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Research Article

Positive Aging Expectations Are Associated With Physical Activity Among Urban-Dwelling Older Adults

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Abstract

Purpose: Regular physical activity is a key component of healthy aging, but few older adults meet physical activity guidelines. Poor aging expectations can contribute to this lack of activity, since negative stereotypes about the aging process can be internalized and affect physical performance. Although prior cross-sectional studies have shown that physical activity and aging expectations are associated, less is known about this association longitudinally, particularly among traditionally underrepresented groups. It is also unclear whether different domains of aging expectations are differentially associated with physical activity.

Design and Methods: The number of minutes/week of physical activity in which Baltimore Experience Corps Trial participants (*N* = 446; 92.6% African American) engaged were measured using the CHAMPS questionnaire, while their aging expectations were measured using the ERA-12 survey. Linear mixed effects models assessed the association between physical activity and aging expectations over 2 years, both in full and sex-stratified samples. Separate models were also fit for different ERA-12 domains.

Results: We found that higher overall expectations regarding aging are associated with higher engagement in moderate- to high-intensity physical activity over a 2-year period of time for women only. When the ERA-12 domains were examined separately, only the physical domain was associated with physical activity, both in women and overall.

Implications: Low expectations regarding physical aging may represent a barrier to physical activity for older adults. Given that most older adults do not meet recommended physical activity guidelines, identifying factors that improve aging expectations may be a way to increase physical activity levels in aging populations.

Keywords: African American older adults, Attitudes & perception toward aging, Epidemiology, Analysis-hierarchical linear modeling

Regular physical activity is essential for healthy aging, with inactivity being a risk factor for morbidity and disability (Kim, 2013; Lee et al., 2012; Menec, 2003; Wen et al., 2011). Physical activity has also been linked to additional positive benefits, such as preserved cognitive function (Bauman, Merom, Bull, Buchner, & Singh, 2016; Clark, Parisi, Kuo, & Carlson, 2015; Colcombe & Kramer, 2003; Erickson, Hillman, & Kramer, 2015; Kramer & Erickson, 2007), improved muscle mass (Bauman et al., 2016; Montero-Fernández & Serra-Rexach, 2013), and reduced risk of mental disorders later in life, such as depression or anxiety (Bauman et al., 2016; Strawbridge, Deleger, Roberts, & Kaplan, 2002; Ströhle, 2009). However, despite these benefits, most middle-aged and older adults do not engage in the recommended amount of physical activity, and interventions designed to improve physical activity levels tend to have poor adherence (Brown, Yore, Ham, & Macera, 2005; Carlson & Varma, 2015; Taylor et al., 2004; Thurston & Green, 2004).

Included among the factors that have been found to underlie why older adults do not meet physical activity guidelines is their belief about the aging process and what is "normal" as one ages (Levy & Myers, 2004; Meisner, Weir, & Baker, 2013; Sarkisian, Prohaska, Wong, Hirsch, & Mangione, 2005a; Wurm, Tomasik, & Tesch-Romer, 2010). Prior research has found that there are age stereotypes regarding the aging body and its performance, including the perception that it is normal for physical health and function to decline considerably as one ages (Emile, Chalabaev, Stephan, Corrion, & d'Arripe-Longueville, 2014; Levy, 1996; Levy & Leifheit-Limson, 2009; Levy & Myers, 2004; Meisner, 2012). Levy posits that aging stereotypes can be "internalized in younger individuals and then become self-stereotypes when individuals reach old age" and that exposure to these ageist stereotypes can affect physical performance (Levy, 2003). Past studies support an association between aging expectations and physical activity levels, but the exact relationship is unclear. For example, Sarkisian and colleagues (2005a) and Emile and colleagues (2014) found cross-sectional associations in older adults between global aging expectations and physical activity levels after adjusting for demographic and health-related confounders. These associations have also been found in longitudinal studies of German older adults (Beyer, Wolff, Warner, Schüz, & Wurm, 2015; Wolff, Warner, Ziegelmann, & Wurm, 2014; Wurm et al., 2010). However, Meisner and colleagues (2013) found by using the 12-item Expectations Regarding Aging questionnaire (ERA-12) (Sarkisian, Steers, Hays, & Mangione, 2005b) that only expectations related to physical health (not cognitive function or mental health) were significantly associated with physical activity engagement, which leaves open the possibility that only certain domains of aging expectations influence physical activity. Finally, research by Levy and colleagues suggests that positive images of aging presented subconsciously across multiple sessions can significantly improve physical functioning over an extended period in older adults. This suggests that stereotypes of aging, and potentially perceptions of aging, could be a modifiable predictor of physical function and activity (Levy, Pilver, Chung, & Slade, 2014).

To add to the growing literature on this topic, our study had multiple aims. First, we were interested in better understanding how expectations regarding aging are longitudinally associated with physical activities in older adults over multiple years. Given that prior studies of aging expectations and physical activity have not included many individuals traditionally marginalized, we were also interested in determining whether the observed associations between physical activity and aging expectations held in a sociodemographically disadvantaged sample. Finally, we were interested in replicating and possibly extending the results of Meisner and colleagues (2013) by evaluating whether there are longitudinal domain-specific effects of aging expectations on physical activity. We were able to address each of these study aims using data from the Baltimore Experience Corps Trial (BECT). The BECT was a longitudinal, randomized volunteer intervention trial that recruited primarily African American women aged 60 and older (Fried et al., 2013). Given the simultaneous collection of information about aging expectations and physical activity engagement, we had the opportunity to explore whether expectations regarding aging were associated with future self-reported moderate- or high-intensity physical activity over 2 years in a sample of adults who belong to a sociodemographically disadvantaged group that has been found to be at higher risk for a variety of health outcomes that can be mitigated by physical activity, such as dementia (Bherer, Erickson, & Liu-Ambrose, 2013; Colcombe & Kramer, 2003; Kramer & Erickson, 2007), cardiovascular disease (Oguma & Shinoda-Tagawa, 2004), and type 2 diabetes (Brancati, Kao, Folsom, Watson, & Szklo, 2000). We were also able to look at domain-specific aging expectations and their association with physical activity through the use of the ERA-12 survey containing questions related to physical health, mental health, and cognitive function. In our cohort, we hypothesized that higher aging expectations would be associated with more minutes/week of physical activity engagement (Horton, 2010). We also expected to find that expectations related to physical health would have the strongest association with physical activity engagement. Furthermore, given that prior work has demonstrated possible sex-specific effects within the BECT with respect to physical activity (Varma et al., 2016), we decided to also examine sex-specific associations between aging expectations and physical activity, hypothesizing that we would see sex-specific effects.

Methods

Participants

Participants were from the BECT, a randomized controlled trial that evaluated whether a volunteer service program intervention within elementary schools (kindergarten through third grade) provided health benefits versus a control of volunteering service outside of schools. All BECT participants were required to be at least 60 years of age at the time of enrollment, to have at a Mini-Mental State Examination score of ≥24 (Folstein, Robins, & Helzer, 1983), and to be able to read at a sixth grade level or higher. The BECT did not have any exclusion criteria related to physical activity or function, such as body mass index, chronic disease status, or disability. BECT participants were recruited through several means, including health fairs, churches, senior centers and housing, community organizations, mailings to AARP members, and targeted radio advertisements (Fried et al., 2013). Older adults responding by phone or in-person were then screened for eligibility and possible enrollment into the study. For those enrolled in the BECT, trained interviewers collected standardized data at baseline and at yearly follow-ups for 2 years. Interviewers collected information regarding participants' health and behavior, participation in volunteer activities, and adherence to the intervention. The Johns Hopkins School of Medicine Institutional Review Board approved the study protocol. At baseline, the BECT enrolled 702 participants with a mean age of 67 years, of whom 85% were women and 90.5% identified as African American.

Due to questionnaires measuring expectations regarding aging being administered only to the last 520 of the 702 BECT participants at baseline, this analysis was restricted to those who completed these questionnaires. Participants were further required to have at least one follow-up visit at 12 or 24 months in addition to their baseline visit to be considered. A total of 446 participants fulfilled both criteria, with 362 completing all three study visits and 84 completing a baseline and one other study visit.

Measures

Expectations Regarding Aging

Participants' feelings about aging were captured by the Expectations Regarding Aging Survey (ERA-12), a 12-item questionnaire made up of three subscales: physical health, mental health, and cognitive function expectations (Sarkisian et al., 2005b). The ERA-12 and its subscales have been shown to have good reliability (α = 0.74–0.88) (Sarkisian et al., 2005b). At each in-person study visit, participants completed the ERA-12 by responding to 12 questions such as "the human body is like a car: when it gets old, it gets worn out," "it's normal to be depressed when you are old," and "it is impossible to escape the mental slowness that happens with aging." Each item could be answered on a 4-point scale, with 1 = "definitely true" and 4 = "definitely false," and the average of a participant's responses is considered her ERA-12 score. Consequently, higher scores indicate more positive expectations of aging. In the analysis, ERA-12 scores were calculated only for those answering at least 11 of the 12 items on the ERA-12, following prior analyses involving aging expectations in the BECT (Menkin, Robles, Gruenewald, Tanner, & Seeman, 2016). ERA-12 subscale scores were also calculated by averaging only those questions within a particular subscale. For simplicity of interpretation, we did not transform the ERA-12 scores and used the natural range from 1 to 4 for each item.

Physical Activity

Physical activity was ascertained by the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire (Stewart et al., 2001). The CHAMPS was developed to measure the types and intensity levels of activity that are meaningful and appropriate for older adults, ranging from light to vigorous activity. It asks about 40 specific activities, with 27 corresponding to exercise-related activities, and 18 of these (67%) are moderate- to high-intensity activities. In the BECT, a modified version of the CHAMPS was used that focused only on exercise-related activities relevant to older adults within the moderate- to vigorous-intensity range. This was based partially on physical activity recommendations focused on higher intensity activities (Koh, 2010). At each study visit, the CHAMPS questionnaire was administered to participants by a trained evaluator. Participants were asked about their participation in activities during the 4 weeks prior to the study visit, and when a participant indicated that she engaged in an activity, the evaluator then asked about the frequency (number of times/week) and duration (hours/week) of participation in the indicated activity. For each activity on the CHAMPS questionnaire, it is possible to assign specific metabolic equivalents (METs), or energy costs, which thereby allows activities to be categorized by intensity. In general, physical activities with MET values < 3.0 are considered low-intensity activity (e.g., walking or light housework), while activities with MET values ≥ 3.0 are considered moderate- to high-intensity activity (e.g., jogging or running for exercise). In this analysis, we focused on the number of minutes/week BECT participants engaged in moderate- to high-intensity physical activity. To calculate minutes/week of activity, we first followed the protocol developed by Stewart and colleagues (2001) to assign MET values to each activity that BECT participants endorsed on the CHAMPS. We then calculated the number of minutes/week spent on each activity by multiplying the midpoint of each category of hours/week by 60 (Morey et al., 2008).

Covariates

We controlled for age, time, sex, depressive symptoms, education, income level, BECT intervention status, and self-reported health status as potential confounders of the association between aging expectations and physical activity. Age was defined to be the baseline age, and time was measured in years since baseline. Depression was treated as a binary variable indicating the presence or absence of geriatric depressive symptoms based on the clinical cutoff of 5 on the Geriatric Depression Scale (Yesavage et al., 1983). Education and income level were also binary variables, with cutoffs at less than 12 years of education and income under $15,000/

year, respectively. BECT intervention status was dichotomous based on whether the participant was randomized to the BECT intervention versus control. Self-reported health was treated as a binary variable, with the cutoff being "Excellent" or "Very Good" health. Of these, only income, self-reported health, and depression had missing values; however, the level of missing data did not exceed 5% for any individual covariate, and 93% of all observations had complete data.

Data Analysis

We ran linear mixed effects models (using the lmerTest package in R version 3.3.1) to test whether average ERA-12 score was significantly associated with minutes/week of moderate- to high-intensity physical activity, controlling for relevant covariates. In the models, we considered participants' visits as level 1 observations, while the participants themselves were treated as level 2 observations. Mixed effect models account for between- and within-subject correlation between repeated measurements of the same BECT participant, and we allowed each participant to have her own estimated intercept (baseline physical activity level) (Woltman, Feldstain, MacKay, & Rocchi, 2012). Models were fit on the full subsample and on sex-stratified subsamples, and all available variables at all available time points were included in the analysis. We repeated this process for each of the three subscales of the ERA-12 as well to see if the results differed by subscale. In the event that a physical activity measurement fell outside ±2.5 *SD*s from the group's mean activity level, we recoded it to be the most extreme value that still permitted it to be within this range.

Results

This study sample closely resembled the full BECT cohort, with a mean age of 66 years, 86% being female, and 93% identifying as African American (see Table 1). Comparing those who were and were not in our subsample, we found that those excluded were older (t = 4.04 with 700 degrees of freedom, p < .001) and less likely to be African American (t = 2.28 with 700 degrees of freedom, p = .016) but were otherwise similar.

There was no association between ERA-12 scores and physical activity over the 2 years of follow-up when analyzing both men and women together after adjustment for relevant socioeconomic and health characteristics (p = .187) (Table 2). In the stratified analysis for women, positive expectations regarding aging (higher ERA-12 scores) were significantly associated with moderate- to high-intensity physical activity over the 2 years of follow-up, with every one-point increase in ERA-12 score being associated with an average increase of 42.8 min/week of moderate- to high-intensity activity (p = .031). In the stratified analysis for men, there was no association between ERA-12 and physical activity (p = .428).

In the analysis of men and women, time (in years), baseline age, and female sex were significantly associated with decreased moderate- to high-intensity physical activity minutes/week (β = −39.9, p < .001; β = −5.1, p = .016; and β = −112.4, p = .001, respectively), while self-reported health "Excellent" or "Very Good" was significantly associated with increased minutes/week of activity (β = 74.9, p < .001). Among women, time (β = −40.1), baseline age (β = −4.6), and self-reported health (β = 66.1) were also significantly associated with the average number of minutes/week that they engaged in moderate- to high-intensity physical activity. Among men, time was significantly associated with a decrease in the average number of minutes spent engaged in moderate- to high-intensity physical activity (β = −45.0, p = .035). In addition, self-reported health was again significantly positively associated with physical activity; however, the magnitude of the coefficient for

Table 1. Demographic Characteristics of the Sample From the Baltimore Experience Corps Trial

Characteristics	Analytic sample (n = 446)	Women (n = 384)	Men (n = 62)	p Value[c]
	Mean ± *SD* or *N* (%)			
Baseline ERA-12 score	2.9 ± 0.6	2.9 ± 0.5	2.8 ± 0.6	.03
Geriatric Depression score ≥ 5	162 (36.6)	135 (35.4)	27 (43.5)	.28
EC participation	234 (52.5)	204 (53.1)	30 (48.4)	.58
Age (years)	66.2 ± 5.5	66.2 ± 5.5	65.8 ± 5.8	.66
Female	384 (86.1)	NA	NA	
Race (African American)	413 (92.6)	355 (92.4)	58 (93.5)	.96
Education (<high school)	58 (13.0)	51 (13.3)	7 (11.3)	.82
Income (<$15,000/year)[a]	132 (29.6)	117 (30.5)	15 (24.2)	.39
Self-reported health "Excellent" or "Very Good"[b]	236 (54.1)	204 (54.4)	32 (52.5)	.89

Note: EC = Experience Corps; *SD* = standard deviation.

[a]One participant was missing baseline data on income.

[b]Ten participants were missing baseline data on self-reported health.

[c]*p* Values compare men vs women in the analytic sample. Chi-squared tests were performed for categorical variables and *t* tests were performed for continuous variables.

men was more than double that for women (β = 142.7, p = .006), indicating that self-reported health may be a particularly important factor for engagement in physical activity for men.

After dividing the ERA-12 into its three subscales, we found that the physical health subscale score was significantly positively associated with average minutes/week engaged in moderate- to high-intensity physical activity (Table 3). A one-point increase in the physical subscale of the ERA-12 was significantly associated with an average increase of 46.3 min/week engaged in moderate- to high-intensity physical activity (p = .003). Among women, this positive effect was even stronger (β = 58.5, p < .001). For men, there was no association. We did not find any significant associations between physical activity and the mental health or cognitive function subscales of the ERA-12 (data not shown).

To test the impact of some of our modeling choices, we ran several sensitivity analyses. First, we reran our linear mixed models, but we did not dichotomize self-reported health, education, and income. We found that our choice to dichotomize these variables had little impact on the observed association between aging expectations and moderate- to high-intensity physical activity, both in terms of statistical significance and the overall strength of the association. Second, we added an interaction term for ERA-12 score and time to see if the association between ERA-12 score and physical activity changed over time. We found no statistical evidence for an interaction. Given that we found different associations for men versus women in our sample,

Table 2. Results of Linear Mixed Effect Models Examining the Adjusted Association of ERA-12 Score on Average Minutes/Week of Moderate- to High-Intensity Physical Activity Among Baltimore Experience Corps Trial Participants

	Full sample (n = 446)			Female sample (n = 384)			Male sample (n = 62)		
Predictor	β	*SE*	*p* Value	β	*SE*	*p* Value	β	*SE*	*p* Value
Intercept	472.89	75.38	<.001	322.01	75.65	<.001	576.09	221.58	.011
ERA-12 score	24.36	18.44	.187	42.75	19.78	.031	−37.61	47.29	.428
Visit/time (years)	−39.86	8.19	<.001	−40.06	8.90	<.001	−45.00	21.04	.035
GDS score ≥ 5	−21.05	17.97	.242	−21.79	19.36	.261	−7.40	45.85	.872
Education < 12 years	−42.98	36.06	.234	−23.33	36.34	.521	−215.11	134.44	.115
African American	−103.45	45.18	.022	−126.32	45.37	.006	13.42	172.26	.938
Income < $15,000/year	−16.40	21.76	.451	−21.78	22.72	.338	−33.36	65.23	.610
Baseline age (years)	−5.12	2.12	.016	−4.63	2.17	.034	−10.35	7.31	.163
Self-reported health (Excellent or Very Good)	74.92	19.59	<.001	66.13	20.80	.002	142.70	51.41	.006
EC intervention status	−43.60	23.60	.065	−24.83	23.98	.301	−169.33	86.20	.054
Female	−112.42	34.52	.001						

Note: EC = Experience Corps; GDS = Geriatric Depression Scale; *SE* = standard error.

Table 3. Results From Linear Mixed Effects Models Examining the Adjusted Association of the Physical Activity Subscale of the ERA-12 Score on Average Minutes/Week of Moderate- to High-Intensity Physical Activity Among Baltimore Experience Corps Trial Participants

	Full sample (n = 446)			Female sample (n = 384)			Male sample (n = 62)		
Predictor	β	*SE*	*p* Value	β	*SE*	*p* Value	β	*SE*	*p* Value
Intercept	426.9	67.8	<.001	292.51	65.31	<.001	480.56	208.79	.024
Physical ERA-12 score	46.28	15.40	.003	58.49	16.31	<.001	−2.33	42.14	.956
Visit/time (years)	−38.70	8.25	<.001	−39.54	8.92	<.001	−36.68	21.36	.089
GDS score ≥ 5	−20.85	18.01	.247	−22.08	19.34	.254	−9.27	46.48	.842
Education < 12 years	−38.22	35.86	.287	−20.74	36.13	.566	−205.27	136.15	.137
African American	−105.17	45.09	.020	−129.15	45.29	.005	16.20	174.89	.927
Income < $15,000/year	−17.79	21.77	.414	−23.67	22.69	.297	−27.94	66.04	.673
Baseline age (years)	−5.05	2.12	.018	−4.61	2.17	.034	−9.66	7.44	.199
Self-reported health (Excellent or Very Good)	70.84	19.60	<.001	62.00	20.78	.003	136.60	51.80	.009
EC intervention status	−42.85	23.55	.070	−23.29	23.91	.330	−181.83	87.49	.042
Female	−118.38	34.57	<.001						

Note: EC = Experience Corps; GDS = Geriatric Depression Scale; *SE* = standard error.

we also reran our models in the total analytic sample with an interaction term for ERA-12 score and sex included. Again, we failed to observe a significant interaction. Finally, we examined whether nonlinear patterns existed in our data by adding nonlinear terms to our model for ERA-12 score and time. We saw no evidence of any significant nonlinearity in the data.

Discussion

We found that higher expectations regarding aging were associated with higher engagement in moderate- to high-intensity physical activity over a 2-year period of time for women in our sample, but not for men. When we looked at individual domains of aging expectations, we found that only the physical health domain was significantly associated with levels of physical activity, both in our overall sample and for women. We conclude that aging expectations, and, in particular, those related to physical health, are important contributors to the number of minutes/week that older women engage in moderate- to high-intensity physical activity. Because we looked at these relationships over a span of 2 years, we were also better able to assess the relative impacts of both aging (i.e., getting older by 1 year) and aging expectations on physical activity engagement.

Because most of the prior work on this topic has focused on moderate to high socioeconomic samples that were primarily of White racial/ethnic composition, one of the goals of our analysis was to see whether associations between aging expectations and physical activity could also be seen in a sample consisting of mostly African American women with heterogeneous socioeconomic backgrounds. These individuals represent a sociodemographically at-risk minority group that has been shown to be at elevated risk for a host of age-related adverse health outcomes that can be mitigated by moderate- to high-intensity physical activity, such as dementia (Bherer et al., 2013; Colcombe & Kramer, 2003; Kramer & Erickson, 2007), cardiovascular disease (Oguma & Shinoda-Tagawa, 2004), and type 2 diabetes (Brancati et al., 2000).

Overall, we found that we could replicate some, but not all, of the previous findings. For example, Sarkisian and colleagues (2005a) found that low aging expectations were associated with very low levels of physical activity in a sample of 636 older adults recruited from the Los Angeles, California area. In addition, several longitudinal studies of German older adults have also found significant associations between aging expectations and physical activity, particularly walking and playing sports (Wolff et al., 2014; Wurm et al., 2010). Our analysis did not entirely replicate these results in the full sample, but we did find a significant effect in the women. We could replicate in a longitudinal study the cross-sectional findings of Meisner and colleagues (2013) that the physical activity subscale was significantly associated with engagement in physical activity among older adults. This result reinforces prior work that argues that a domain-specific perspective for studying aging expectations can be useful, particularly in cases when a domain closely aligns with a particular health behavior (e.g., the physical domain of aging expectations and physical activity) (Kornadt & Rothermund, 2011, 2015; Levy & Leifheit-Limson, 2009). However, our finding that the aggregate ERA-12 score also was associated with physical activity engagement among women represents a departure from their results.

There are several possible explanations for why we replicated part, but not all, of prior results concerning the relationship between aging expectations and physical activity. First, external factors such as neighborhood walkability, physical activity guideline knowledge, and access to recreational facilities may have differed between our urban-dwelling Baltimore City sample and the samples used in the other studies of this topic, which may have affected the physical activity levels measured (Estabrooks, Lee, & Gyurcsik, 2003; Giles-Corti & Donovan, 2002; Gray, Murphy, Gallagher, & Simpson, 2016). Relatedly, it is also possible that differences were driven by the use of different instruments to measure both physical activity and aging expectations. To measure aging expectations, prior studies have used the ERA-12 (Meisner et al., 2013), the ERA-38 (Sarkisian et al., 2005a), the Attitudes Toward Own Aging subscale of the Philadelphia Geriatric Center Morale Scale (Beyer et al., 2015), the short form of the German Ageing Semantic Differential (Wolff et al., 2014), and the AgeCog Ongoing Development scale (Wurm et al., 2010; Wurm, Tesch-Romer, & Tomasik, 2007). To measure physical activity, these same studies have used the Physical Activity Scale for the Elderly (Meisner et al., 2013), the Lorig Self-management Exercise Survey (Sarkisian et al., 2005a), the International Physical Activity Questionnaire (Beyer et al., 2015), and the PRISCUS physical activity questionnaire (Wolff et al., 2014). Wurm and colleagues (2010) measured physical activity by asking study participants about their frequency of walking and doing sports, with responses measured on a 6-point scale ranging from “never” to “daily.” This considerable variation in questionnaires used makes comparing across studies difficult, and leaves open the possibility that any differences seen could be due, at least in part, to variation between questionnaires.

An interesting finding of our study was that there were sex differences for the association between overall ERA-12 score and the minutes/week that BECT participants spent engaging in moderate- to high-intensity physical activity. For women, we found a positive and significant association, while in men, we found a surprisingly negative and nonsignificant association. One explanation for these findings is that our sample was only 14% male versus 86% female, which means we lacked the statistical power to detect an association in men, and the estimate we did obtain was less stable. Prior studies have also found that the men in the BECT were more physically active than the women in the study (Varma et al., 2016), which may mean that a ceiling effect occurred in the men. Consequently, any interpretation of this result should be made with caution. Nevertheless, there may also be alternative explanations. For example, the percentage of African American grandmothers who partially or fully assist with raising their grandchildren has risen over the past years, despite the high physical, psychological, economic, and social prices associated with becoming "new mothers again" (Gibson, 2002). African American grandmothers can also experience the cumulative disadvantages of gender and racial discrimination, which can be magnified by living in lower resource environments (like Baltimore City), and these forces can drive the way they shape and are shaped by their experiences (Crystal & Shea, 1990; Gibson, 2002). Consequently, the aging experience of the African American women in the BECT may very well be different from the men in the BECT due to an accumulation of experiences across the life course, which in turn could mean that the associations between aging expectations and physical activity are different in African American women versus African American men. We recommend that future studies be done that are adequately powered to detect sex differences in the association between aging expectations and physical activity, given that such knowledge greatly contributes to the understanding of the overall association.

There are several limitations that can be noted. First, we were unable to examine fully the impact of aging expectations on low-intensity activity, given that the CHAMPS is better suited to study moderate- to high-intensity activities and that the BECT used a shortened version of the CHAMPS that eliminated many low-intensity activities. Even though current physical activity guidelines do not include recommendations for low-intensity activity, older adults do tend to engage in more low-intensity activity as they age, making the study of low-intensity activity important. Relatedly, our analysis relies on self-reported responses to the CHAMPS questionnaire, which may have affected our measurement of the number of hours/week participants spent on moderate- to high-intensity physical activity. As a result, future studies are currently being planned to examine the association between physical activity (including low-intensity activity) and aging expectations within the BECT by using objective physical activity measurements, like accelerometry, as has been done in previous work in a subset of the BECT sample (Varma, Chuang, Harris, Tan, & Carlson, 2015). Finally, information on aging expectations was not available for all participants because the ERA-12 was only given to the last 520 of 702 BECT participants, which introduces the possibility that selection or other biasing effects affected our findings. The reason for only a subset of participants receiving a baseline ERA-12 was that it was introduced to the BECT evaluation protocol after some participants had already had their baseline evaluation, and once it was introduced, every subsequent BECT participant completed the ERA-12. As such, we believe that there was little, if any, biasing effect of a lack of complete ERA-12 information on all BECT participants at baseline, although we cannot fully rule it out.

We found a strong association between expectations regarding physical aging and moderate- to high-intensity physical activity over 2 years in women who are at high risk for poor health outcomes. These findings were the result of a robust analysis using repeated measurements of aging expectations and physical activity over 2 years in a relatively large urban cohort where continuous data on physical activity was available. It is also one of the first studies that explored how aging expectations and physical activity are associated in a predominantly socioeconomic at-risk group. These results suggest that low expectations regarding physical aging may represent a barrier to physical activity in disadvantaged, urban-dwelling individuals living in areas like Baltimore City. Given that most older adults fail to meet recommended physical activity guidelines (Brown et al., 2005; Carlson & Varma, 2015; Taylor et al., 2004; Thurston & Green, 2004), future research should investigate if expectations regarding physical aging can be modified, and if improvements to expectations regarding physical aging can increase subsequent physical activity. Levy's work provides one possible line of inquiry: if subliminal imagery could mitigate the aging stereotype threat response, perhaps similar interventions or programs targeting perceptions on aging could facilitate increases in physical activity in aging adults (Levy et al., 2014), with prior work showing that even modest increases in daily physical activity may elicit neurocognitive benefits (Varma et al., 2015). AARP's "Disrupt Aging" campaign may be an example of one such program (Jenkins, 2016). The "Disrupt Aging" campaign posits that challenging outdated beliefs and stereotypes about aging will allow individuals to embrace their current age and elevate self-perceptions on aging, and we posit based on our results that this may in turn improve their physical activity levels. We encourage the future study of this program and others like it to inform future policy and practice surrounding how to increase, even modestly, older adult physical activity levels.

Conflict of Interest

None declared.

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