

Intensive meditation training, immune cell telomerase activity, and psychological mediators

Tonya L. Jacobs^{a,*}, Elissa S. Epel^b, Jue Lin^c, Elizabeth H. Blackburn^c, Owen M. Wolkowitz^b, David A. Bridwell^d, Anthony P. Zanesco^a, Stephen R. Aichele^e, Baljinder K. Sahdra^a, Katherine A. MacLean^f, Brandon G. King^a, Phillip R. Shaver^e, Erika L. Rosenberg^a, Emilio Ferrer^e, B. Alan Wallace^g, Clifford D. Saron^{a,h}

^a UC Davis Center for Mind and Brain, Davis, CA, USA

^b UC San Francisco Department of Psychiatry, San Francisco, CA, USA

^c UC San Francisco Department of Biochemistry and Biophysics, San Francisco, CA, USA

^d UC Irvine Department of Cognitive Science, Irvine, CA, USA

^e UC Davis Department of Psychology, Davis, CA, USA

^f Department of Psychiatry and Behavioral Sciences, Johns Hopkins University School of Medicine, Baltimore, MD, USA

^g Santa Barbara Institute for Consciousness Studies, Santa Barbara, CA, USA

^h UC Davis Medical Center M.I.N.D. Institute, Sacramento, CA, USA

Received 22 January 2010; received in revised form 28 August 2010; accepted 17 September 2010

KEYWORDS

Meditation;
Neuroticism;
Perceived control;
Purpose in life;
Stress;
Telomerase

Summary

Background: Telomerase activity is a predictor of long-term cellular viability, which decreases with chronic psychological distress (Epel et al., 2004). Buddhist traditions claim that meditation decreases psychological distress and promotes well-being (e.g., Dalai Lama and Cutler, 2009). Therefore, we investigated the effects of a 3-month meditation retreat on telomerase activity and two major contributors to the experience of stress: Perceived Control (associated with decreased stress) and Neuroticism (associated with increased subjective distress). We used mediation models to test whether changes in Perceived Control and Neuroticism explained meditation retreat effects on telomerase activity. In addition, we investigated whether two qualities developed by meditative practice, increased Mindfulness and Purpose in Life, accounted for retreat-related changes in the two stress-related variables and in telomerase activity.

Methods: Retreat participants ($n = 30$) meditated for ~6 h daily for 3 months and were compared with a wait-list control group ($n = 30$) matched for age, sex, body mass index, and prior meditation experience. Retreat participants received instruction in concentrative meditation techniques and complementary practices used to cultivate benevolent states of mind (Wallace, 2006). Psychological measures were assessed pre- and post-retreat. Peripheral blood mononuclear cell samples

* Corresponding author at: UCD Center for Mind and Brain, 267 Cousteau Place, Davis, CA, 95618 USA. Tel.: +1 415 219 4583.
E-mail address: tljacobs@ucdavis.edu (T.L. Jacobs).

were collected post-retreat for telomerase activity. Because there were clear, a priori hypotheses, 1-tailed significance criteria were used throughout.

Results: Telomerase activity was significantly greater in retreat participants than in controls at the end of the retreat ($p < 0.05$). Increases in Perceived Control, decreases in Neuroticism, and increases in both Mindfulness and Purpose in Life were greater in the retreat group ($p < 0.01$). Mediation analyses indicated that the effect of the retreat on telomerase was mediated by increased Perceived Control and decreased Neuroticism. In turn, changes in Perceived Control and Neuroticism were both partially mediated by increased Mindfulness and Purpose in Life. Additionally, increases in Purpose in Life directly mediated the telomerase group difference, whereas increases in Mindfulness did not.

Conclusions: This is the first study to link meditation and positive psychological change with telomerase activity. Although we did not measure baseline telomerase activity, the data suggest that increases in perceived control and decreases in negative affectivity contributed to an increase in telomerase activity, with implications for telomere length and immune cell longevity. Further, Purpose in Life is influenced by meditative practice and directly affects both perceived control and negative emotionality, affecting telomerase activity directly as well as indirectly.

© 2010 Elsevier Ltd. All rights reserved.

1. Introduction

1.1. Telomerase: linking stress with physical health

Although relations between psychological functioning and physical health have long been documented, mechanistic links are only beginning to be understood at the cellular level (e.g., Miller et al., 2009). Telomere length has recently been proposed as a useful 'psychobiomarker' linking stress and disease (Epel, 2009). Shortened telomere length and reduced telomerase (the cellular enzyme primarily responsible for telomere length and maintenance) predict a host of health risks and diseases (Blackburn, 2000; Serrano and Andres, 2004; Lin et al., 2009b), and new findings suggest they may be regulated in part by psychological stress, stress appraisals, and well-being (Epel et al., 2004, 2009a; Ornish et al., 2008). The literature on Buddhist traditions has long suggested that meditation can reduce psychological stress and enhance well-being (e.g., Dalai Lama and Cutler, 2009).

In the present study, we investigated whether meditative practice is associated with immune cell telomerase activity and whether this association is at least partly explained by changes in two major contributors to the experience of stress: Perceived Control and Neuroticism (see Fig. 1).

Telomeres are protective DNA sequences at the ends of chromosomes that ensure genomic stability during cellular replication, but they shorten with each cell division and additionally shorten under conditions of oxidative stress unless counteracted by telomerase action (Blackburn, 1991). Below a critical telomere length, cell division can no longer occur and a cell is at a higher risk for entering a state of senescence, which may underlie tissue aging (Fossel, 2000; Chan and Blackburn, 2004). During human aging, as cells divide, telomere length decreases on average and hence is one indicator of a cell's biological age (Frenck and Blackburn, 1998), predicting physical health and longevity (e.g., Cawthon et al., 2003; Epel et al., 2009b; Njajou et al., 2009). Although cross-sectional studies show that telomere length decreases with age (on average), recent longitudinal studies

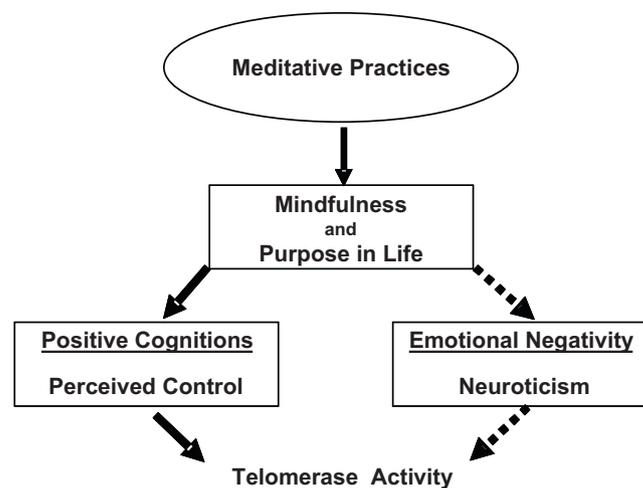


Figure 1 A schematic depiction of how meditation practice might influence telomerase activity by increasing perceived control and decreasing neuroticism (figure adapted from Epel et al., 2009a). Solid and dashed arrows depict positive and inverse relations, respectively.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات