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Original Research

Physical activity mediates the relationship between program participation and improved mental health in older adults

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ABSTRACT

Objectives: There is an implicit assumption that increased physical activity (PA) levels are responsible for the mental health benefits resulting from participation in PA programs. Other factors associated with participation may in fact be responsible. The purpose of this study was to examine whether changes in PA mediated the effects of two PA programs (Active Choices [AC] and Active Living Every Day [ALED]) on mental health outcomes.

Study design: Secondary data analyses of quasi-experimental study.

Methods: A sub-sample of older adults who participated in AC ($n = 744$) and ALED ($n = 853$) were included in the current analyses. MacKinnon's product of coefficients was used to test change in PA as a mediator of the relationship between program dose and change in mental health outcomes (depressive symptoms, stress, and number of days with poor mental health).

Results: Change in PA explained 19% (AC) and 13% (ALED) of the absolute effects of program dose on depressive symptoms, 18% (AC) and 14% (ALED) of the effects on stress, and 37% (ALED) of the effects on days with poor mental health.

Conclusions: Mounting evidence from both epidemiological studies and controlled trials suggests that PA can improve mental health. This study adds that increasing PA levels may improve mental health in older adults in 'real-world' settings.

Exercise interventions with both healthy[1,2] and depressed[3–5] middle-aged and older adults have led to improved mental well-being and/or reduced depressive symptoms. Many plausible mechanisms for this relationship have been proposed, ranging from a direct alteration of brain chemistry to changes in psychosocial factors, such as self-efficacy and self-esteem. Importantly, non-specific properties of physical activity (PA) programs may lead to improvements in mental

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health irrespective of changes in PA behaviour. 'Placebogenic' properties of behavioural interventions may include expectancy, social support and attention.[6]

Mediation analyses help to explain how interventions exert their effects,[7] and can be used to inform the development of more efficient and effective interventions. Most mediation studies in the PA literature investigate the psychosocial mediators of change in PA.[8–14] Although it is of obvious value to understand the psychosocial mediators of PA adoption and adherence, studies investigating PA as a mediating factor between program participation and various health outcomes are lacking. The purpose of the current study was to examine whether changes in PA mediated the effects of participation in (more specifically, dosage of) two evidence-based PA behaviour modification programs (Active Choices [AC] and Active Living Every Day [ALED]) on depressive symptoms, stress, and days with poor mental health in older adults.

Methods

Active for Life was a 4-year translational initiative that successfully implemented two evidence-based PA behaviour modification programs, AC and ALED, in 'real-world' community settings with diverse older adult populations. Both programs resulted in significant improvements in PA; effect sizes for change in total PA and moderate-to-vigorous intensity PA were medium to large, ranging from 0.61 to 0.68 for both programs.[15] The methods and major findings of Active for Life are described in detail elsewhere.[16] All participants completed an informed consent form approved by the Institutional Review Boards at the University of South Carolina and Texas A&M Health Science Center, and review boards or legal departments of the lead organizations. The interventions were implemented by nine public health, senior service, health care, and grassroots organizations across 12 sites; four organizations (five sites) implemented AC and five (seven sites) implemented ALED. The nine participating organizations and the programs they implemented (AC or ALED) are described in detail elsewhere.[16] The current study used a prepost design, with data collected from 2003 to 2007.

Active for Life was powered to detect change in the primary outcome variable (PA) as measured by the Community Health Activities Model Program for Seniors (CHAMPS) survey. With an a priori range of possible intraclass correlations (ICCs) for site as 0.002, 0.005, and 0.008, and 80% power, 80 participants per site per year for two years were needed to detect small effect sizes ($d = 0.09$ to 0.13). In the primary outcomes paper,[15] actual effect sizes as small as $d = 0.02$ were found to be statistically significant at $P < 0.05$. Because it was not necessary for adequate statistical power to collect survey data on all participants across all years, comprehensive surveys were administered to all participants in year 1 (~100 per site) and to the first 100 participants per site in years 3 and 4 (year 2 was a planning year and data were not collected). Shortened versions of the survey were administered to those not completing the comprehensive survey in years 3 and 4. Participants completed surveys at baseline and at postintervention.

Participants

Participants taking part in Active for Life were ≥50 years of age, sedentary or underactive (≤2 days/week and <120 min/week), and free of medical conditions or disabilities that required higher levels of supervision, as determined by lead staff. The nine participating organizations recruited participants through their networks and from the larger community, using strategies tailored to the specific community being targeted. The most successful recruitment efforts were on-site staff recruitment, presentations at the facilities, direct mail, flyers, newsletters, and local media. Participants were recruited to take part in AFL on an ongoing basis; a given individual was enrolled in the program for the duration of the intervention they took part in. A total of 2502 (AC) and 3388 (ALED) participants were enrolled in AFL across the nine participating organizations.[15]

The sample size in this study is smaller than what was reported in the primary outcomes paper[15] for a number of reasons: (1) attendance at the ALED sessions during Year 1 was not captured at the individual participant level, (2) the number of days with poor mental health was not assessed during Year 1 for either program, and (3) shortened versions of the survey were administered to those not completing the comprehensive survey; however, outcomes used in this study were not assessed on the shortened versions. This study includes data across two years of recruitment for ALED and three years of recruitment for AC (except for the 'days with poor mental health' outcome variable, which was only assessed in two years). Of the 1175 AC participants (across three years of recruitment) and 1202 ALED participants (across two years of recruitment) eligible to take part in the study, 744 (AC) and 853 (ALED) had all required data points to be included in at least one of the mediator analyses in this study.

Interventions

In Active for Life, AC was a 6-month telephone-based program.[17–19] Participants received an initial face-to-face orientation, followed by up to eight one-on-one telephone counselling calls. The counselling was tailored to the participant's readiness for change[20] and emphasized key behavioural constructs in the social cognitive theory (e.g. social support, rewards, self-monitoring).[21] During each call, the health educator discussed the participant's current level of physical activity, their readiness for change, specific behaviour change strategies, and modified physical activity goals if necessary. A total of 275 AC participants (72%) in Year 1, 687 (60%) in Year 3, and 558 (57%) in Year 4 returned their posttest surveys.[15]

ALED was a 20-week lifestyle physical activity intervention.[22,23] Participants attended a 60 min, weekly, group-based session that focused on behaviour-change principles consistent with the social cognitive theory (e.g. self-efficacy, social