., Lin, J., . . . Thomas, S. B. (2016). Discrimination, mental health, and leukocyte telomere length among African American men. *Psychoneuroendocrinology, 63,* 10–16. http://dx.doi.org/10.1016/j.psyneuen.2015.09.001

Chae, D. H., Nuru-Jeter, A. M., Adler, N. E., Brody, G. H., Lin, J., Blackburn, E. H., & Epel, E. S. (2014). Discrimination, racial bias, and telomere length in African-American men. *American Journal of Preventive Medicine, 46,* 103–111. http://dx.doi.org/10.1016/j.amepre.2013.10.020

Clark, R., Anderson, N. B., Clark, V. R., & Williams, D. R. (1999). Racism as a stressor for African Americans. A biopsychosocial model. *American Psychologist, 54,* 805–816. http://dx.doi.org/10.1037/0003-066X.54.10.805

Contrada, R. J., & Ashmore, R. D. (1999). *Self, social identity, and physical health: Interdisciplinary explorations*. New York, NY: Oxford University Press.

Dalbert, C. (2009). Belief in a just world. In M. R. Leary & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 288–297). New York, NY: Guilford Press.

De Vogli, R., Ferrie, J. E., Chandola, T., Kivimäki, M., & Marmot, M. G. (2007). Unfairness and health: Evidence from the Whitehall II Study. *Journal of Epidemiology and Community Health, 61,* 513–518. http://dx.doi.org/10.1136/jech.2006.052563

Diez Roux, A. V., Ranjit, N., Jenny, N. S., Shea, S., Cushman, M., Fitzpatrick, A., & Seeman, T. (2009). Race/ethnicity and telomere length in the Multi-Ethnic Study of Atherosclerosis. *Aging Cell, 8,* 251–257. http://dx.doi.org/10.1111/j.1474-9726.2009.00470.x

D'Mello, M. J. J., Ross, S. A., Briel, M., Anand, S. S., Gerstein, H., & Paré, G. (2015). Association between shortened leukocyte telomere length and cardiometabolic outcomes: Systematic review and meta-analysis. *Circulation: Cardiovascular Genetics, 8,* 82–90. http://dx.doi.org/10.1161/CIRCGENETICS.113.000485

Elovainio, M., Kivimäki, M., & Vahtera, J. (2002). Organizational justice: Evidence of a new psychosocial predictor of health. *American Journal of Public Health, 92,* 105–108. http://dx.doi.org/10.2105/AJPH.92.1.105

Epel, E. S., Blackburn, E. H., Lin, J., Dhabhar, F. S., Adler, N. E., Morrow, J. D., & Cawthon, R. M. (2004). Accelerated telomere shortening in response to life stress. *Proceedings of the National Academy of Sciences of the United States of America, 101,* 17312–17315. http://dx.doi.org/10.1073/pnas.0407162101

Epel, E. S., Lin, J., Wilhelm, F. H., Wolkowitz, O. M., Cawthon, R., Adler, N. E., . . . Blackburn, E. H. (2006). Cell aging in relation to stress arousal and cardiovascular disease risk factors. *Psychoneuroendocrinology, 31,* 277–287. http://dx.doi.org/10.1016/j.psyneuen.2005.08.011

Fleenor, J. W., McCauley, C. D., & Brutus, S. (1996). Self–other rating agreement and leader effectiveness. *The Leadership Quarterly, 7,* 487–506. http://dx.doi.org/10.1016/S1048-9843(96)90003-X

Gardner, M., Bann, D., Wiley, L., Cooper, R., Hardy, R., Nitsch, D., . . . the Halcyon Study Team. (2014). Gender and telomere length: Systematic review and meta-analysis. *Experimental Gerontology, 51,* 15–27. http://dx.doi.org/10.1016/j.exger.2013.12.004

Geronimus, A. T. (1992). The weathering hypothesis and the health of African-American women and infants: Evidence and speculations. *Ethnicity & Disease, 2,* 207–221.

Geronimus, A. T., Pearson, J. A., Linnenbringer, E., Schulz, A. J., Reyes, A. G., Epel, E. S., . . . Blackburn, E. H. (2015). Race–ethnicity, poverty, urban stressors, and telomere length in a Detroit community-based sample. *Journal of Health and Social Behavior, 56,* 199–224. http://dx.doi.org/10.1177/0022146515582100

Greenberg, J. (2006). Losing sleep over organizational injustice: Attenuating insomniac reactions to underpayment inequity with supervisory training in interactional justice. *Journal of Applied Psychology, 91,* 58–69. http://dx.doi.org/10.1037/0021-9010.91.1.58

Hafer, C. L., & Sutton, R. (2016). Belief in a just world. In C. Sabbagh & M. Schmitt (eds.), *Handbook of social justice theory and research* (pp. 145–160). New York, NY: Springer. http://dx.doi.org/10.1007/978-1-4939-3216-0_8

Hall, A. V., Hall, E. V., & Perry, J. L. (2016). Black and blue: Exploring racial bias and law enforcement in the killings of unarmed Black male civilians. *American Psychologist, 71,* 175–186. http://dx.doi.org/10.1037/a0040109

Hayes, A. F., & Montoya, A. K. (2017). A tutorial on testing, visualizing, and probing an interaction involving a multicategorical variable in linear regression analysis. *Communication Methods and Measures, 11,* 1–30. http://dx.doi.org/10.1080/19312458.2016.1271116

Jackson, B., Kubzansky, L. D., & Wright, R. J. (2006). Linking perceived unfairness to physical health: The perceived unfairness model. *Review of General Psychology, 10,* 21–40. http://dx.doi.org/10.1037/1089-2680.10.1.21

Jackson, J. S., Knight, K. M., & Rafferty, J. A. (2010). Race and unhealthy behaviors: Chronic stress, the HPA axis, and physical and mental health disparities over the life course. *American Journal of Public Health, 100,* 933–939. http://dx.doi.org/10.2105/AJPH.2008.143446

James, S. A., Keenan, N. L., Strogatz, D. S., Browning, S. R., & Garrett, J. M. (1992). Socioeconomic status, John Henryism, and blood pressure in black adults: The Pitt County Study. *American Journal of Epidemiology, 135,* 59–67.

Kivimäki, M., Ferrie, J. E., Brunner, E., Head, J., Shipley, M. J., Vahtera, J., & Marmot, M. G. (2005). Justice at work and reduced risk of coronary heart disease among employees: The Whitehall II Study. *Archives of Internal Medicine, 165,* 2245–2251. http://dx.doi.org/10.1001/archinte.165.19.2245

Kotrschal, A., Ilmonen, P., & Penn, D. J. (2007). Stress impacts telomere dynamics. *Biology Letters, 3,* 128–130. http://dx.doi.org/10.1098/rsbl.2006.0594

Kwate, N. O. A. (2014). "Racism still exists": A public health intervention using racism "countermarketing" outdoor advertising in a Black neighborhood. *Journal of Urban Health, 91,* 851–872. http://dx.doi.org/10.1007/s11524-014-9873-8

Lerner, M. J. (1980). *The belief in a just world*. New York, NY: Springer. http://dx.doi.org/10.1007/978-1-4899-0448-5

Levine, C. S., Basu, D., & Chen, E. (2016). Just world beliefs are associated with lower levels of metabolic risk and inflammation and better sleep after an unfair event. *Journal of Personality*. Advance online publication. http://dx.doi.org/10.1111/jopy.12236

Lin, J., Epel, E., Cheon, J., Kroenke, C., Sinclair, E., Bigos, M., . . . Blackburn, E. (2010). Analyses and comparisons of telomerase activity and telomere length in human T and B cells: Insights for epidemiology

of telomere maintenance. *Journal of Immunology Methods, 352,* 71–80. http://dx.doi.org/10.1016/j.jim.2009.09.012

Lind, E. A., & Tyler, T. R. (1988). *The social psychology of procedural justice*. New York, NY: Springer Science & Business Media. http://dx.doi.org/10.1007/978-1-4899-2115-4

Lipkus, I. M., Dalbert, C., & Siegler, I. C. (1996). The importance of distinguishing the belief in a just world for self vs. for others: Implications for psychological well-being. *Personality and Social Psychology Bulletin, 22,* 666–677. http://dx.doi.org/10.1177/0146167296227002

Liu, S. Y., & Kawachi, I. (2017). Discrimination and telomere length among older adults in the United States. *Public Health Reports, 132,* 220–230. http://dx.doi.org/10.1177/0033354916689613

Lucas, T. (2009). Justifying outcomes vs. processes: Distributive and procedural justice beliefs as predictors of positive and negative affectivity. *Current Psychology, 28,* 249–265. http://dx.doi.org/10.1007/s12144-009-9066-x

Lucas, T. (in press). Health consequences and correlates of social justice. K. Sweeny & M. L. Robbins (Eds.), *The Wiley encyclopedia of health psychology* (Vol. II). New York, NY: Wiley.

Lucas, T., Alexander, S., Firestone, I., & LeBreton, J. M. (2007). Development and initial validation of a procedural and distributive just world measure. *Personality and Individual Differences, 43,* 71–82. http://dx.doi.org/10.1016/j.paid.2006.11.008

Lucas, T., Alexander, S., Firestone, I., & Lebreton, J. M. (2008). Just world beliefs, perceived stress, and health behavior: The impact of a procedurally just world. *Psychology & Health, 23,* 849–865. http://dx.doi.org/10.1080/08870440701456020

Lucas, T., Alexander, S., Firestone, I., & Lebreton, J. M. (2009). Belief in a just world, social influence and illness attributions: Evidence of a just world boomerang effect. *Journal of Health Psychology, 14,* 258–266. http://dx.doi.org/10.1177/1359105308100210

Lucas, T., Hayman, L. W., Jr., Blessman, J. E., Asabigi, K., & Novak, J. M. (2016). Gain versus loss-framed messaging and colorectal cancer screening among African Americans: A preliminary examination of perceived racism and culturally targeted dual messaging. *British Journal of Health Psychology, 21,* 249–267. http://dx.doi.org/10.1111/bjhp.12160

Lucas, T., Kamble, S. V., Wu, M. S., Zhdanova, L., & Wendorf, C. A. (2016). Distributive and procedural justice for self and others measurement invariance and links to life satisfaction in four cultures. *Journal of Cross-Cultural Psychology, 47,* 234–248. http://dx.doi.org/10.1177/0022022115615962

Lucas, T., Lumley, M. A., Flack, J. M., Wegner, R., Pierce, J., & Goetz, S. (2016). A preliminary experimental examination of worldview verification, perceived racism, and stress reactivity in African Americans. *Health Psychology, 35,* 366–375. http://dx.doi.org/10.1037/hea0000284

Lucas, T., Rudolph, C., Zhdanova, L., Barkho, E., & Weidner, N. (2014). Distributive justice for others, collective angst, and support for exclusion of immigrants. *Political Psychology, 35,* 775–793. http://dx.doi.org/10.1111/pops.12204

Lucas, T., Strelan, P., Karremans, J. C., Sutton, R. M., Najmi, E., & Malik, Z. (2017). When does priming justice promote forgiveness? On the importance of distributive and procedural justice for self and others. *The Journal of Positive Psychology, 13,* 471–484. Retrieved from https://www.tandfonline.com/doi/full/10.1080/17439760.2017.1303533

Lucas, T., Strelan, P., Karremans, J. C., Sutton, R. M., Najmi, E., & Malik, Z. (2018). When does priming justice promote forgiveness? On the importance of distributive and procedural justice for self and others. *The Journal of Positive Psychology, 13,* 471–484.

Lucas, T., & Wendorf, C. A. (2012). Perceived justice at work and worker well-being: How and for whom do unethical work practices matter? In R. A. Giacalone & M. D. Promislo (Eds.), *Handbook of unethical work behavior: Implications for well-being* (pp. 237–252). New York, NY: M.E. Sharpe.

Lucas, T., Young, J. D., Zhdanova, L., & Alexander, S. (2010). Self and other justice beliefs, impulsivity, rumination, and forgiveness: Justice beliefs can both prevent and promote forgiveness. *Personality and Individual Differences, 49,* 851–856. http://dx.doi.org/10.1016/j.paid.2010.07.014

Lucas, T., Zhdanova, L., & Alexander, S. (2011). Procedural and distributive justice beliefs for self and others. *Journal of Individual Differences, 32,* 14–25. http://dx.doi.org/10.1027/1614-0001/a000032

Major, B., Mendes, W. B., & Dovidio, J. F. (2013). Intergroup relations and health disparities: A social psychological perspective. *Health Psychology, 32,* 514–524. http://dx.doi.org/10.1037/a0030358

Major, B., & Townsend, S. S. (2012). Meaning making in response to unfairness. *Psychological Inquiry, 23,* 361–366. http://dx.doi.org/10.1080/1047840X.2012.722785

McDade, T. W. (2014). Development and validation of assay protocols for use with dried blood spot samples. *American Journal of Human Biology, 26,* 1–9. http://dx.doi.org/10.1002/ajhb.22463

McEwen, B. S. (2012). Brain on stress: How the social environment gets under the skin. *Proceedings of the National Academy of Sciences of the United States of America, 109*(Suppl. 2), 17180–17185. http://dx.doi.org/10.1073/pnas.1121254109

McParland, J. L., & Eccleston, C. (2013). "It's not fair" social justice appraisals in the context of chronic pain. *Current Directions in Psychological Science, 22,* 484–489. http://dx.doi.org/10.1177/0963721413496811

Monden, K. R., Trost, Z., Scott, W., Bogart, K. R., & Driver, S. (2016). The unfairness of it all: Exploring the role of injustice appraisals in rehabilitation outcomes. *Rehabilitation Psychology, 61,* 44–53. http://dx.doi.org/10.1037/rep0000075

Neighbors, H. W., Hudson, D. L., & Bullard, K. M. (2012). The challenge of understanding the mental health of African Americans: The risks and rewards of segregation, support, and John Henryism. In E. C. Chang & C. A. Downey (Eds.), *Handbook of race and development in mental health* (pp. 45–66). New York, NY: Springer.

Penner, L. A., Albrecht, T. L., Orom, H., Coleman, D. K., & Underwood, W., III. (2010). Health and health care disparities. In T. D. Nelson (Ed.), *Handbook of prejudice, stereotyping, and discrimination* (pp. 472–490). London, UK: SAGE.

Proulx, T., Inzlicht, M., & Harmon-Jones, E. (2012). Understanding all inconsistency compensation as a palliative response to violated expectations. *Trends in Cognitive Sciences, 16,* 285–291. http://dx.doi.org/10.1016/j.tics.2012.04.002

Institute of Medicine, Board on Health Sciences Policy, Committee on Understanding and Eliminating Racial and Ethnic Disparities in Health Care, & Smedley, B. D., Stith, A. Y., & Nelson, A. R. (Eds.). (2003). *Unequal treatment: Confronting racial and ethnic disparities in health care*. Washington, DC: National Academies Press.

Strelan, P., & Sutton, R. M. (2011). When just-world beliefs promote and when they inhibit forgiveness. *Personality and Individual Differences, 50,* 163–168. http://dx.doi.org/10.1016/j.paid.2010.09.019

Sutton, R. M., & Douglas, K. M. (2005). Justice for all, or just for me? More evidence of the importance of the self-other distinction in just-world beliefs. *Personality and Individual Differences, 39,* 637–645. http://dx.doi.org/10.1016/j.paid.2005.02.010

Sutton, R. M., Douglas, K. M., Wilkin, K., Elder, T. J., Cole, J. M., & Stathi, S. (2008). Justice for whom, exactly? Beliefs in justice for the self and various others. *Personality and Social Psychology Bulletin, 34,* 528–541. http://dx.doi.org/10.1177/0146167207312526

Taylor, D. M., Wright, S. C., Moghaddam, F. M., & Lalonde, R. N. (1990). The personal/group discrimination discrepancy: Perceiving my group, but not myself, to be a target for discrimination. *Personality and Social Psychology Bulletin, 16,* 254–262. http://dx.doi.org/10.1177/0146167290162006

Tepper, B. J. (2001). Health consequences of organizational injustice: Tests of main and interactive effects. *Organizational Behavior and Human Decision Processes, 86,* 197–215. http://dx.doi.org/10.1006/obhd.2001.2951

Thibaut, J. W., & Walker, L. (1975). *Procedural justice: A psychological analysis*. Hillsdale, NJ: Lawrence Erlbaum.

Tomaka, J., & Blascovich, J. (1994). Effects of justice beliefs on cognitive appraisal of and subjective, physiological, and behavioral responses to potential stress. *Journal of Personality and Social Psychology, 67,* 732–740. http://dx.doi.org/10.1037/0022-3514.67.4.732

Vermunt, R., Peeters, Y., & Berggren, K. (2007). How fair treatment affects saliva cortisol release in stressed low and high type-A behavior individuals. *Scandinavian Journal of Psychology, 48,* 547–555. http://dx.doi.org/10.1111/j.1467-9450.2007.00593.x

Vermunt, R., & Steensma, H. (2003). Physiological relaxation: Stress reduction through fair treatment. *Social Justice Research, 16,* 135–149. http://dx.doi.org/10.1023/A:1024200120646

Vermunt, R., & Steensma, H. (2005). How can justice be used to manage stress in organizations? In J. Greenberg & J. A. Colquitt (Eds.), *Handbook of organizational justice* (pp. 383–410). Mahwah, NJ: Lawrence Erlbaum.

Watson, D., & Clark, L. A. (1994). *The PANAS-X: Manual for the Positive and Negative Affect Schedule - Expanded Form*. Iowa City: University of Iowa.

Weiss, H. M., Suckow, K., & Cropanzano, R. (1999). Effects of justice conditions on discrete emotions. *Journal of Applied Psychology, 84,* 786–794. http://dx.doi.org/10.1037/0021-9010.84.5.786

Wentzensen, I. M., Mirabello, L., Pfeiffer, R. M., & Savage, S. A. (2011). The association of telomere length and cancer: A meta-analysis. *Cancer Epidemiology, Biomarkers & Prevention, 20,* 1238–1250. http://dx.doi.org/10.1158/1055-9965.EPI-11-0005

Williams, D. R., & Jackson, P. B. (2005). Social sources of racial disparities in health. *Health Affairs, 24,* 325–334. http://dx.doi.org/10.1377/hlthaff.24.2.325

Zhao, J. Z., Miao, K., Wang, H. R., Ding, H., & Wang, D. W. (2013). Association between telomere length and Type 2 diabetes mellitus: A meta-analysis. *PLoS ONE, 8,* e79993. http://dx.doi.org/10.1371/journal.pone.0079993

Zhdanova, L., & Lucas, T. (2016). Justice beliefs, personal well-being and harsh social attitudes: Initial demonstration of a polynomial regression and response surface methodology. *Current Psychology, 35,* 615–624. http://dx.doi.org/10.1007/s12144-015-9328-8