

Well-Being Outcomes from the Delivery of RASCALS, a Group Activity Intervention Using Nature-Focused Livestream Broadcasts

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Abstract

Group activities and connection with nature are associated with improved well-being for older adults. This quasi-experiment tests the effectiveness of RASCALS, an innovative program of group activities using nature-focused livestream broadcasts. Assisted living residents in the experimental group ($n = 16$) lived in buildings that received RASCALS programming twice a week for 3 months. Compared to residents in the comparison group ($n = 17$) who received regular group activity programming, they experienced significant positive change in the Positive Relations with Others domain of well-being ($\beta = .873$, $p = .008$). Combining nature-focused livestream broadcasts with groups activities for older adults in assisted living communities may be an innovative and effective way to overcome barriers to accessing nature and improve residents' well-being.

Keywords

nature-focused livestream broadcasts, group activities, well-being, social integration, assisted living

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What this Paper Adds

- This paper describes a program that combines the potential benefits of nature-focused livestream broadcasts and group activities in assisted living.
- Delivering RASCALS to assisted living residents may improve the Positive Relations with Others domain of well-being.

Application of Study Findings

- Practitioners can apply study findings in designing and implementing group activities.
- Findings inform future research on the use of virtual/digital technology to connect with nature.

The over 30,000 assisted living communities (ALCs) in the United States are a significant home and service provider for more than 800,000 Americans, most of whom are age 85 or older (National Center for Assisted Living, n.d.). ALCs provide important supports to residents, yet transitioning to living in an ALC can lead to multiple losses for residents, including loss of home, possessions due to downsizing, normal daily activities, and typical social contact with family and friends (Mueller et al., 2023; Perkins et al., 2012; Scott & Mayo, 2019). Some

ALC residents experience concerning gaps in social connections; however, those with social connections tend to experience higher levels of well-being (Cohen-Louck & Aviad-Wilchek, 2020; Lim et al., 2023). Many residents experience changes in physical and cognitive abilities that can lead to a profound sense of loss of identity and control (Mueller et al., 2023; Perkins et al., 2012; Scott & Mayo, 2019). Some may have reduced autonomy or sense of self due to a lack of privacy or forced adherence to stated and implied community rules (Perkins et al., 2012). ALC residents are also at risk for occupational deprivation—being unable to participate in meaningful and satisfying activities (Whiteford, 2000)—due to physical limitations, lack of transportation, and inadequate fit between residents' interests and the activities that are offered by the ALC (Egan et al.,

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2014; Knecht-Sabres et al., 2020). In fact, significant decreases in leisure activity participation for older adults after transitioning into living in an ALC have been documented (Knecht-Sabres et al., 2020).

Many ALCs offer organized group activities for residents, which provide an opportunity for residents to establish regular routines in their new homes and have been associated with easier residential transitions and increased sense of independence, autonomy/control, happiness, quality of life, sense of self, and life satisfaction (Mueller et al., 2021; Plys, 2019; Winstead et al., 2014). Group activities in ALCs allow residents to meet new people and establish relationships, potentially increasing their perceived social support, social well-being, psychological well-being, life satisfaction, and quality of life (Bradshaw et al., 2012; Chang et al., 2014; Cummings, 2002; Hall et al., 2011; Knecht-Sabres et al., 2020; Plys, 2019; Pudur et al., 2023; Street & Burge, 2012; Winstead et al., 2014). Interestingly, a recent review found that ALC residents prefer site-based social connections and activities (e.g., socializing in ALC common areas; ALC group activities involving physical activity, hobbies, and arts) over going out for social engagement, further underscoring the value of group activities in ALCs (Pudur et al., 2023).

Nature-focused group activities are worthy of consideration for their potential to enhance residents' well-being. Experiences with and in nature are associated with lower stress, blood pressure, heart rate, and risk for mortality (Twohig-Bennett & Jones, 2018; Yao et al., 2021). Psychological and cognitive benefits include alleviation of anxiety, depression, fatigue, confusion, and anger/hostility; increased self-esteem; enhanced selective attention; and improved memory span (Berman et al., 2012; Daniels et al., 2022; Wen et al., 2019). Unfortunately, connecting to nature for ALC residents with limited mobility can be challenging due to sloping terrain, poor quality ground surface, and inadequate availability of assistance or accommodations (Zhang et al., 2017). Opportunities for residents to go outside may depend on staff availability and willingness to support the endeavor, giving residents less control over their own access to nature (Freeman et al., 2019; Snell et al., 2019). Given these barriers experienced by ALC residents, novel means of connecting to nature are important to develop and evaluate.

One opportunity for ALC residents to connect with nature is via virtual/digital means such as nature-focused livestream broadcasts. Livestreams are webcam feeds in real time via the internet. Livestreams allows viewers to access locations, including those in nature, that they may not otherwise be able to see due to living situation (e.g., ALC), physical disability, or illness-related quarantine (Lee et al., 2022; van Houwelingen-Snippe et al., 2020). Viewing nature-focused livestream broadcasts has been connected to improved quality of life, reduced stress, increased relaxation, and uplifted mood (Blaer, 2023; Jarratt, 2021; Johnson-Pynn & Carleton, 2019;

Kamphof, 2011; Skibins et al., 2023; Turnbull et al., 2020). Because viewing nature-focused livestream broadcasts may increase well-being and can address some of the previously discussed barriers this population faces in connecting to nature or participating in certain in-person group activities during times of illness-related quarantine, it is a promising potential activity for ALC residents. The purpose of the present study was to establish preliminary evidence for the effects of delivering a program of nature-focused livestream group activities—*RASCALS: Reinforcing and Advancing Social Connectedness in Assisted Living*—on the well-being of ALC residents. Because *RASCALS* included an online experience with nature, a shared novel experience, and the possibility to socialize with others online, we hypothesized that participation in the *RASCALS* program would improve the well-being of ALC residents.

Method

This quasi-experiment piloted the *RASCALS* program in an ALC to assess its effect on the well-being of residents. The study was conducted from September 2022 to July 2023. All aspects of the research were approved by The University of Texas at Arlington's Institutional Review Board (Protocol #: 2022-0522).

Participants

Participants were residents of an assisted living community in north Texas, consisting of 4 separate assisted living buildings housing up to 15 residents each. In a typical week, each house held 4 or 5 smaller group activities. An additional 2 to 3 community-wide group activities were offered in a combined community activities center in a separate building. Research participants were recruited in 2 settings: (1) after a community-wide information session or (2) in individual meetings in the resident's home building. In each case, a research team member met individually with the resident to discuss the informed consent document and receive written consent. Of the approximately 57 residents living in the community at the time of recruitment (residents moved in and out during the recruitment period), 33 (58%) enrolled in the study.

Two of the assisted living houses received *RASCALS* programming twice a week for 3 months (late January to early April 2023) in the house's common living room area instead of the regular group activity that would have taken place on that day. All house residents were able to participate in the group activity, regardless of their status as a research participant. The other 2 houses served as a comparison group and received no additional or replacement programming, but did receive the regularly scheduled group activities already planned by the ALC. After completion of the 3-month *RASCALS* program, a membership to the nature-focused livestream platform was provided to the assisted living community

for an additional 9 months and residents in the comparison group were able to participate in the group activity.

Data Collection

Baseline data collection using interviewer-administered questionnaires was conducted in October and November 2022 (and January 2023 for one new resident) prior to initiating the *RASCALS* program in January 2023. Post-tests were administered in April 2023 after the delivery of the *RASCALS* programming. Participants received a \$20 Amazon gift card for completing the baseline assessment and a \$10 Amazon gift card for completion of the post-test assessment. Research team members facilitating the *RASCALS* group activities took attendance and recorded it in a spreadsheet.

Measures

To provide a description of the sample, demographic characteristics (i.e., age, gender, race/ethnicity, marital status, education, living arrangement prior to moving to the ALC, and number of living children) and variables related to cognitive ability and physical health were assessed at baseline. We assessed cognitive functioning with the Saint Louis University (SLU) Mental Status Examination (Morley & Tumosa, 2002). The SLU Mental Status Examination is a 30-point, 11-item measure of memory, attention, and executive functioning and an assessment tool for cognitive impairment. Items include clock drawing, object identification, recall, and digit span. Higher scores indicate greater levels of cognitive functioning. It is in wide use with various older adult populations and has been demonstrated to have acceptable levels of reliability, sensitivity, and specificity (Tariq et al., 2006). Overall physical health, hearing, and vision were each assessed with a single item asking participants to rate their health, hearing, and vision on a scale from 0 to 10, with 0 being poor and 10 being excellent. Limitations in physical functioning were measured using the Older American Resources and Services (OARS) Multidimensional Functional Assessment Questionnaire (Fillenbaum & Smyer, 1981). The OARS assesses ability to perform 7 activities of daily living (ADLs) and 7 instrumental activities of daily living (IADLs) independently. Scores range from 0 to 28, with higher scores indicating more independent functioning.

Dependent Variable: Psychological Well-Being

To assess various domains of the outcome of interest, psychological well-being, we used the Ryff Scales of Psychological Well-Being Short Form (Ryff PWB SF; Ryff & Keyes, 1995). The Ryff PWB SF is an 18-item, 7-point rating scale measure that assesses overall psychological well-being as well as 6 domains using subscales for *autonomy* (e.g., “I have confidence in my own opinions, even if they are different from the way most

other people think.”); *environmental mastery* (e.g., “In general, I feel I am in charge of the situation in which I live.”); *personal growth* (e.g., “For me, life has been a continuous process of learning, changing, and growth.”); *positive relations with others* (e.g., “I have not experienced many warm and trusting relationships with others”); *purpose in life* (e.g., “Some people wander aimlessly through life, but I am not one of them.”); and *self-acceptance* (e.g., “When I look at the story of my life, I am pleased with how things have turned out so far.”). Scores on the overall scale range from 18 to 126, and subscale scores range from 3 to 21. Higher scores indicate higher levels of psychological well-being.

The RASCALS Program

RASCALS was designed by the research team to support the well-being of assisted living residents by providing nature-focused livecam broadcasts in a group format that could facilitate social interactions both online and among residents. This implementation of *RASCALS* used Days at Dunrovin (D@D, www.daysatdunrovin.com), an online platform that captures life at Dunrovin Ranch in rural Montana, but other nature-focused livecam broadcast platforms can be used in *RASCALS*. D@D is an online platform that gives members varied content, including livestreams from 4 webcams strategically positioned throughout the ranch (see Figure 1), live broadcasts of ranch life, videos from the livestreams, and online presentations by experts. D@D is also a platform for member engagement and is intended for (but not restricted to) an older adult audience. Its discussion boards contain a variety of posts from other members uploading family photos and nature shots, volunteer camera operators reporting on interesting footage with time stamps provided, and viewers asking questions and discussing life on the ranch as seen through the cameras. For older adults with individual D@D memberships, evidence suggests D@D may have broad social and emotional benefits, including building community, and increasing social networks (Anderson, 2019).

Twice a week for 3 months (January–April 2023), members of the research team delivered *RASCALS* to each of the 2 houses in the experimental group. The group activity was typically led by a licensed social worker who was a PhD student, but in their absence, the activity was led by a team member with a PhD and Master of Social Work (MSW) degree or an MSW student. All group facilitators had social work training and skills in working with groups and had been trained on the D@D platform. For this study, participants received a 2-week orientation to D@D and the Dunrovin Ranch. The orientation differed from the standard *RASCALS* programming in that the owner of Dunrovin ranch joined the group activity using Zoom and provided a customized orientation that introduced each of the ranch’s 4 cameras. During the orientation, the ranch owner operated the cameras showing 360-degree views zooming in and out.

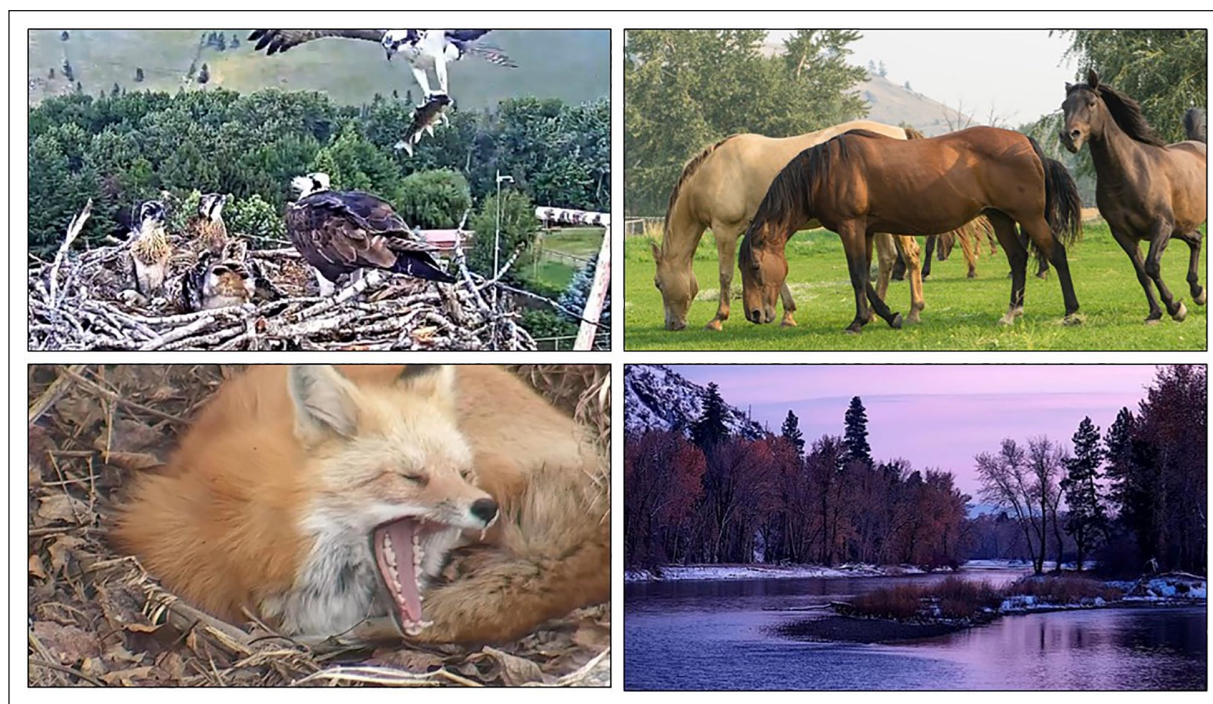


Figure 1. Images from the 4 days at Dunrovin webcams. The image at the upper left is the popular osprey nest cam, which is located a few feet above an osprey nest and provides close-up views of an osprey raising her young from her return to the nest in April to the fledging of the young osprey in September. The image at the upper right is the ranch cam, which gives views of the paddock, pastures, orchard, and osprey nest from a distance. The lower left image is from the bench cam, which is mostly focused on a bird feeder that is visited by a variety of birds and wildlife such as fox, deer, raccoons, and nocturnal flying squirrels. The lower right is an image from the river cam, which shows scenic views of the Bitterroot River and wildlife such as elk and wild horses that visits the river and the mountains on the opposite riverbank. Photographs courtesy of Days at Dunrovin, © SuzAnne Miller, 2024.

She shared the history of the ranch and introduced staff members and ranch animals. At the beginning of each group activity, the facilitator provided attendees with a flyer of related content provided by Days at Dunrovin. After the orientation was completed, regular programming was delivered. Sessions in the *RASCALS* program lasted 45–60 minutes (see Table 1) and consisted of 2 types of viewing activities: (1) organic viewing of the livestreams and (2) ranch staff-led broadcasts. Table 1 describes typical sessions for each type of session.

Data Analysis

Differences in well-being from pre- to post-test between experimental and comparison groups were identified using a series of 7 regression analyses with changes in overall well-being and each individual domain of well-being as the dependent variables. The regression models were specified using group membership (0 = comparison group; 1 = experimental group), number of sessions attended, and any baseline variable that differed significantly between groups and was significantly associated with the models' respective baseline well-being scores. For example, because the experimental group differed significantly from the comparison group on marital status, and marital status was significantly associated with overall well-being at baseline, we included marital status

as a covariate when regressing overall well-being. All analyses were conducted in SPSS version 29 or R version 4.2.2. Alpha levels for significance were set at $p < .05$.

Results

Overall, 33 assisted living residents participated in the *RASCALS* program, with 16 in the experimental group and 17 in the comparison group. Table 2 provides full descriptive statistics on the entire sample, as well as for the experimental and comparison groups. The average age of the sample was 80.14 years ($SD=8.66$). There were more women ($n=22$; 66.7%) than men ($n=11$; 33.3%). The largest racial/ethnic group was white ($n=17$; 51.5%), followed by Black or African American ($n=10$; 30.3%), and Hispanic, Latino, or Spanish ($n=3$; 9.1%). A plurality of participants ($n=14$; 42.4%) were married or in a domestic partnership, and a third ($n=11$; 33.3%) were widowed. Most had living children ($n=29$; 87.9%). Close to half of the sample's highest educational attainment was high school graduation or less ($n=14$; 42.4%), a little over a third had some college or an associate degree ($n=12$; 36.4%), and about a fifth had a graduate, professional, or doctorate degree ($n=7$; 21.2%).

Most participants reported moderately high levels of health, hearing, and vision with an average of 7.69 ($SD=2.16$), 7.83 ($SD=2.21$), and 8.13 ($SD=2.15$) out of

Table 1. Typical RASCALS Content for the Two Types of Viewing Sessions—Organic Viewing or Live Broadcasts—Using the Days at Dunrovin Nature-Focused Livestream Platform.

Organic viewing RASCALS session (45 to 60 minutes)	Live broadcasts (45 to 60 minutes)
Facilitator logs into the Days at Dunrovin account and begins the activity by calling attention to the real-time weather conditions at the ranch and viewing posts to the discussion boards.	The facilitator logs into regularly scheduled ranch broadcasts (which are broadcast through the ranch cam).
Participants choose which of the four webcams they would like to start viewing and the group watches what is happening on the ranch in real-time.	Days at Dunrovin staff provide a variety of broadcast content including equine training sessions with commentary from the trainer, special ranch events such as the osprey chicks getting banded by naturalists or horse painting during an arts festival, book clubs, or presentations by nature or ranching experts.
If interesting content was flagged in the discussion board posts, the facilitator may rewind the video footage to watch highlighted footage.	Most broadcasts entail on-camera presenters wearing microphones to broadcast their voices who are able to respond to questions and comments posted on the broadcast’s discussion board.
Facilitator offers option to watch archived video footage. If desired by participants, the facilitator makes posts to the discussion board on behalf of the group.	The facilitator posts questions or comments from the group to the broadcast discussion board.
Facilitator asks questions linking content to residents’ lives both past and present; solicits group participation.	

Table 2. Sample Characteristics at Baseline (N= 33 Assisted Living Residents).

Characteristic	Total (N=33)				Experimental group (n= 16)				Comparison group (n= 17)				p
	n	%	M	SD	n	%	M	SD	n	%	M	SD	
Age	29		80.1	8.7	13		80.9	10.0	16		79.6	7.7	.699
Gender													.325
Female	22	66.7			12	75.0			10	58.8			
Male	11	33.3			4	25.0			7	41.2			
Race/ethnicity													.598
White	17	51.5			9	56.3			8	47.1			
Hispanic, Latino, or Spanish	3	9.1			1	6.3			2	11.8			
Black or African American	10	30.3			5	31.3			5	29.4			
American Indian or Alaska Native	1	3.0			0	0.0			1	5.9			
Middle Eastern or North African	1	3.0			1	6.3			0	0			
Multiracial	1	3.0			0	0.0			1	5.9			
Marital status													.001
Single, never married	3	9.1			3	18.8			0	0			
Married/domestic partnership	14	42.4			3	18.8			11	64.7			
Widowed	11	33.3			5	31.3			6	35.3			
Divorced	4	12.1			4	25.0			0	0			
Separated	1	3.0			1	6.3			0	0			
Has living children (ref=No)	29	87.9			12	75.0			17	100			.044
Number of living children	29		3.0	1.8	12		2.8	1.9	17		3.1	1.8	.741
Education													.208
Less than high school	2	6.1			0	0.0			2	11.8			
High school graduate	12	36.4			5	31.3			7	41.2			
Some college or associate degree	12	36.4			8	50.0			4	23.5			
College degree	0	0.0			0	0.0			0	0.0			
Graduate, professional, doctorate	7	21.2			3	18.8			4	23.5			
Prior Residence													.611
Another assisted living	6	19.4			4	26.7			2	12.5			
Own house or apartment	20	64.5			9	60.0			11	68.8			
Someone else’s home	5	16.1			2	13.3			3	18.8			

(continued)

Table 2. (Continued)

Characteristic	Total (N=33)				Experimental group (n=16)				Comparison group (n=17)				p
	n	%	M	SD	n	%	M	SD	n	%	M	SD	
Health (0–10)	29		7.7	2.2	14		8.7	1.4	15		6.7	2.3	.011
Hearing (0–10)	30		7.8	2.2	15		8.2	2.2	15		7.5	2.2	.374
Vision (0–10)	30		8.1	2.2	15		8.7	1.7	15		7.5	2.5	.129
Cognitive functioning (0–30)	32		10.5	5.6	16		11.4	6.3	16		9.6	4.9	.360
Physical limitations (0–28)	30		23.2	4.8	15		24.5	3.9	15		21.9	5.4	.144
Overall psychological well-being ^a	26		96.4	12.3	15		93.3	9.9	11		100.6	14.3	.132
Well-being domains ^b													
Autonomy	26		16.4	2.9	15		16.8	2.4	11		15.7	3.6	.351
Environmental mastery	26		15.4	3.9	15		14.3	3.3	11		16.7	4.5	.126
Personal growth	26		15.7	3.5	15		15.7	3.5	11		15.7	3.7	.967
Positive relations with others	26		16.1	3.3	15		14.9	3.3	11		17.7	2.5	.023
Purpose in life	26		15.3	3.9	15		15.1	3.0	11		15.5	5.1	.839
Self-acceptance	27		17.4	3.2	15		16.5	2.8	12		18.5	3.4	.012

^aScores for overall psychological well-being can range from 18 to 126.

^bScores for each domain of well-being can range from 3 to 21.

a possible score of 10, respectively. The vast majority who completed the cognitive assessment ($n=30$; 93.8%) had SLU Mental Status Examination scores that were indicative of dementia according to the recommended cutoff scoring (Morley & Tumosa, 2002). The average OARS score assessing physical limitations was 23.17 ($SD=4.83$). Given the maximum score on the OARS is 28 (with higher scores indicating the participant can do more activities independently without help), this indicates a fairly low level of self-reported support needed among the sample in activities of daily living and instrumental activities of daily living. Finally, the average number of group activity sessions attended by experimental group members was 12.69 out of 21 total sessions (60.4%, $SD=7.94$ sessions).

Differences Between Experimental and Comparison Groups at Baseline

The experimental and comparison groups differed on marital status (Fisher's exact test, $p=.001$), having living children (Fisher's exact test, $p=.044$), and self-reported health ($t(27)=-2.75$, $p=.011$). Of these, the only variable that was significantly associated with any of the well-being dependent variables at baseline was marital status, which was significantly associated with overall well-being ($F(2, 19)=3.548$, $p=.049$).

Significant Changes in Well-Being Associated with the RASCALS Program

Receiving the RASCALS programming was significantly associated with greater improvement in the Positive Relations with Others domain of well-being compared to residents who did not receive RASCALS programming, $F(2, 19)=4.69$, $p=.022$, adjusted $R^2=.260$. Being

in a house that received RASCALS programming was associated with a large ($\beta=.873$) change in this domain of well-being ($p=.008$). Among experimental group members, the average score on this subscale experienced a small increase (Cohen's $d=.22$) from 14.87 ($SD=3.25$) at baseline to 15.67 ($SD=4.05$). The comparison group had an average subscale score of 17.73 ($SD=2.53$) at baseline and an average subscale score of 15.17 ($SD=4.51$) at posttest, reflecting a large (Cohen's $d=.70$) decrease. The regression analyses for the remaining 6 well-being outcome variables did not return statistically significant results. Table 3 provides full regression results for all 7 regression models.

Discussion

In this study, the researchers developed, implemented, and evaluated an innovative, nature-based group activity (RASCALS) in an ALC to determine the impact on psychosocial well-being for ALC residents. Results of regression analyses indicated that ALC residents who received RASCALS had significant gains in positive relations with others compared to the comparison group. Social integration has been identified as a key element to well-being for older adults in long term care facilities (Lem et al., 2021), such as ALCs, and the RASCALS program appears to have promise in fostering positive attitudes toward one's relationships. This is an intriguing result and one that is well-situated across several bodies of literature related to group activities for older adults, nature-based activities, and technology-enhanced activities for older adults (see e.g., Gagliardi & Piccinini, 2019; Knecht-Sabres et al., 2020; Plys, 2019; Pudur et al., 2023; Yeo et al., 2020).

Engagement in activities has been shown to have promising effects on well-being for older adults. Group

Table 3. Standardized Regression Coefficients for Change in Well-Being Associated with Receipt of RASCALS Programming Among Assisted Living Residents ($N = 33$).

Variable	Overall well-being		Positive relations with others		Autonomy		Environmental mastery		Personal growth		Purpose in life		Self-acceptance	
	β	p	β	p	β	p	β	p	β	p	β	p	β	p
Experimental group ^a	-.08	.854	.87	.008	-.31	.388	.22	.526	.21	.548	-.09	.808	-.23	.502
Number of sessions attended	.06	.868	-.53	.089	.20	.577	.13	.717	-.35	.329	.16	.655	.53	.124
Marital status ^b														
Widowed	.46	.075												
Other	.59	.087												
Intercept (b)	-10.17	.061	-2.97	.022	.29	.823	-85.52	<.001	-.38	.768	.19	.915	-.24	.777
Adjusted R^2		.10		.26		-.06		.01		-.05		-.09		.06

Note: All models were specified with group (experimental or comparison) and number of sessions attended as primary independent variables. Variables that differed significantly by group and were associated by baseline levels with the dependent variable (i.e., well-being or specific domain of well-being) were included in the model specification for that dependent variable. Significant coefficients are indicated with bold font.

^aReference is the comparison group.

^bReference is married.

activities, in particular, allow residents to meet new people and establish new relationships, which has been shown to be associated with increased perceived social support, social wellbeing, psychological wellbeing, life satisfaction, and quality of life (Bradshaw et al., 2012; Chang et al., 2014; Cummings, 2002; Hall et al., 2011; Knecht-Sabres et al., 2020; Plys, 2019; Pudur et al., 2023; Street & Burge, 2012; Winstead et al., 2014). The findings from the present study provide further support for the beneficial effects of a group activity for ALC residents.

The results from this study also support the literature on the benefits of nature for individuals across the lifespan and across levels of ability and disability. The literature is replete with examples of nature-based activities that enhance well-being for older adults (for reviews, see Gagliardi & Piccinini, 2019; Yeo et al., 2020), including outdoor activities (e.g., horticultural therapies, walking, or sitting outdoors, gardening) and indoor activities (e.g., indoor gardening, looking at aquariums, watching videos, virtual reality). Benefits range from higher emotional well-being to less sleep disturbance to improvements in cognitive functioning (Gagliardi & Piccinini, 2019; Yeo et al., 2020). However, the authors of these reviews caution that evaluations of nature-based interventions for older adults often lack methodological rigor. For example, studies lacked experimental designs, were often underpowered, were susceptible to selection bias, and the duration of the interventions was often quite brief (8 weeks or less). The methods used in the current study address many of these concerns, adding credence to the understanding that nature-based activities can enhance psychosocial well-being in long-term care settings. In the future, the RASCALS intervention should be evaluated on a larger scale to address limitations of statistical power, and perhaps target the social outcomes of this program with more complex and comprehensive

approaches, such as social network analysis. This may yield a more nuanced understanding of the impact of RASCALS on residents' social integration. In addition, future studies should focus on the understanding the frequency and duration of participation in RASCALS needed to reap benefits. On average, the participants in the experimental group attended 60% of the sessions offered, and although the number of sessions attended was not associated with change in well-being in this study, it is possible that there was a floor or a ceiling to the effect that was not detected in our analyses.

Despite the promise of nature-based activities for older adults, access to nature remains a challenge for many older adults. Mobility limitations have been identified as a primary barrier to engagement with nature for older adults, especially in the case of outdoor activities (Schehl & Leukel, 2020). The designs of long-term care facilities, such as ALCs, can also be problematic in terms of access to nature. Some facilities lack outdoor space. Other facilities may have outdoor spaces, but access and use are limited due to physical barriers (e.g., heavy doors, thresholds) or the lack of proximity, pathways, seating, or shade (van den Berg et al., 2020). While it remains important for assisted living communities to incorporate nature in their design elements to the extent possible, indoor nature activities may help offset barriers to direct immersion in nature (Yeo et al., 2020). In the present study, we used technology to overcome these barriers and it appeared that even remote access to nature can have benefits for older adults. This finding is aligned with emerging evidence regarding the use of technology-enhanced activities for older adults. Although a relatively new area of research, initial evidence exists for the feasibility and potential positive impacts of using digital/virtual activities with older adults, including those residing in ALCs. For example, information and communication technologies have been

shown to improve social support and connectedness among older adults (Barbosa Neves et al., 2019; Chen & Schulz, 2016). Furthermore, virtual activities have proven feasible in fostering intergenerational connections among older and young adults, with both age groups reporting enjoying virtual opportunities to socially connect with one another during the isolation of the COVID-19 pandemic (Fassi & Rickenbach, 2022). Socioemotional benefits have also been found among older adults living in ALCs who play digital games, especially when those games involve playing with others (Kaufman et al., 2018). Finally, in a randomized controlled trial, older adults in ALCs who participated in virtual reality reminiscence therapy (VR RT) showed increased improvements in psychological well-being beyond that experienced by older adults participating in traditional (non-virtual) reminiscence therapy. Participants in VR RT also indicated high levels of positive experience utilizing this technology (Khirallah Abd El Fatah et al., 2024). Although further research is warranted, practitioners should consider the use of nature-focused livestream group activities in ALCs.

Limitations

Despite the potentially promising findings for this innovative nature-focused group activity, it is important to recognize some key limitations to the study. Although the analyses controlled for differences between the experimental and comparison groups, assignment to the groups was not at random, increasing the likelihood that the groups may have differed in ways that were salient to the well-being outcomes. There were missing data on some variables (e.g., hearing), and our analyses used pairwise deletion, which could have reduced the analytical power of an already small sample ($N=33$). Future research with larger samples in which random assignment to groups can be done at an ALC-level could help address these concerns. Further threatening internal validity is the fact that the pre-test scores for Positive Relations with Others for the comparison group was relatively high. It is possible that the significant difference in change in this domain of well-being could be related to regression to the mean for the comparison group. Another consideration is the relatively low scores on the cognitive assessment among the participants. Efforts were taken during data collection to make sure participants understood the questions, had plenty of time to answer, and the environment and timing were conducive to data collection (e.g., in a quiet and private setting, when the participant was alert and communicative). However, there could be measurement error related to recall or other biases associated with the residents' cognition.

In addition to the statistical and measurement considerations for this study, the fact that most of the *RASCALS* sessions were facilitated by the same person may limit the generalizability of the findings. Although the research team met regularly to ensure consistency in

program activities regardless of the facilitator, it is possible that the sustained relationship with one facilitator may have affected the social well-being of those in the experimental group. Controlling for the number of sessions attended likely helps reduce this potential bias, as does the fact that residents in both groups had sustained contact with the ALC's activity director, who delivered other programming in the community. Future research using a variety of well-trained facilitators and a standardized intervention guide will provide greater insights into the effects of *RASCALS* in different contexts and with different facilitators.

Conclusion

Activities for older adults residing in ALCs can be overlooked when the focus is on physical care and health; however, there is emerging evidence that activities that combat loneliness and social isolation may be more important than once thought. In the current study, we found that a nature-based, livestream group activity (*RASCALS*) had the ability to improve the Positive Relations with Others domain of well-being. These findings hold implications for researchers and practitioners alike. For researchers, there is an opportunity to explore the development and testing of activities that bring together low-tech (i.e., nature) and high-tech (e.g., livestreams, virtual reality) approaches. Researchers should also explore how shared experiences grounded in nature can foster a sense of community and connection. For practitioners, this study suggests that older adults have the ability and the desire to be engaged with nature, and that technology can be viewed as a facilitator. Providing activities that support connection and inclusion are an essential way to help dismantle potential tangible and intangible institutional barriers that separate older adults in long-term care from each other and from the world outside.

Author contributions

The authors confirm contribution to the paper as follows: study conception and design: Rebecca L. Mauldin and Keith A. Anderson; data collection: Megan R. Westmore, Rebecca L. Mauldin, and Anna Tulloh; analysis and interpretation of results: Megan R. Westmore and Rebecca L. Mauldin; draft manuscript preparation: all authors. All authors reviewed the results and approved the final version of the manuscript.

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