

Exploring the relationship between health and activities: Implications for subjective experiences

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Abstract: Background. Recent research has demonstrated the positive effects of lifestyle factors on telomere health. These studies typically focus on activities such as diet, exercise, and meditation and their influence on telomere length. However, there is a lack of studies on other types of activities. **Purpose.** Through the Health and Retirement Study, social and creative activities were analyzed to explore their associations with overall health. **Method.** Secondary, cross-sectional regression analyses were conducted, examining the associations between social and creative activities with 2 measures of health: self-rated health and telomere length. **Findings.** Decreased frequency of writing was associated with longer (healthier) telomere lengths, and mixed findings were found for the relationship between activities and self-reported health. **Implications.** Various factors are discussed regarding the unexpected and inconsistent results. Most notably, this analysis calls for future studies to use participants' subjective experiences of activity engagement to study health benefits.

Keywords: Health, activities, and subjective experiences

1. Introduction

1.1 Activities and well-being. What you do affects your health (Moll et al., 2015; Wilcock, 2007). This is a widely known assumption that people generally believe and uphold. In fact, the 'holy trinity' of health promotion targets

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smoking, diet, and exercise with the aim of improving public health (Moll et al., 2013). In addition, youth engaging in extracurricular activities lead to many health and psychosocial benefits, such as reduced rates of delinquent behaviors, reduced alcohol use, and increased physical activity (Centre for Excellence in Youth Engagement, 2003). Older adults who volunteer have improved health (e.g., higher self-reported health and lower depressive symptoms) compared to those who don't volunteer (Gottlieb & Gillespie, 2008). The field of occupational therapy

and occupational science is based on the central tenet that health is largely affected by one's activities or occupations (Wilcock, 2005).

1.2 Telomeres. Health can be defined in many different ways. Past research has used a variety of self-reported health measures to explore indicators such as well-being (e.g., Anaby, Jarus, Backman, & Zumbo, 2010), life satisfaction (e.g., Kim, 2013), and affect (e.g., Hsieh & Lo, 2013). While such self-reported or perceived health status is useful, these measures can be augmented with the inclusion of biological indicators. This addition would enable a fuller examination of overall health. Telomeres are a novel biomarker of health and aging that are being used increasingly in ecological and intervention studies.

Telomeres are protein complexes that cap chromosomes, protecting chromosomal DNA from damage. Telomeres shorten with each cell division, until cell senescence or death (Wright & Shay, 2001). Immune cell aging and chronic stress are marked by short telomeres (Epel et al., 2004), and telomere attrition and dysfunction is a precursor to many chronic health conditions including heart disease (Van der Harst, Van der Steege, & De Boer, 2007), obesity (Zannolli et al., 2008), cancer (Wu et al., 2003), and dementia (Grodstein et al., 2008). Therefore, telomere length is predictive and reflective of biological aging and health (Puterman & Epel, 2012).

1.3 Past studies. Since telomeres are a useful indicator of health, researchers have begun using this biomarker to explore the effects of lifestyle factors and behaviors

on health. Ornish and colleagues (2008; 2013) found that physical and mindfulness activities, along with diet and group support, were significantly associated with preserving telomere length. Other studies also document similar results (e.g., Puterman, Lin, Krauss, Blackburn, & Epel, 2014; Schutte & Malouff, 2014).

Studies hypothesize that activities improve health (preserve telomere length) by reducing stress and enhancing psychological well-being. In other words, when one engages in satisfying activities, stress is reduced thereby improving health, as indicated by telomeres. Existing studies focus mainly on mindfulness and physical activities (To-Miles & Backman, 2016). It is unknown whether other kinds of activities would also contribute to telomere health. Specifically, how do other stress-relieving activities (e.g., creative and social activities) affect telomere health?

The hypothesis of this study is: engaging in social and creative activities predict better health, as indicated by objective (telomere health) and subjective (self-reported health) measures, while controlling for important variables.

2. Methods

The Health and Retirement Study (HRS) surveys a representative sample of United States residents over the age of 50 (HRS, 2008a). Since 1992, these individuals have been surveyed every two years. The aim of the HRS is to examine health and other measures as people transition from employment into retirement. Researchers collect a wide range of information including income, employment, health, and lifestyle. The HRS is sponsored by the

National Institute on Aging and is conducted by the University of Michigan (HRS, 2008a).

Through the HRS, a cohort of 17, 217 individuals have completed questionnaires related to their health, demographics, and activities in 2008 (HRS, 2008a). Out of this population, 5808 had their saliva drawn for telomere measurement (HRS, 2008b). Information from this cohort was used for this cross-sectional, secondary analysis. Confidentiality was retained since all identifiers were removed.

2.1 Variables. To study health (outcome), a subjective measure of health was used. Participants rated their own health as excellent, very good, good, fair, or poor, which were then coded to be binary ('good health' vs. 'poor health'). Mean telomere length data was gathered to measure objective health. Telomere length assays were performed by Telome Health (HRS, 2008b) and observations with telomeres over 2.0 kilobases ($n = 289$) were excluded.

Ten activities were used as predictor variables. These include four social activities (*volunteering* with children or young people, other volunteering or *charity work*, attending a sport, social, or other *clubs*, attending *interest groups*) and three creative activities (*writing*, *baking/cooking*, *sewing/knitting*). In addition, the variable 'working on a project or *hobby*' was included to see if it would predict health. Since physical activities can be social and is known to be associated with health (including telomere

length), physical activities were also explored in this study. Thus, the variables *sports/exercise*, and *walk for 20 minutes or more* were included. Participants rated how frequently they engaged in these activities on a scale of 1-6 (from daily to not in the last month). Both age and sex were controlled for in our analyses.

Stress was also explored as a potential covariate for telomere length; this variable is a sum of the frequency of six stressful emotions participants experienced in the past month (distressed, nervous, frustrated, scared, afraid, and upset).

2.2 Statistical analyses. Following an exploration of descriptive statistics and bivariate associations, multivariate regression analyses were used to study the associations between the predictor and outcome variables. This type of statistical analysis would help determine how, and to what extent, the predictor variables predict the outcome variables. The statistical software program SAS version 9.4 (SAS Institute Inc. Cary NC) was used. Two sided p-values of < 0.05 were used to demonstrate significant associations.

3. Results

The research aim was to determine what effect creative and social activities have on health, as measured by self-rated health and telomere length.

3.1 Activities and Telomere Length. The correlation between stress and telomere length was not significant ($r = -0.001$, $p = 0.90$), and was therefore not included in our subsequent analyses as a covariate. First, to see whether activities predict telomere length, controlling for age and sex, a linear regression was conducted.

From the initial sample of 17, 217 participants, there were 4395 participants with completed data on telomeres, activities, and covariates (see Figure 1 for further details).

Except for writing, other activities did not significantly predict telomere length ($ps > 0.11$). Surprisingly, those who wrote less than several times a week have a longer mean telomere length than those who wrote daily ($ps < 0.05$). See Table 1 for further details on the relationship between writing frequency and telomere length. The overall R^2 for this regression was 0.04, meaning only approximately 4% of the variance in telomere length can be explained by activities, age, and sex.

3.2 Activities and Self Rated Health.

Next, a logistic regression was conducted to explore the likelihood of having ‘good health’ when engaging in social and creative activities. From the initial sample of 17, 217 participants, 6137 completed self-reported health, activities and covariates data (see Figure 2 for further details).

Those who did less charity work, baking/cooking, and walking > 20 minutes have a lower odds of better health.

Interestingly, engaging in less volunteering and clubs predicted higher odds of better health. For example, those who volunteered the least (not in the last month) have over a 2-fold increase in odds of having ‘good health’, compared to those who volunteered daily. There were mixed results for engaging in hobbies and sports/exercise, depending on the

frequency category of each activity. Writing, interest groups, and sewing/knitting were not shown to be significantly associated with having better subjective health.

Table 2 depicts the significant relationships between charity work, baking/cooking, sports/exercise, walking > 20 minutes, hobbies, volunteering, and clubs with self-reported health. Analyses controlled for age and sex, and categories were compared to the referent group (daily engagement). The AUC (area under the curve) is 0.71, indicating that the overall measure of classification accuracy and predictive power of this model is adequate.

4. Discussion

This analysis explored the association between social and creative activities with health. Overall, there was little relationship with creative and social activities in predicting mean telomere length. There were mixed findings with activities in predicting the odds of having subjective ‘good health’. The strength of this analysis was the large sample size. However, there were a number of limitations in this study that may have contributed to our unexpected results. Since a secondary analysis was used, the original HRS questions do not perfectly fit the purposes of this analysis. More accurate and specific questions may lead to different results than the ones found from the current study.

4.1 Activity and occupational engagement.

Participants provided

information on their activity engagement in the past month; however, longer term data (e.g., over the past year) would more accurately capture what people typically do and decrease the chances of collecting activity information on an atypical month. This is especially noteworthy since telomere length changes are usually not immediate, and can take up to 2 to 6 years (Epel, 2012). Therefore, if activities do influence telomere length, then information on activity engagement from a longer time period is needed.

Occupational (activity) engagement is defined as “the subjective state of being ‘involved’ or ‘occupied’ in everyday activity” (Sutton, Hocking, & Smythe, 2012, p. 143). Disengagement, partial engagement, everyday engagement, and full engagement reflect the different states and experiences as one engages with their activity of choice (Sutton et al., 2012). From this analysis, it is unclear how ‘involved’ or ‘occupied’ participants were in each of the activities. Only data regarding the frequency of engaging in these activities was available, and the subjective state of participants when undertaking these activities is unknown.

This study’s hypothesis assumes that increased participation in social and creative activities is associated with better health. Yet, are these activities meeting the ‘occupational needs’ of these participants (Doble & Santha, 2008)? These needs, which include accomplishment, affirmation, agency, coherence, companionship, pleasure, and renewal,

largely influence well-being (Doble & Santha, 2008). For example, it was expected that engaging in social clubs would be related to well-being. However, this activity may not meet the need of accomplishment for some people, which would then have little effect on well-being. The importance of each occupational need is personal and individualized, which once again substantiates the call for subjective information on occupations. Also, it is unclear whether these activities were actually creative or social, and whether participants even enjoyed or valued creative or social activities in the first place. Engaging in sports/exercise may be a social activity for some (e.g., being on a sports team), but this can also be a solitary activity (e.g., jogging). Therefore, in addition to exploring the frequency of activity engagement, the subjective experiences should also be examined.

4.2 Stress. Shorter telomere length is associated with stress (Epel, 2009). As mentioned in the introduction, psychological well-being and stress play an important role in mediating the relationship between activities and telomere health. For example, physical and meditative activities have been shown to decrease stress and improve health, and are also associated with longer telomeres (Puterman et al, 2010; Lavretsky et al., 2013). Engaging in healthy behaviors (diet, exercise, and sleep) have a protective effect between major life stressors and telomere shortening (Puterman et al., 2014). Therefore, it was expected that stress would be a covariate in our analysis, influencing telomere length. However,

since there was not a significant relationship between stress and telomere length, stress was not included in the analysis. As mentioned, stress was calculated as a frequency sum of 6 stressful emotions in the past month. Like activity engagement, examining stress from a longer-term perspective may demonstrate a significant association. Finally, it is not known how closely together in time the data on stress and telomere length was collected. If there was little overlap between the two, then minimal relationship between the two would be expected.

5. Conclusion and future studies

Although this analysis did not find substantial evidence to support the hypothesis that social and creative activities are associated with overall health (especially telomere length), future studies should still explore this relationship. Such studies should take into consideration of the limitations and suggestions listed above. Using primary data will allow for more tailored questions targeting the study at hand. Carrying out an intervention is optimal, providing temporal and causal information; yet, an observational study has its own merits and can also provide useful information (Horn, DeJong, Ryser, Veazie, & Teraoka, 2005). Future research should incorporate measures on the subjective experiences of activity engagement, as well as long-term measures of stress.

Despite this study's results, research on occupation can be advanced by including biological measures of health such as telomeres, in adjunct with self-reported

health. This would require a well-designed study with variables specific to the research question. Exploring the relationship between health and occupations can benefit the general population as well as specific populations with various diseases and illnesses. Through quantifying the effect of occupations on health, such research can inform public health recommendations for everyday occupations or activities to promote health and well-being.

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