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Physical Activity Interventions for Older Adults: Efficacy, Adherence and Sustainability for Stroke Prevention Outcomes

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Physical Activity Interventions for Older Adults: Efficacy, Adherence and Sustainability for Stroke Prevention Outcomes

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ABSTRACT Objective: To examine outcomes of older adults who participate in physical activity intervention programs, whether there is a significant difference in group and individual based physical activity interventions, and assess promise of older adult behavior change post-intervention. Methods: Literature review using seventeen previously published data on physical activity intervention programs for older adults. Results: Studies suggest that physical activity program intervention for older adults show improved physical and mental outcomes. Group-based interventions are more successful for program adherence. Discussion: Family and social support play a significant role in participant adherence to program physical adherence interventions, as well as sustained positive behavior changes post-intervention.

INTRODUCTION

The population of older adults currently makes up 8.5% of the world's population, and the number will continue to rise. By 2050, it is predicted that the percent of older adults will compose of 17% of the global population (National Institute of Health, 2016). Stroke is one of the most common conditions suffered by older adults, and the third leading cause of death (Van Houtven, et al.,

2018). Stroke risk-factors include: sedentary lifestyle, high blood pressure, diabetes, heart disease, smoking, obesity, unhealthy diet and more.

Many studies have been done about preventing heart attacks, and Cardiovascular Disease (CVD) but because heart attacks and stroke have many

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common risk factors, it is important to pay more attention to preventing stroke. Many studies have been done about preventing heart attacks, but far less studies discuss prevention of stroke. While stroke and CVD have similar risk factors such as obesity, hypertension, and high cholesterol, stroke is unique from CVD due to the inability to reverse the adverse effects and negative quality of life outcomes tied to post-stroke disability (Sen et. al, 2020; Nash & Fillit, 2006). Stroke is currently the leading cause of long-term serious disability (Center for Disease Control, 2020). Some of the outcomes include paralysis, problems using and understanding language and memory, as well as sensory issues that may amplify pain (National Institute of Neurological Disorders and Stroke, 2020). Because stroke can cause so many physical and cognitive limitations, it can result in years of rehabilitation, that require a wide variety of medical staff. Approximately \$34 billion is used annually on stroke health care related costs in the United States (CDC, 2020). Because of the rising incidence of stroke in older adults, delivering high quality is becoming increasingly challenging especially with the rise of chronic diseases and cost of care (Prince, et al., 2015).

Physically active individuals have lower rates of stroke than those who follow a sedentary lifestyle (Middleton et al., 2013). Older adult physical activity guidelines promote an average of 150 minutes of exercise a per week (Harris, et al., 2018). Physical activity programs are in place to serve both as primary and secondary prevention methods to either prevent stroke all together or improve physical function post-stroke, and prevent future stroke-related incidences in older adult populations by promoting physical activity. These programs take place in different settings such as hospitals, individual homes, or community settings as well as follow different intensity regimens. After finding different settings and physical activity interventions and implantation methods, the following research questions were explored. What outcomes are used to measure intervention efficacy? Is there a significant difference in group vs. individual based programs? Which interventions show promise of longest adherence and sustained

behavior change with physical activity as part of lifestyle?

METHODS

A literature review was done with the use of DePaul library database, Google Scholar and PubMed. Key words in search consisted of: physical activity, exercise, older adults, stroke, adherence and prevention. Studies done outside of the United States were not excluded from the literature review. Twenty-nine studies were found that included key-words, and seventeen studies qualified for further investigation and literature matrix coding. Studies qualified if they discussed the keywords mentioned above, as well as included an older adult population sample. Fifteen studies are included in the literature review. Two of the seventeen studies did not quality. One study did not include a sample size of older adults, the other was a survey-based study on beliefs and perceptions of physical activity post-stroke. See Figure 1.

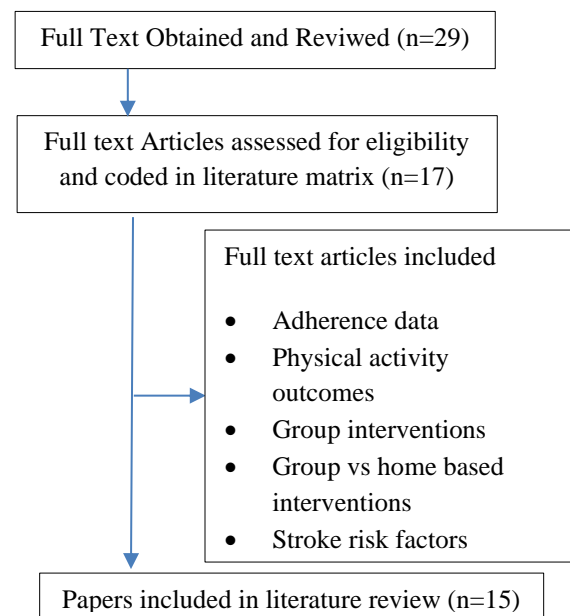


Figure 1. Flow of studies reviewed.

RESULTS

Outcomes of PA Programs

Although there were differences across studies how outcomes were measured, published studies showed a trend of improved physical, mental, and

lifestyle adaptation outcomes after the completion of physical activity intervention program. This trend was evident in published studies that implemented intervention programs, whether they were community, group or home based. Physical activity outcomes can include improved balance, flexibility, strength, or increased amount of time exercising. Mental outcomes include feeling an overall well-being, a sense of involvement and control over ones health after participating in physical activity programs. Some additional lifestyle changes may promote group exercise, or including healthy habits into everyday life such as adapting healthy diets. See Table 1.

Physical activity outcomes showed significant improvements in several groups. In a study done by Cyarto, et al., (2008) three interventions took place: a group resistance training program, home resistance training program, and a control walking group. Group based resistance training took place twice a week, in a common room, with a trained instructor (2008). Home based training included eight private sessions with an instructor at home for the first month, and picture guides for the remainder of the program. Of the three groups, the group based resistance program showed most improvement in four resistance tests, and improved significantly in strength and flexibility (Cyarto, et al, 2008).

A similar study took place in Belgium, with a control group, structured control group with closely monitored physical activity three times a week, and a life style group with home based exercise interventions (Opdenacker et al., 2008). Researchers gave the life-style group the most recommendations on implementing not only exercise but goal setting and increasing autonomy as well (Opdenacker et al., 2008). While both the structured control group and lifestyle group had significant improvements in increasing physical activity during post-test of the study, only the lifestyle group maintained their adherence to exercise a year after the study (Opdenacker, et al., 2008). While adherence is not a health outcome, it does play a significant role in improving health

outcomes. Adherence to program interventions will be explored in the following section.

In a study done by Silva-Smith, Fleury & Belyea, intervention and control groups were both given pedometers to measure walking activity for eight weeks (2013). The intervention group received hypertension appropriate diet guidelines, a lay health advisor with weekly sessions facilitated by interventionist, as well as supervised 30 minute walks. The control group was mailed health newsletters weekly for the duration of the study. Significant improvement in physical activity took place in the intervention group, with more self-reported and pedometer steps weekly (Silva-Smith, et al., 2013). Physical activity was increased when monitored and overlooked by trained professionals in an individual program.

In Kim's, et al., (2004) study, researchers looked at the impact of using lay health advisors on several factors such as physical activity, lifestyle changes, and overall knowledge of health issues in Latino communities. The study was not experimental due to the lack of a control group, but a public health intervention looking to improve health disparities by utilizing outreach programs to local community members. After applying community educational outreach programs, in a culturally appropriate setting, there were improvements in lifestyle and mental outcomes promoting healthy behaviors in older adult minority individuals. Study participants developed an improved need for physical activity, a sense of well-being, and incorporated family members into exercise routines to promote group wellness (Kim, et al., 2004). Additionally, participants attending group educational programs voiced interest and remained engaged in the health education curriculum (Kim et al., 2004). Here participants experienced both improved physical activity outcomes, as well as lifestyle and mental improvements due to the

educational classes in culturally appropriate settings.

Program Adherence: Individual-Based vs. Group-Based

Due to the different settings and natures of studies, programs resulted in different adherence outcomes. Programs explored were either home based, group-based, or group-based with a concentration in community involvement. Trends have shown that individual based physical activity programs for older adults tend to have a lower adherence rate than group based interventions (Simek, McPathe & Haines, 2012, Cyarto et al., 2008, Steinman et al., 2011). It is specifically important to implement physical activity support after hospital stay, as patient will be less likely to adhere alone (Andreasen, Soendergaard & Holst, 2018). Barriers to home programs may include motivational and safety barriers. Facilitators to group adherence programs may include social components, motivational factors and facilitator supervision.

Adherence to a home program can be difficult when there is a lack of guided social interaction. A home program is one that is done individually in the participant's own home, using resources that were given by the study leaders. In a study conducted by Simek, McPathe & Haines, it was reported that older adults would often neglect the home component of an exercise intervention because of the lack social interaction (2012). Additionally, participants may feel that the group component is sufficient enough to achieve the physical activity health outcomes they desire, so it is enough to not participate in the home exercise as well (Simek, et al., 2012). Moreover, a healthcare provider's supervision can be influential to maintain intervention adherence in older adults. Guidance is necessary, because there is a decreased probability that patients will adhere to a physical activity program alone (Andreasen, Soendergaard & Holdt, 2018). This is in line with

the study conducted by Cyarto et al., as participants in the home-based resistance study had no significant change from pre-test to post test, showing far less exercise than the group-based resistance program (2008).

Safety is another barrier to adherence to home-based programs. In a study about exercise adherence of elderly living in urban areas, exercising alone resulted in decreased adherence due to safety issues of walking alone outdoors in a low-income, and according to the residents dangerous neighborhood conditions (Stineman, et al., 2011). Out of 12 participants in the home-based intervention group in the study, only one classified as "high adherence" and reported all the exercises to be completed (Stineman, et al., 2011).

Social components have a critical role in increasing physical activity and adhering to intervention programs. Social aspects can be reflected especially in minority groups, where family and religious groups play important role in individuals lives. Religious gatherings such as churches create safe spaces where individuals who are already accustomed with each other can participate in culturally-appropriate activities. This may explain why in Stineman et. al., study, African-American group-intervention adherence was much higher than the home intervention program (2010). The participant of the studies focus group were pulled from a local church, and a social group day program. Researchers found the importance of group intervention from the emphasis on the focus groups perspective on group activity in their community. The on-site group physical activity was high in 68 out of the 92 participants (Stineman et al., 2010). A similar desire to participate, share new learned health information and physical activity interventions was reflected in Latino group-education classes led by lay health advisors (Kim, et al., 2004). Older adults are at risk of social isolation, and

approximately 30% of non-institutionalized older adults lived independently in 2010 (Coyle & Dugan, 2012). Additionally, retired older adults lose their main outlet for social contact, therefore have more free time and an increased desire to join social groups activities (Vogelsang, 2016). This research supports that group programs - especially community based interventions - facilitate socialization between group intervention participants, resulting in increased motivation for adherence among participants (McPathe et al., 2013).

An additional group exercise facilitator was a willingness for a group of stroke survivors to exercise together (Damush, et al, 2007). This reflects both the safety and socialization aspect of group physical activity, because the stroke survivors found comfort in each other's shared stroke experiences. By being at a group exercise class that was targeted at improving physical outcomes post-stroke, under caregiver supervision, the participants were able to be comfortable around one another and increased their motivation to attend class (Damush, et al. 2007).

Sustainability

Adherence and sustainability go hand in hand – the more older adults adhere to physical activity interventions the more knowledge they gain that might be applied to their lifestyle post-intervention. Program sustainability is critical in ensuring patients continue physical activity long after program interventions have finished. Sustainability is a key factor, as preventing stroke will only occur when physical activity occurs over long periods of time, and participants do not return to sedentary lifestyles and previous unhealthy behaviors. Sustainability could be achieved in many ways, however common trends explored focused on community-engagement and content of program intervention.

In some cases, community-based physical activity interventions served as a positive reinforcement for sustainability and continued good-health behaviors. In Latino communities, using lay health advisors promoted sustainability for several reasons. First of all, lay health advisors were Latino community members that were trained to educate about healthy diets and physical activity, so they were trusted members of the community that participants could gain important information from. Lay health advisors were advisors that could speak Spanish, so important information would not get lost in translations. Additionally, lay health advisors were shown to be cost effective in promoting healthy behavior to reduce smoking, obesity and promote nutrition in Latino communities (Kim, et al., 2004). Analyses from baseline to follow-up showed significant improvement in study participant health behaviors, suggesting a positive influence of lay health advisors on healthy behaviour improvement and sustainability (Kim, et al., 2004). Affordability, linguistic accessibility and trusted members of the communities encouraged participants to continue health education after the intervention study has concluded (Kim, et al., 2004).

Content of intervention programs play an important role in maintaining good-health habits after end of program intervention. Researchers Opendacker, et al.,(2008) found that physical activity interventions with a life-style modifying components such as goal setting and self-motivation tactics had most successful rates of continued physical activity levels even after the conclusion of the study. Additionally, individual factors play a role in sustaining physical activity post-intervention as well. Having motivation to exercise due to family support, having a pet, or specific doctors' orders increased participant's motivation for exercise, (Damush, et al., 2007). Having family support can be crucial to encouraging or diminishing interest in

participants' physical activities. For example, researchers Kim et. al, (2004) explored how family resistance can be challenging when "husband does not want to get up and exercise" but participants are more inclined to walk and exercise if children join their routines. Incorporating these aspects into intervention methods may increase sustained physical activity in older adults over time. Physical activity content also influences whether exercise is sustained over time. Programs that incorporated

walking regimen into older adults physical activity intervention created increased sustainability due to the ease of the exercise itself (Simek, McPhate & Haines, 2012). Older adults showed difficulty sticking to physical activity after end of intervention when the use of a gym was involved, due to the increased costs of joining a fitness center or intimidation of working out without the supervision of a trainer (Opdenacker et al., 2008).

STUDY	INTERVENTION DESIGN	LEVEL OF PREVENTION	FINDINGS	IMPLICATIONS
ANDREASEN, ET AL., 2018	Case management; tailored PA to patients individual needs	Primary	Positive responses: awareness of PA, being center of care, education component perceived well by patients	Important to include PA support after hospital release, patient less likely to adhere to PA regimen alone
CYARTO, AT AL., 2008	Health teaching, counseling, community outreach	Primary and Secondary	Significant improvement in group based exercise	Group PA programs for OA's help maintain strength and functional ability
KIM, ET AL., 2004	Screening, outreach, health teaching	Primary	Significant increase in scores from baseline to follow up in participants in health behavior groups	Program sustainability plays important role in participants attendance in PA programs
MCPATHE, ET AL., 2013	Health teaching, counseling, outreach	Primary	Group exercise programs resulted in higher adherence to total number of session provided (74%)	Longer program duration, more flexibility, and higher complexity resulted in decreased adherence by participants.
OPDENACKER, ET AL., 2008	surveillance, case management, health teaching	Primary	Significant improvement in participants in group physical activity support	Physical activity in OA's most improved with support in healthy lifestyle changes
PANG, ET AL., 2005	Community organization, screening, health teaching	Primary	Significant improvement in intervention group in cardio fitness, mobility and strength	Serves as a good model for community based programs for OA's with chronic diseases
RIVERA-TORRES, ET AL., 2019	Surveillance, case management, health teaching, counseling	Tertiary	Improving program PA adherence enhances patient safety, adherence to PA as predictor of health status	Poor adherence to PA treatment programs in OA's is worldwide problem
SILVA-SMITH, ET AL., 2013	Counseling, health teaching	Primary	Significant improvement in pedometer steps posttest in intervention group	Group PA classes provide beneficial form of motivational interventions that result in behavioral changes
SIMEK, ET AL., 2012	Health investigation counseling, health teaching	Primary and secondary	Greater adherence to walking exercise programs, decreased adherence to flexibility training	Program PA characteristics may affect OA's adherence to exercise
STINEMAN, ET AL., 2011	Outreach, counseling, collaboration, community organizing	Secondary	On site, group exercise programs resulted in higher adherence than at home exercise program.	Exercising alone at home creates safety issues to OA's.
WEINRICH, ET AL., 2014	Community organizing, case management	Primary and Secondary	Six months after intervention group improved while control declined in gait and balance	Foreign based study, may create challenges in sustainability in the United States

Table 1. Main findings and implications of included studies.

DISCUSSION

The studies examined the questions of what are the health outcomes of physical activity programs

in older adults such as: improved physical outcomes as well as, a sense of well-being, positive engagement with program material. Studies additionally examined whether individual or group programs more effective, and what

factors should be considered to ensure adherence and suitability takes place once program interventions are concluded. Studies have shown that stroke prevention can be improved by increasing patient knowledge of physical activity on recurring stroke prevention (Laloux, Lemmonnier & Jamart, 2010). Studies dictate that over 30% of older adults do not participate in physical activity, yet physical activity is the largest factor in reducing risk of stroke (Silva-Smith, et al., 2013). With improved knowledge and support, older adults have greater support in completing exercise interventions to prevent stroke.

Physical activity programs are safe and effective ways to prevent initial stroke or prevent recurring stroke in surviving patients. Multiple examples of interventions being successful took place with emphasis on structured PA intervention, support systems and appropriate cultural support. These are some common themes and best practices that future physical activity stroke prevention programs could implement into their intervention models for added success rates.

Intervention groups create greater opportunities for success for participating older adults. While in many cases both control and intervention groups can see improvements in physical activity, intervention groups based on closely monitored physical activity have better adherence and physical activity outcomes (Pang, et al., 2005). Older adults program adherence can serve as an important predictor of health status and mental well-being (Rivera-Torres, Fahey & Rivera, 2019).

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Social components such as group meetings, and family support also play a role in older adult's adherence to the program intervention. These studies serve as prospects for future research on older adult physical activity programs, and how opportunities for different forms of social support can have effects on program intervention adherence.

Sustainability efforts such as including motivation strategies and goal setting helps promote continuation of physical activity in older adults. The use of group community-based programs adds to sustainability due to low costs for participants, and ability to continue social interaction with other group member which adds and additional motivational component for attending classes.

While there is a large amount of studies on physical activity programs for older adults, assessments of outcomes differ from study to study making intervention effects less directly comparable. Additionally, as mentioned, not all studies took place in the United States. This poses difficulty in finding program effectiveness in the United States when different interventions took place across different ethnic populations. One of the limitations is that there are many exercise intervention models, however there is no cohesive system in place to measure outcomes of physical activity interventions.

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