

Blending v-LiFE and O&M training to build self-confidence and self-determination for independent

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Abstract

Orientation and mobility programs are uniquely crafted training programs to support people with vision impairment to achieve daily living independence and social participation. Like any other learning tasks, they require self-motivation on the part of the learner to be able to successfully engage and experience the benefits of such programs. For many older adults, variables such as sedentary lifestyle, declining physical strength, fear of falls, feelings of perceived inadequacy or lack of competence, may impact negatively their willingness and confidence to keep moving. We are presenting the results of four case studies that have investigated the potential of pairing an Orientation and Mobility program with the benefits of the vision-Lifestyle-integrated Functional Exercise (v-LiFE) program; a unique functional exercise program designed to keep an individual active while performing everyday life tasks. Pairing the two programs together benefits individuals across several domains: moving and completing daily activities with improved confidence, increasing awareness of body posture and movement and developing overall self-confidence and independence.

Keywords

Orientation and Mobility, functional exercise, habit forming, vision impairment, rehabilitation

Introduction

It has been well documented that aging is consistently associated with a decline in physical activity, a trend that is especially pronounced among individuals with disabilities (Flynn et al., 2024; Ramulu et al., 2012). For example, Smith et al. (2017) found that individuals with vision impairment were more than twice as likely to be physically inactive compared to those reporting excellent vision. Physical inactivity has also broader implications for quality of life. People with vision impairment consistently report significantly lower quality of life scores compared to the general population across all age groups (Bonsaksen et al., 2023). Evidence suggests that physical activity can

positively influence psychological health and overall life satisfaction in this population, highlighting its importance as a modifiable factor in enhancing quality of life (Caputo et al., 2022).

Orientation and Mobility (O&M) programs are specifically designed to support individuals with vision impairment in achieving independence in daily living and social participation (Deverell et al., 2009). Learning to use a white cane or walk with a guide dog represents a critical step toward independence for people who are blind or have low vision (Deverell et al., 2009). However, students undergoing white cane or guide dog mobility training may face physical and psychological

challenges, including difficulties with coordination, posture, and confidence (Russo et al., 2022). For example, the physical effort and coordination required to arc the cane while walking can disrupt balance—particularly in individuals with pre-existing balance issues or medical conditions, and especially among older adults (Ramsey et al., 2003). The prevalence of postural sway, gait and balance deficits increases with age (Osoba et al., 2019). This decline in physical strength, combined with a sedentary lifestyle, fear of falling, and feelings of inadequacy or low self-efficacy, may negatively impact older adults' willingness and confidence to remain active and successfully engage in O&M programs (Seybold, 2005).

The vision-Lifestyle-integrated Functional Exercise (v-LiFE) program was adapted for delivery by O&M instructors to individuals with vision impairments from the evidence-based LiFE training program, which has been shown to prevent falls in the older adults (Clemson et al., 2012). The v-LiFE program is specifically designed to improve muscle strength and balance in adults aged 50 years and older and is particularly beneficial for those who have lost confidence in their ability to move safely and independently (Dillon et al., 2020, Keay et al., 2015). Unlike traditional exercise programs, functional exercise in v-LiFE is integrated into daily routines rather than performed as separate, structured workouts (Clemson et al., 2012), and exercises triggered by routine activities help participants form new movement habits (Holland et al., 2006).

In this study we explored whether combining the v-LiFE program with O&M training could:

- Improve physical confidence and balance,
- Increase motivation to engage in mobility training, and
- Enhance overall wellbeing and independence in older adults

Methods

Between March 2024 and January 2025, four Guide Dogs clients, participating in an O&M training program reported experiencing reduced muscle strength and balance. In response, they were invited to join a six-session v-LiFE program designed to support their physical wellbeing. Consent from clients was obtained to use the de-identified data in future research for publication.

Clients Profiles

Client A: a 74-year-old woman referred to the neurological O&M program following a stroke that resulted in homonymous hemianopia, causing loss of half her visual field. She was also awaiting knee-replacement surgery, which further restricted her mobility. Prior to the stroke, she led an active lifestyle, engaging in dancing and swimming. The combined impact of stroke and knee pain significantly reduced her confidence in moving safely indoors and outdoors. Her O&M program focused on rebuilding confidence and compensating for visual field loss through safe mobility techniques, environmental scanning, and route planning.

Client B: a 63-year-old woman diagnosed with Retinitis Pigmentosa who led a sedentary lifestyle with no regular exercise routine. Progressive vision loss had severely impacted her confidence, especially in unfamiliar environments. She expressed concern about maintaining balance and safe mobility during an upcoming cruise with her husband. Her O&M goal included improving confidence and independence in dynamic environments while using her white cane.

Client C: a 73-year-old woman who experienced near-total vision loss following multiple strokes. Despite maintaining high physical fitness through regular gym activities, she reported significant anxiety about mobility and reduced confidence in navigating safely outdoors. In particular, she reported frustration at not being able to work in the garden leaving her husband with tasks she had previously completed such as bringing in wood. Her O&M goal was to restore independence and address emotional barriers to participation in meaningful activities.

Client D: a 66-year-old blind man, a professional golfer and guide-dog user, who experienced a noticeable deterioration in balance and posture. These changes significantly impacted his ability to play golf at a professional level and affected his daily mobility and overall wellbeing. The O&M program aimed to restore balance, improve posture, and maintain independence to support continued engagement in professional and recreational activities.

Program Delivery

Participants A, B, and C completed a six-session v-LiFE training program (Keay et al., 2015), while Participant D completed five sessions. The program

was delivered via video conference by an O&M instructor, with in-person support provided either by another O&M instructor or a family member at the participant's home. The intervention was tailored to the individual's needs, and it integrated "functional exercises," as defined by Clemson et al. (2012) and referred to hereafter as "activities," into daily routines. The program comprised eleven activities targeting muscle strength and seven activities aimed at improving balance (Appendix 1A-1B). Examples of embedding functional activities into daily tasks included: practicing the activity "tandem-stand" while waiting for the kettle to boil, performing "sit-to-stand" whenever rising from a chair, and practicing the "tandem-walk" when moving from the bedroom to the bathroom upon waking.

At the first session, the participant's daily routine was reviewed to identify opportunities for pairing each v-LiFE activity with an existing daily task. During each session, two to three strength and balance activities were introduced. Participants were encouraged to practice these activities between sessions and to progressively increase the challenge by reducing the surface of support or increasing the frequency of repetitions (e.g., integrating the activity with multiple daily tasks).

Measurements

We used a mixed method approach to evaluate the delivery of the program:

Quantitative indicators

Physical performance was assessed pre- and post-intervention using two indicators from the Short Physical Performance Battery (SPPB) (Guralnik et al., 2000): Five Times Sit-to-Stand Test and the Timed Up and Go Test (Figures 1 and 2). For each v-LiFE activity introduced, the level of support (Appendix 2A-2B) required by each participant to perform the activity was recorded as a baseline benchmark and re-assessed at the final session. For the tandem stand balance activity, typically introduced during the first session, the level of support needed was monitored at each session and compared among three participants (A, B, and C) who completed all six training sessions (Figure 3).

Pre and Post scores of Five times sit and stand- 5XSTS

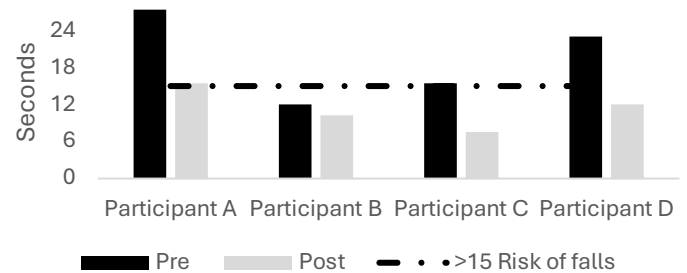


Figure 1. Pre and post scores (time in seconds to complete five times sit to stand). The dashed line shows the benchmark for risk of falls (>15 seconds).

Pre and post scores of Timed up and Go

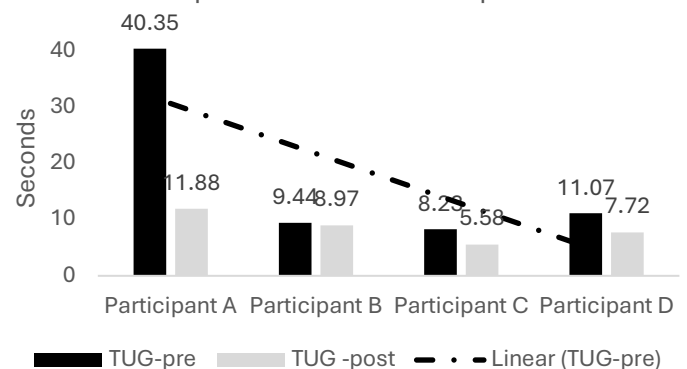


Figure 2. Pre and post scores (time in seconds to stand from a seated position and walked 3 meters in front of the chair and return to seated position) of Timed Up and Go. The dashed line shows the linear trend for all four participants.

Qualitative indicators-participants' feedback

Participants provided qualitative feedback on the program's usefulness, overall satisfaction, its impact on mobility independence, and their confidence in performing activities of daily living tasks (e.g. showering, putting on shoes, getting dressed) that require balance. Notably, Participant D offered detailed performance-related feedback from his golf training sessions. Using radar technology at the golf training box, key metrics such as angle of attack, swing path of the golf club, and ball speed were recorded to evaluate changes in his functional performance.

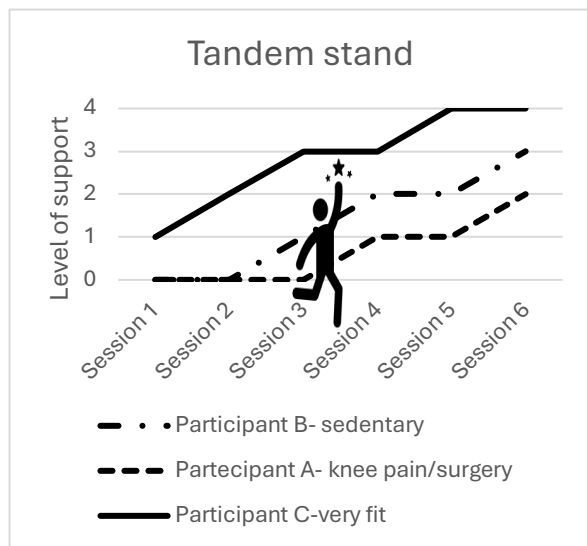


Figure 3. Trend of the ability to perform the "Tandem Stand" activity across the 6 sessions of the program. Regardless of their initial fitness, all participants showed a similar pattern of improvement. By session three they all required less support. Client D is not included as it completed only five sessions, nevertheless he also progressed from full support (level 0) at the initial session to no support (level 3) by the fifth session.

Results

Quantitative indicators

The Five Times Sit-to-Stand test showed consistent improvement across all four participants (Figure 1). At the end of the program, completion times were lower for every participant compared to their initial time, indicating enhanced ability to rise from a seated position. These results suggest a meaningful improvement in overall functional lower-limb strength.

Similarly, the Timed Up and Go test results revealed consistent improvement across all four participants (Figure 2). Observations during testing indicated that participants were walking with greater confidence and a more stable gait at the end of the program, reinforcing the positive impact of the intervention on balance and overall mobility.

Across six training sessions, all participants showed a steady reduction in the level of support required to perform the "tandem-stand" activity (Figure 3). The

pattern of improvement was consistent across all three participants, regardless of their initial fitness level. At the outset, each participant required some form of support—ranging from full hand support to intermittent fingers support—but by the third/fourth session, all were able to complete the activity without constant support.

Participants' feedback

Participant A

"I feel more motivated to leave the house and go for a walk. The activities have become part of my daily routine, and I often think about how I can incorporate more v-LiFE activities throughout the day. I've started standing while showering and cooking, and I feel stronger. I'm even considering postponing my knee surgery and will discuss it with my GP."

Participant B

"I feel much more confident moving around my home and when I'm out in the community. The training improved my balance while I was learning to use the cane, and pairing the two programs has been a real success. My husband has noticed that I'm more stable on my feet when walking. I'm especially surprised by the progress I've made with my balance—at the start of the program, I never imagined I could walk the "tandem-walk" without support."

Participant C

"I must admit that at the start of the program I wasn't confident that it would make much difference to my physical fitness. However, I am very surprised by the impact it had especially on my balance. I now feel capable of doing most of my daily tasks while standing and am ready to challenge myself by returning to kayaking. The program has really boosted my confidence that I can enjoy again activities that are meaningful to me."

Participant D

"Before starting this program, I was averaging about one fall per week. It's now been three months since I've fallen or even stumbled at the golf course. My overall balance and posture have improved significantly, but most importantly, I'm playing golf much better. My instructor showed me the radar measurements from my training box, and I've improved across all parameters: angle of attack,

ball speed, and swing path. That makes me feel incredibly proud."

Discussion

The findings from these case studies highlight the potential benefits of integrating O&M training with the physical activities from the v-LiFE program for older adults with vision impairment. This combined approach demonstrated improvements across multiple domains, including physical strength, balance, self-efficacy, and confidence in mobility.

Despite participants starting with markedly different levels of fitness and physical strength, all showed a steady reduction in the level of support required to perform the tandem stand and other balance activities over five to six training sessions. This progression suggests that the program can enhance balance and stability within a relatively short timeframe.

Importantly, these gains extended beyond physical improvements. As participants advanced through the program, they reported greater confidence in movement, increased awareness of posture, and improved self-assurance in managing balance challenges during daily tasks. These outcomes align with existing evidence that gait and balance are critical predictors of the ability to perform activities of daily living in older adults (Dunsky 2019) and may influence the successful integration of O&M skills into daily routines (Ramsey et al., 2003). The renewed sense of capability among participants underscores the psychological benefits of the program, with all reporting heightened motivation to remain active and improved self-efficacy during O&M training.

These reflections suggest that combining structured balance and strength training with O&M instruction can positively influence both physical and psychological aspects of mobility. Since the late 1980s, rehabilitation service providers for individuals with vision impairment have called for evidence-based research to determine whether these services lead to measurable improvements in functional abilities and psychosocial well-being (Ramsey et al., 2003).

However, this study has limitations: it is primarily qualitative and exploratory, based on feedback from only four individuals. Therefore, further investigations should continue to explore the potential benefits found in this study of pairing O&M programs with the v-LiFE program, in a larger population of older adults.

Given that children and young adults with vision impairments also experience motor delays and face challenges with bilateral coordination and balance (Zečević et al., 2023), future research could look at whether the benefits we observed by integrating strength and balance activities into everyday routines, could inform paediatric O&M intervention programs.

Conclusion

Integrating v-LiFE activities with O&M training may offer a promising approach to improving both physical and psychological outcomes for individuals with vision impairment. These case studies demonstrate that even within a short timeframe, participants achieved measurable gains in strength, balance, confidence, and independence. While further research is needed to confirm these findings in a larger population, our exploratory study suggests that embedding functional exercises into daily routines can enhance mobility skills and overall quality of life. This approach could establish lifelong habits that support active living and optimize rehabilitation outcomes.

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Appendix 1 A. Activities aimed at improving strength

Name	Description
Heal and toe raise	Sit with your back straight and feet flat on the ground. Alternate lifting heels as high as possible with lifting toes as high as possible.
Leg extension	Sit with your back straight and feet flat on the ground. Lift one foot so that the leg is straight and horizontal to the ground. Hold the leg in position, then slowly lower and place foot flat on the ground. Repeat with other leg.
Tighten Buttocks	Clench Buttocks by tilting the pelvis forward. Hold while comfortable then release. Can be completed sitting or standing.
Sit to Stand	Bring buttocks to front of the chair. Using hands on chair only if needed, stand up looking straight ahead. Slowly sit back in the chair, hands positioned as above.
Stand on toes	Stand, looking straight ahead. Lift heels off the ground, hold, then lower heels onto the ground.
Walk on toes	Raise heels and take as many steps on toes as comfortable.
Stand on Heels	Stand looking straight ahead. Lift toes off the ground, hold, then lower toes onto the ground.
Walk on Heels	Raise toes and take as many steps on heels as comfortable
Semi Squat	Bend the knees while keeping the back as straight as possible. Slowly lower your body pushing out the buttocks, stopping at a comfortable range. Hold position then slowly stand.
Walk Sideways	With hips facing chosen support, swing leg to the side then step other leg in to meet it. Take as many steps as comfortable then use opposite leg to go in opposite direction.
Up the stairs	Push through the legs to walk upstairs rather than pulling up with hands on the handrail. Use handrail for support.

Appendix 1B. Activities aimed at improving balance

Name	Description
Tandem stand	Keep your back straight and look ahead while standing with the heel of one foot in front of the toes of the other. Hold, then swap feet.
Tandem walk	Start with tandem stand, then walk, placing the heel of the front foot in front of the toes of the back foot like walking a tightrope.
One leg stand	Keep your body straight and look straight ahead. Lift one foot off the ground. Repeat with other leg.
Lean side to side	Stand keeping your body straight and feet hip width apart. Transfer weight on to one foot until the other foot is almost off the ground. Return to centre before leaning to other side.
Lean forward and back	Stand with body straight and feet hip width apart. Transfer weight on to toes, then on to heels. Hold each position while comfortable.
Step over forward and back	Lift one knee high so it is 90 degrees to the floor and take an exaggerated step over a real or imagined object. Repeat with your back leg. Reverse the activity
Step over sideways	Lift one knee high to 90 degrees and take an exaggerated step over a real or imagined object to one side, follow with the other leg. Return to starting point then repeat movement on other side.

Appendix 2A. Assessing level of support needed to perform balance activities

Decreased base of support	Level 0	Level 1	Level 2	Level 3	Level 4
Tandem stand	Tandem stand with constant support. Or unable to perform.	Tandem stand with intermittent support	Tandem stand with no support	Tandem support with no support while brushing hair or with eyes shut	
Tandem walk	Tandem walk with constant support. Or unable to perform.	Tandem walk with intermittent support	Tandem walk with no support	Tandem support with no support with eyes shut	
One-leg stand	Single leg stand with constant support. Least stable leg: left or right. Or unable to perform.	Single leg stand with intermittent support. Least stable leg: left or right.	Single leg stand with no support. Least stable leg: left or right.	Single leg stand with no support while doing something else such as getting object from cupboard at shoulder height. Least stable leg: left or right.	Single leg stand with no support with eyes shut. Least stable leg: left or right.
Shifting weight and moving to the limits of stability	Level 0	Level 1	Level 2	Level 3	Level 4
Leaning forward and backwards	Stand with feet shoulder width apart; use constant support. Hold for 10 secs or unable to perform	Stand with feet shoulder width apart; use no support. Time position held:	Stand with feet shoulder width apart; use no support. Hold for 10 sec while using mental distractor. Or hold for 10 sec with eyes closed		
Stepping over objects	Level 0	Level 1	Level 2	Level 3	Level 4
Forward and backward	Step in both directions using support. Or not able to perform.	Step in both directions without using support.	Step over foam block without using support	Step over foam block without using support while doing another task such as carrying a dinner plate or with eyes shut	

Appendix 2B. Assessing level of support needed to perform strength activities

Bend the knee	Level 0	Level 1	Level 2	Level 3	Level 4
Squatting	Partial squat with support. Or unable to perform.	Partial squat with no support. Hold for 5 secs.	Half squat with no support. Hold for 5 secs. Or get something from below the sink using a squat.		
On your toes	Level 0	Level 1	Level 2	Level 3	Level 4
Walking on toes	Unable to perform level 1	Walking on toes using constant support	Walking on toes using intermittent or no support	Walk on toes using no support while doing something else such as carrying a plate with a biscuit on it	Walk on toes using no support with eyes shut
On your heels	Level 0	Level 1	Level 2	Level 3	Level 4
Walking on heels	Unable to perform level 1	Walking on heels using constant support	Walking on heels using intermittent or no support	Walk on heels using no support while doing something else such as carrying a plate with a biscuit on it	Walk on heels using no support with eyes shut
Sit to stand / stand to sit	Level 0	Level 1	Level 2	Level 3	Level 4
Standing up from a seated position	Rising from standard chair with hand support. Or not able to perform	Rising from standard chair. No hand support	Rising from a low chair with hand support	Rising from low chair slowly. No hand support, must take at least 5 secs	
Move sideways	Level 0	Level 1	Level 2	Level 3	Level 4
Move sideways	Sideways walk with steps that are shoulder width or less apart, using support or unable to perform	Sideways walk with steps that are wider than shoulder width apart with support	Sideways walk with steps that are wider than shoulder width apart with no support		