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RESEARCH ARTICLE

Clinician acceptability of the ReacStep reactive balance training program for fall prevention

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Abstract

Aim: To examine if a novel reactive balance training program (ReacStep) designed for clinical settings is acceptable to clinicians prescribing balance and mobility training.

Methods: ReacStep consists of tether-release reactive step training, volitional trip and slip training, and functional strength training. An open survey comprising 11-point visual analog scale items (0 = strongly disagree to 10 = strongly agree) based on the Theoretical Framework of Acceptability was sent to clinicians working in balance and mobility training. Items evaluated the acceptability of ReacStep across seven domains (intervention coherence, perceived efficacy, self-efficacy, ethicality, affective attitude, burden and opportunity cost).

Results: Two hundred and seven clinicians (169 Physiotherapists, 22 Exercise Physiologists, 11 Occupational Therapists and five others) completed the survey. Respondents considered ReacStep to have good overall acceptability, intervention coherence, effectiveness, ethicality and self-efficacy (mean acceptability scores >7). However, respondent's ratings of ReacStep's affective attitude, burden and opportunity cost were more variable (mean acceptability scores 2–8) due to concerns about client anxiety, the need for a safety harness and staffing and training requirements. Respondents considered that ReacStep would be more effective and safer to conduct in geriatrics clients compared with neurological clients, and that it would be more appropriate for rehabilitation and private practice settings compared to home settings.

Conclusions: ReacStep was generally acceptable from the perspective of clinicians who prescribe balance and mobility training in various clinical settings, and was deemed more effective and safer for older clients without neurological conditions, and beneficial in outpatient rehabilitation and private practice settings.

KEYWORDS
acceptability, accidental falls, clinical/hospital settings, older adults, reactive balance training, survey

1 | INTRODUCTION

Falls present a challenge to the health and independence of older people, with a third of the population aged 65 years falling each year (Berg et al., 1997; Campbell et al., 1990; Sattin, 1992). Falls in older people lead to injury (Peel et al., 2002), disability (Gill et al., 2004), psychological burden (Yardley & Smith, 2002), and reduced quality of life (Stenhagen et al., 2014). Slips and trips are the leading causes of falls in older community-living adults, likely stemming from a reduced ability to quickly adapt and regain balance following unexpected perturbation (Berg et al., 1997; Campbell et al., 1990). Preventive strategies used to mitigate the occurrence of falls such as strength training, aerobic exercise training, and conventional balance training can reduce falls by 15%–20% in older adults (Gerards et al., 2017). However, these training modalities do not address unexpected perturbations and are therefore limited by the lack of task-specificity to potentially avert falls caused by slips and trips.

To address this training gap, studies have implemented reactive balance training (RBT) to specifically improve the postural responses to induced trips and slips (McCrum et al., 2022). Through repeated exposure to perturbations, RBT enhances the sensory system (i.e., tactile, proprioception, visual, somatosensory and vestibular) to detect a perturbation, and the neuromuscular system to execute rapid compensatory steps to restore balance (McCrum et al., 2017). Systematic reviews of randomized controlled trials (RCTs) have shown RBT to improve balance recovery skills and reduce falls in daily life by approximately 25%–50% (Devasahayam et al., 2022; Okubo et al., 2017). This is especially promising as RBT programs average 4 h/year (Okubo et al., 2017) and thus require a much lower dose compared to conventional balance training recommendations of 3+ hours/week (Sherrington et al., 2017).

Most RBT has been previously conducted using perturbation treadmills (Gerards et al., 2017), moveable plates and obstacle pop-up systems (Okubo, Sturnieks, et al., 2019). However, the application of these interventions is limited due to the requirement of sophisticated equipment and safety concerns when exposing older adults to sudden and unpredictable perturbations (Mansfield et al., 2021). In contrast, manual perturbations applied by a therapist (e.g. pulls) (Mansfield et al., 2018) have clear advantages regarding clinical feasibility but their effectiveness may be limited, likely due to the reduced task-specificity that is, not accurately simulating daily-life hazards such as trips and slips.

A pilot RCT conducted in young participants reported that high doses of intentional (predictable or anticipatory) slip training were as effective as low doses of unpredictable slip training (using an undetectable slip hazard) in improving slip recovery responses (Allin et al., 2018). Such intentional training provides high kinematic task-specificity (e.g., step patterns) but does not involve unpredictability, which is considered to be a major cause of anxiety during RBT (Okubo, Brodie, et al., 2019). Intentional training components may therefore be particularly appropriate for clients with balance impairment who are afraid of falling.

A recent RCT found that RBT can be significantly enhanced by incorporating strength training that targets the muscles used in reactive stepping (Rogers et al., 2021). Furthermore, tether-release is a simple, low-cost perturbation method that can be used to train reactive step training with incremental intensity. Building on these findings, we developed a task-specific training program, ReacStep (Figure 1), that incorporates tether-release reactive step training, intentional slip and trip training and functional strength training while balancing the safety concerns and ecological validity. However, while appearing appropriate for clinical care, the successful implementation of such a RBT program requires acceptability by clinicians, and this as yet, has not been examined. This information, which is crucial for estimating the uptake of the RBT program, could be efficiently obtained via a quantitative and qualitative survey which can reach beyond the geography of the researcher, identify target population, settings and perceived barriers to translate the use of ReacStep (Sekhon et al., 2017).

The primary aim of this study, therefore, was to conduct an online survey to measure and explore the acceptability of the ReacStep program from the perspective of clinicians who prescribe balance and mobility training. The second aim was to identify the target population (e.g. geriatrics and neurological clients) and clinical settings that were deemed to be the most appropriate for this intervention. The third aim was to identify perceived barriers to implementing ReacStep in clinical settings. Findings from this study would assist in refining ReacStep and making RBT more accessible in clinical practice.

2 | METHODS

2.1 | Study design

This study comprised an online survey conforming to the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). The study protocol was reviewed and approved by the [REDACTED] Human Research Ethics Committee (REDACTED). All study participants provided electronic informed consent.

2.2 | The ReacStep program

The ReacStep program is based on the components of effective RBT programs and trains balance recovery kinematics elicited during common gait disturbances in daily life (i.e., trips and slips). A pilot

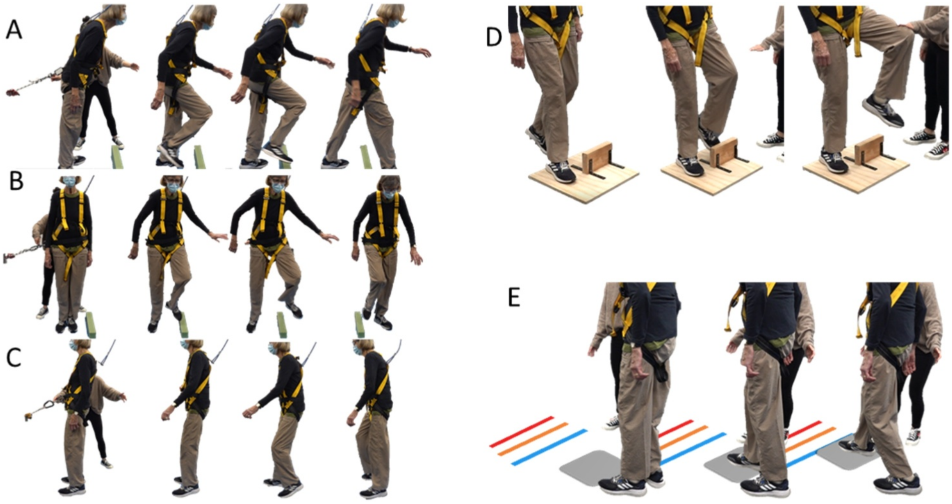

FIGURE 1 The ReacStep program. Tether-release reactive step training in (a) forward, (b) lateral and (c) backward directions. Intentional (d) trip and (e) slip training.

program was reviewed by three Exercise Physiologists, three Physiotherapists, a Geriatrician, and a fall prevention expert to ensure high task-specificity, safety and clinical feasibility. The program was also evaluated in five younger (20–37 years) and four older (63–89 years) participants and refined based on their feedback. The final ReacStep program comprised three components: tether-release reactive step training, intentional trip and slip training, and functional strength training (Figure 1, Table 1). To ensure that the survey respondents understood what was included in the ReacStep training program, we developed a 6-min video to demonstrate and describe the program, rationale, and methodology of each intervention component (Appendix B). A brief overview of RBT is included in the video.

2.3 | Survey respondent eligibility

The survey respondent eligibility criteria were: (1) healthcare professional (e.g. Physiotherapist (PT), Exercise Physiologist (EP), Occupational Therapist (OT)) and (2) currently providing direct clinical care aimed at improving balance/mobility and/or preventing falls in daily life. The survey was distributed via REDCap by professional organizations (NSW Network, ANZ Falls Prevention Society, Exercise and Sports Science Australia, Australian Physiotherapy Association), Facebook and word of mouth. A $100 gift card participation incentive was offered and given to a randomly selected responder. The research team had no direct contact with the clinicians participating in the study; the survey was completed through the online link and completely anonymously and voluntarily.

2.4 | Survey design and distribution

A custom-built open survey (consent, eligibility, work settings, current treatment approaches and acceptability of ReacStep) was created and distributed using REDCap (from September 2021 to May 2022). No reminders were sent to non-responders. For consent and eligibility questions, answers were required but all other questions were made "optional", thus completeness was not checked. Branching logic in REDCap was used to display the main questions only to eligible responders. There were four pages, with up to 24 items per page and were not randomized in order. Once the survey responses were submitted, there was no option to revise the answers. We conducted pre-testing of our survey to ensure its clarity, comprehensibility, and relevance. This process involved administering a draft survey to four EPs and three falls/balance researchers familiar with the survey design and methodology. The surveys were administered sequentially so that feedback could be iteratively incorporated in the next version.

2.5 | Acceptability assessment

Clinician participant perspectives of ReacStep were assessed based on the Theoretical Framework of Acceptability (TFA) (Sekhon et al., 2017). 23 questions across the domains of affective attitude, burden, opportunity cost, ethicality, intervention coherence, perceived effectiveness, and self-efficacy were developed (see Appendix A for the full survey). These were evaluated using an 11-point numerical rating scale (0 = Strongly disagree, 10 = Strongly agree). To aid interpretation, we operationally categorized scores of 0–3, 4–6, 7–10 as low, middle and high acceptability, respectively. Overall acceptability scores were calculated by averaging multiple items within each domain and between the domains. Scores for questions on interference and fear/anxiety were reversed during evaluation (10 minus a raw score). We also included items to collect clinician characteristics, work setting, and treatment approaches adapted from a previous survey by Mansfield et al. that reported the use and barriers and facilitators of RBT in clinical settings (Mansfield et al., 2021). An open question was used to obtain any suggestions and potential barriers of ReacStep.

TABLE 1 The ReacStep program description.

Preparation	Warm-up includes stretching with sufficient tension and duration (15 s) in major muscles for example, quadriceps, hamstrings, hip flexors. The participant is fitted with a full body safety harness.
Tether-release reactive step training	The participant wears a belt strap at the pelvis and tethered to a stable structure (e.g., wall anchor). A 7 or 14 cm foam block is placed in front of the feet to guide the elevated reactive stepping required for successful trip recovery. The participant leans towards the specified direction (forward, backward and lateral directions, Figure 1a–c) to load the tether. The loading force can start at 5% of their body weight and gradually increase according to their progress and confidence. Cued by a release of the tether (i.e., pulling a snap shackle), the participant steps over the foam block and regains balance with two recovery steps. There were approximately 40–80 repetitions in total. These are delivered in 4 directions and to both feet.
Intentional trip training	Building an automatic foot lifting response in response to hitting an obstacle. The participant is instructed to step with one foot next to the block and intentionally strike the block with the other foot during the mid-swing phase. When stepping over, the participant is instructed to perform a high knee movement (flexing the knee and hip) to tap the trainer's hand which is held at hip height, before placing their foot down (Figure 1d). The trainer's hand height may be adjusted to suit the participant's lower limb length and/or stepping ability. Approximately 20–40 repetitions with both feet.
Intentional slip training	Step 1. Controlled slides strengthen the leg muscles required to resist a foot-surface slip. The participant is instructed to stand on low-pile carpet flooring with both feet at the starting position and place one foot onto a hard plastic sheet (50 × 50 cm) and slide it forward until the foot reaches a designated marker located either 20, 40 and 60 cm away. During the controlled slides, the stance foot and the sliding foot remain on the floor and the sheet, respectively. Repeat 5 times in each foot for the 20, 40 and 60 cm targets (approximately 30 repetitions).
	Step 2. Dynamic slides train proactive and reactive balance control while slipping. The starting position is two steps behind the plastic sheet creating a "walk up" and a forward momentum. They then step onto the plastic sheet and slide forward to the designated marker while the stance foot leaves the floor and follow the sliding foot. Repeat 5 times in each foot for the 20, 40 and 60 cm targets (approximately 30 repetitions).
Functional strength training	Strengthening the hip flexors, hip extensors, and knee extensors, the key muscles necessary to improve stepping velocity and avoid knee buckling during balance recovery. The selected exercises included 2–3 sets of 10–15 repetitions of squats, high knees, glute kickbacks and hip abduction with body weight or resistance bands (recommended).

2.6 | Sample size estimation

A power analysis for adequate precision (Dobson, 1984) showed that with a 95% confidence interval width of 0.4 and a standard deviation of 2.5 for the primary survey questions, 150 participants would be required. This would provide a precise (−/+ 0.2) average acceptability score on the 11-point scale. This sample size was also sufficient to detect differences in acceptability scores in paired ($n = 34$) and independent ($n = 64$ per group) t-tests with a moderate effect size (d): 0.5, alpha error: 0.05 and power: 0.8 (G*Power 3.1). In the absence of prior studies directly informing the power analysis, we chose a moderate effect size as a commonly accepted convention. Post hoc power analysis showed sufficient power (0.85–0.99).

2.7 | Statistical analysis

Clinician characteristics, work setting, and treatment approaches of the responders are summarized in frequency (n) and proportion (%). Data derived from the numerical rating scales were treated with parametric analysis (Harpe, 2015). Normality of distributions was evaluated with the skewness statistics (within −/+1) and Q-Q plots, with log transformations conducted as necessary. Little's MCAR tests were used to examine if missing was completely at random. Acceptability scores were summarized using descriptive statistics including mean and 95% confidence intervals with violin plots that depicted the distribution of responses. One-sample t-tests were used to test if the average responses to the acceptability items were greater than or less than 5 (no clear agreement/disagreement), with more than 5 and < 5 indicating agreement (positiveness) and disagreement (negativeness), respectively. Respondent's perceived efficacy and safety ratings were compared between geriatrics (without neurological conditions) and neurological clients using paired t-tests. Ratings regarding the ease and perceived benefit of integrating ReacStep into clinical practice were compared using independent t-tests between those who did and did not work in the setting. Open text survey responses (question D24) were analyzed using summative content analysis (Hsieh & Shannon, 2005). Content analysis was used to explore participant responses related to potential barriers to implementing the ReacStep program and other comments regarding the acceptability of ReacStep. Analysis involved multiple readings of open text responses for familiarization and then coding of responses to categories related to the aims of the study. To confirm the analysis findings, a second researcher reapplied the coding framework to all responses to ensure comprehensive identification of all relevant content in the responses. IBM SPSS version 27 was used for the analyses. $p < 0.05$ was the threshold for statistical significance.

3 | RESULTS/FINDINGS

Of the 296 responders who provided informed consent, 207 (70%) were eligible and included in the analysis. All surveys were submitted in reasonable timeframes (13 ± 8, 3–56 min). Ten surveys (4.8%) were incomplete, with one or two (0.5%–1%) missing answers in 12 items with a total of 14 values (0.29%) missing. The Little's MCAR test indicated that the missing were missing at random ($p = 0.978$). Given this, we analyzed the available data without imputation. Survey respondents were Physiotherapists ($n = 169$, 83%), Exercise Physiologists ($n = 22$, 11%), Occupational Therapists ($n = 11$, 5%), and others ($n = 5$, 2%) including personal trainers, a physician and nurse consultant (Table 2). Many respondents were working in home/community care ($n = 78$, 38%), outpatient rehabilitation ($n = 58$, 28%), inpatient rehabilitation ($n = 44$, 22%), acute care ($n = 58$, 25%), or private practice ($n = 32$, 16%). The most common work area was geriatrics ($n = 167$, 82%), followed by neurological ($n = 114$, 56%), orthopedic ($n = 108$, 53%), cardiorespiratory ($n = 69$, 34%) and pediatric ($n = 13$, 6%). Twenty-eight respondents (14%) reported using RBT as part of their treatments. Further details about the background of the respondents are summarized in Table 2.

3.1 | Overview of clinician acceptability of ReacStep

The mean [95% CI] overall acceptability score was 7.22 [7.38–7.07] and positive ($p < 0.001$) (Figure 2 and Appendix C). *Intervention coherence*: The respondents reported having an adequate understanding of ReacStep, perceived that ReacStep targeted appropriate mechanisms to prevent falls and demonstrated evidence-based methods (positive $p < 0.001$). *Perceived effectiveness*: The respondents considered that ReacStep could improve reactive stepping, reduce falls in clients with and without neurological conditions and be safely conducted in clients with and without neurological conditions (positive $p < 0.001$). *Self-efficacy*: The respondents felt confident in safely delivering the program and explaining the purpose and rationale of ReacStep to clients (positive $p < 0.001$). *Ethicality*: The respondents considered that their clients would value/appreciate ReacStep. *Affective attitude*: The respondents felt that their clients would enjoy ReacStep, be motivated (positive $p < 0.001$) but be afraid/anxious during the training (negative $p < 0.001$). Most respondents were open to implementing ReacStep (positive $p < 0.001$). *Burden*: Respondents generally felt that the training time (30–45 min/session), necessary upskilling (up to 4 h of theoretical and practical learning) to implement ReacStep were reasonable and the cost (~AU$1000) of ReacStep was reasonable (positive $p < 0.001$). However, the respondents had mixed responses regarding ease of obtaining equipment (negative $p < 0.021$) and whether they had sufficient space to implement ReacStep (neutral $p < 0.061$). *Opportunity cost*: The respondents were generally positive regarding the ease of integrating ReacStep into their current services and not interfering with current services (positive $p < 0.05$). Most respondents felt that ReacStep would be beneficial for expanding their current services (positive $p < 0.001$).

3.2 | Suitable population and settings

Respondents rated perceived effectiveness ($p < 0.001$) and safety ($p < 0.001$) of the ReacStep were significantly lower for neurological clients (e.g. Parkinson's disease) compared to geriatrics clients (Figure 2). Respondent's ratings regarding the ease of integrating ReacStep into clinical practice were higher (easier) in outpatient rehabilitation (Yes: 6.7 ± 2.3, No: 5.0 ± 2.8, $p < 0.001$), inpatient rehabilitation (Yes: 6.3 ± 2.5, No: 5.3 ± 2.8, $p = 0.022$), private practice (Yes: 7.0 ± 2.5, No: 5.2 ± 2.7, $p < 0.001$) but lower (harder) in home/community (Yes: 4.6 ± 2.9, No: 6.0 ± 2.6, $p < 0.001$) (Figure 3a). Respondents who worked in outpatient rehabilitation (Yes: 8.0 ± 1.5, No: 6.9 ± 2.2, $p < 0.001$) and private practice (Yes: 8.0 ± 1.6, No: 7.0 ± 2.2, $p = 0.011$) settings saw greater benefit in ReacStep for expanding their current services as compared to those who did not work in these settings (Figure 3b).

3.3 | Potential barriers

One hundred and two participants provided comments related to barriers of ReacStep (Appendix D), which are summarized in a bubble plot (Figure 4). The need for a safety harness (n = 26, 26%), the cost ($n = 15$, 15%) and space ($n = 15$, 15%) for the equipment and/or harness installation were most frequently raised. Eleven (11%) respondents thought anxiety would be an issue for those admitted for a fall in the acute setting and for clients with cognitive impairment and a fear of falling. One respondent (1%) commented that shorter 20-min training sessions may be more appropriate for aged care residents who fatigue quickly, and another respondent with a high caseload considered 30-min training sessions would be the maximum unless the training could be conducted in groups.

4 | DISCUSSION

This study demonstrated that ReacStep, a novel RBT program, is generally acceptable to a sample of clinicians working in balance and mobility training across a variety of practice settings. Acceptability scores for intervention coherence, perceived effectiveness, ethicality, and self-efficacy of ReacStep were positive and rated highly by the

TABLE 2 Characteristics of the survey respondents, their work settings, client groups and treatment strategies (N = 207).

Variable	N	%	Variable	N	%	Variable	N	%
Profession			Work area[a]			Client group treated by therapists[a]		
Physiotherapist	169	83%	Geriatrics	167	82%	<18 years old	24	12%
Exercise physiologist	22	11%	Neurological	114	56%	18–35 years old	61	30%
Occupational therapist	11	5%	Orthopedic	108	53%	36–50 years old	84	41%
Other	5	2%	Cardiorespiratory	69	34%	51–65 years old	112	55%
Gender identity			Pediatric	13	6%	>65 years old	194	95%
Male	35	17%	Other	39	19%	Geriatrics patients/high-risk older adults	186	91%
Female	167	82%	Work location			Stroke	134	66%
Prefer not to say	2	1%	City/Urban	96	47%	Parkinson's disease/other movement disorders	156	77%
Age			Suburban	66	32%	Spinal cord injury	46	23%
<30 years old	49	24%	Rural	42	21%	Cerebral palsy	32	16%
31–40 years old	57	28%	Work hours			Non-stroke acquired brain injury	61	30%
41–50 years old	40	20%	0–7.5 h (0–1 day)	51	25%	Multiple sclerosis	72	35%
51–60 years old	44	22%	8–15 h (1–2 days)	38	19%	Vestibular conditions	85	42%
61–70 years old	14	7%	15.5–22.5 h (2–3 days)	39	19%	Dementia/cognitive impairment	142	70%
Clinical experience			23–30 h (3–4 days)	27	13%	Musculoskeletal conditions	144	71%
<6 years	43	21%	30.5–37.5 h (4–5 days)	49	24%	COPD/respiratory conditions	97	48%
6–10 years	32	16%	Clients each week			Cardiac conditions	85	42%
11–15 years	30	15%	1–10 clients	102	50%	Other neurological conditions not listed above	44	22%
16–20 years	22	11%	11–20 clients	65	32%	Other	12	6%
>20 years	76	37%	21–30 clients	22	11%	Fall prevention treatment strategy[a]		
Work settings[a]			More than 30 clients	15	7%	Balance training (without mechanical perturbations)	188	92%
Acute care	51	25%	Academic hospital			Reactive balance training using mechanical perturbation	28	14%
Inpatient rehabilitation	44	22%	Yes	38	19%	Task-oriented training	153	75%
Outpatient rehabilitation	58	28%	No	139	68%	Bobath/neurodevelopment training	13	6%
Private practice	32	16%	Not sure/don't know	25	12%	Overground walking practice	151	74%
Home/community care	78	38%	Highest level of education			Body-weight supported treadmill training	27	13%
Long-term care	18	9%	Diploma	13	<1%	Functional electrical stimulation	8	4%
Other	16	8%	Bachelors	144	69%	Strength training	188	92%
Leadership position[b]			Professional masters	54	27%	Aerobic/cardiorespiratory exercise	118	58%
No	109	54%	Thesis-based masters	11	5%	Video-game based interventions/exergaming	24	12%
Yes	94	46%	Professional doctoral	2	1%	Specific exercise program (e.g., FAME, otago etc.)	58	28%
			Thesis-based doctoral	6	3%	Other	24	12%

[a]Multiselect.

[b]In a position to manage other clinicians. COPD, Chronic obstructive pulmonary disease.

clinicians. However, negative responses were reported for affective attitude (fear/anxiety) and burden (equipment and space), indicating potential barriers.

Most clinicians surveyed were open to implementing ReacStep in their practice and considered ReacStep an evidence-based approach that targets appropriate mechanisms to prevent falls caused by slips and trips. These observations are consistent with published evidence that RBT can significantly reduce falls (Devasahayam et al., 2022; Okubo et al., 2017) and a previous survey reporting ~90% of Canadian health care professionals working in fall prevention were interested in

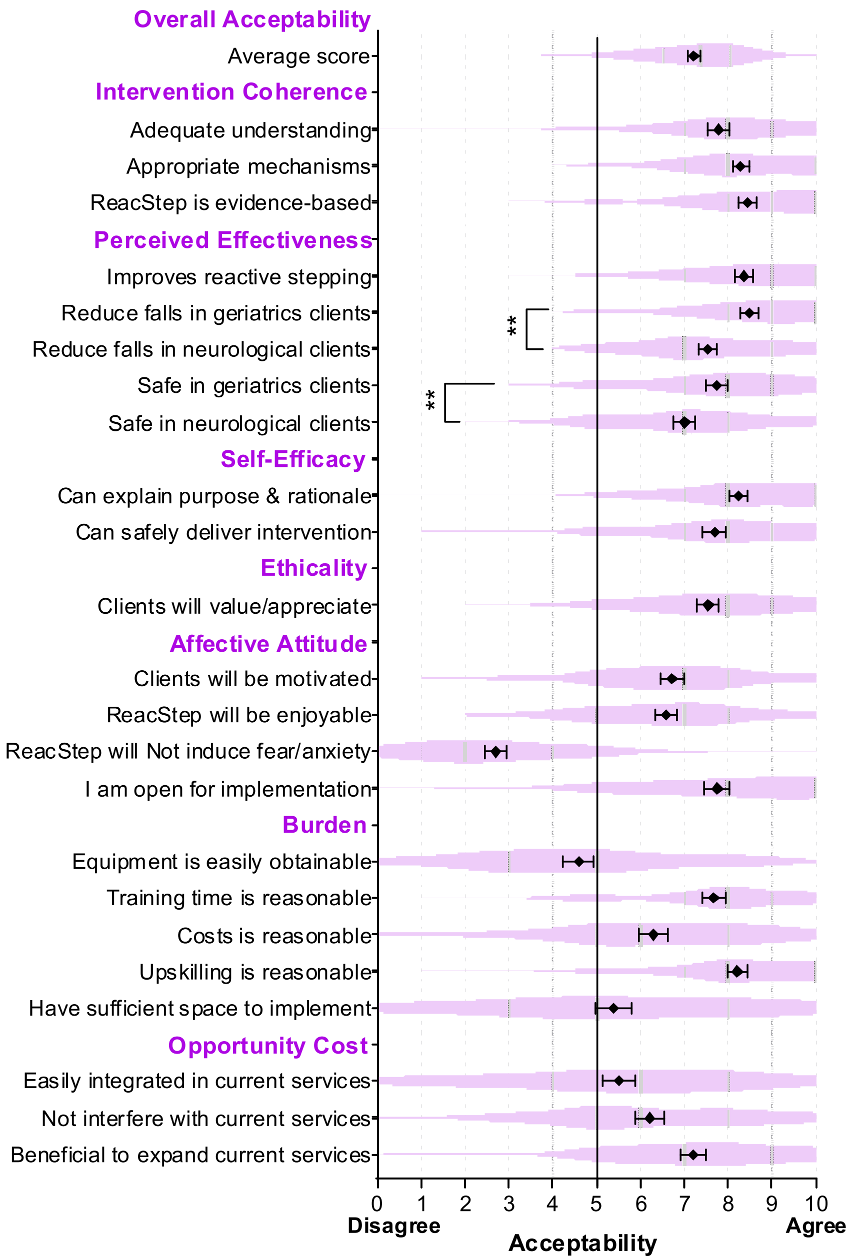

FIGURE 2 Acceptability ratings of ReacStep by clinicians working in falls/balance (n = 207). The black diamond and error bars represent mean and 95% confidence interval (precision), respectively. The width of the purple violin plot indicates the frequency of the responses (distribution). **$p < 0.01$ by paired *t*-test.

learning about RBT (Mansfield et al., 2021). Importantly, the respondents were confident to explain the purpose and rationale of ReacStep and safely deliver it following appropriate training (Figure 2).

Many respondents considered that ReacStep would be effective and safe for clients with neurological conditions. However, the rating scores for safety and effectiveness for neurological clients were slightly lower than the rating scores for those without neurological conditions. This view contrasts with published trials that have shown RBT can improve gait, balance, balance confidence, and reduce fall rates in people with Parkinson's disease (Hoehn & Yahr stage: 1–4) (Protas et al., 2005; Shen & Mak, 2015; Smania et al., 2010; Steib et al., 2017) and subacute/chronic stroke (Handelzalts et al., 2019; Mansfield et al., 2018). Studies have reported RBT to be feasible and safe to conduct in adults with cerebral palsy and incomplete spinal cord injury (Morgan et al., 2015; Unger et al., 2021). This disconnect, may be due in part to few standalone RBT interventions (Protas et al., 2005; Steib et al., 2017), with RBT integrated into more comprehensive balance training programs targeting both anticipatory and reactive balance control in trials involving neurological groups (Mansfield et al., 2018; Shen & Mak, 2015; Smania et al., 2010). Moreover, a recent review reported slightly higher adverse events in RBT (29%) compared to control groups (20%) (Devasahayam et al., 2022). Thus, although RBT can be effective in improving balance recovery in neurological populations, appropriate inclusion and exclusion criteria, program modality and safety precautions need to be clarified to enable a large-scale rollout.

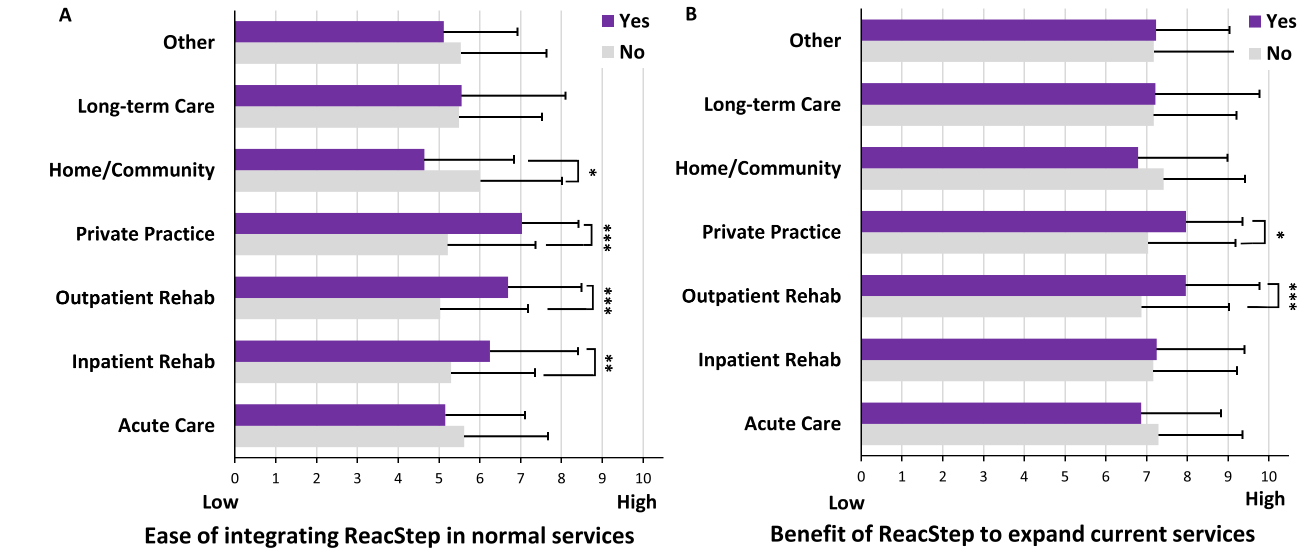

FIGURE 3 Clinician ratings on ease of integration and benefit of ReacStep based on work settings ($n = 207$). Yes/No refers to whether the respondent did or did not work in the setting. The bars and error bars represent means and standard deviations. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$ by independent t-test.

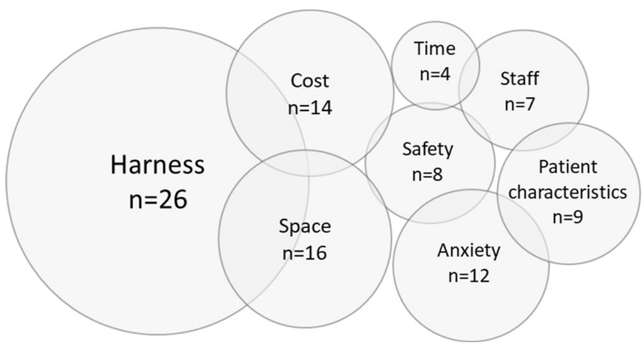

FIGURE 4 Barriers to implementing the ReacStep program in clinical settings. The circle size (frequency of the barriers raised by respondents) and overlaps (related barriers) are approximate.

Interestingly, participants working in rehabilitation and private practice settings considered integrating the ReacStep as part of routine treatment would be relatively easy (Figure 3a) likely because the provision of a safety harness was possible. Clinicians in outpatient rehabilitation and private practice also felt ReacStep reported greater benefits for expanding their current services (Figure 3b). It is likely that clients who can travel to gyms and clinics are at an appropriate functional level to benefit from challenging their reactive balance through perturbations. Thus, ReacStep should be first tested in rehabilitation and private practice settings.

The need for a safety harness was the most prominent barrier for clinical implementation. Our cost estimate for the ReacStep program did not include the cost of harness installation (which may have been unclear to some respondents). If it is not already available, the cost of harness installation and certification of the supporting structure can be costly. To overcome this barrier, future research should investigate other supportive devices such as portable harness systems, parallel bars and transfer belts, although their safety must be demonstrated before any clinical implementation. Client fear/anxiety was also raised as a barrier, which is consistent with previous RBT studies reporting dropouts due to anxiety (Okubo et al., 2019a, 2019b). Different qualitative studies have reported that RBT can be enjoyable and purposeful for the client if the client-therapist relationship is strong (Jagroop et al., 2022; Unger et al., 2021). Building a rapport with the client during RBT is likely the key for meaningful delivery of intervention while minimizing fear or anxiety. Future studies could compare Reacstep with other RBT programs in terms of client's' perspectives. Since, ReacStep has been designed to ease anxiety using intentional slip/trip training and tether-release reactive step training with incremental challenges, future research should investigate participant anxiety during training. Regarding the staffing requirements necessary to safely conduct ReacStep, some respondents indicated that 1:1 clinician-client supervision is not always feasible. However, considering most RBT programs require a lower training dose (e.g., 4 h/year (Okubo et al., 2017) than conventional balance training (3+ hours/week (Sherrington et al., 2017), ReacStep potentially has good cost-effectiveness. However, evidence regarding the optimal training dose is limited and RBT protocols with more than 4 h/year may also be beneficial. Future research should thus examine the cost-effectiveness of 1:1 supervision delivery, while seeking ways to increase the number of clients trained in a single session.

The feasibility of the Reacstep program in clients with cognitive impairment has been questioned with a previous study reporting that some clinicians feel RBT is not appropriate for lower-functioning clients, including those with cognitive impairment (Jagroop et al., 2022). To date, no RBT studies have been conducted in people with cognitive impairment. However, similar to conventional training (Racey et al., 2021), it is possible that RBT may be beneficial for this high-risk population if adapt appropriately.

4.1 | Strengths and limitations

This study represents an important part of program development of a novel intervention to determine whether it is likely to be useful and implementable in clinical populations. The respondents work settings included not only geriatrics and neurology but also orthopedics, cardiology/respiratory and pediatrics, suggesting a potential broader application of ReacStep. However, there are certain limitations worth noting. First, the study is subject to a sampling bias in these clinicians more receptive to innovations in care may have been more likely to have responded. Reminders to non-responders may have reduced a non-response bias in this study. Second, the survey respondents were mostly from Australia and the findings may not generalize to other countries. Third, the psychometric properties of the custom acceptability scale used in this study are unknown. Fourth, although our online survey with a large sample of clinicians could assess prospective acceptability (i.e. prior to experience) of ReacStep, retrospective acceptability (i.e. following experience) also needs to be examined with in-depth semi-structured interviews. Fifth, we did not collect data regarding clinician's prior knowledge of RBT. Finally, acceptability of ReacStep by intervention recipients (i.e. clients) was not assessed in this study but will be reported as part of a recently completed RCT (ACTRN12622000911796). Further research should be directed in facilitating systematic uptake of RBT programs based on knowledge transfer and implementation frameworks such as the RE-AIM framework (Gaglio et al., 2013; Walker et al., 2020).

5 | CONCLUSION

The study findings suggest that ReacStep, a novel RBT program, was generally acceptable from the perspective of clinicians who prescribe balance and mobility training in various clinical settings. Respondents considered ReacStep had good intervention coherence, effectiveness, ethicality and self-efficacy, and were generally open for implementation. However, mixed responses were reported for affective attitude, burden and opportunity cost indicating potential barriers. Many respondents considered that ReacStep was appropriate for clients living with neurological conditions, but some clinicians were concerned about acceptability and safety. Clinicians in outpatient rehabilitation and private practice felt greater benefits of ReacStep for expanding their current services. The largest barrier of ReacStep was the requirement for a safety harness, space, cost, anxiety and safety. Further refinement is needed to address the anxiety concerns and safety equipment accessibility.

6 | IMPLICATION FOR PHYSIOTHERAPY PRACTICE

The ReacStep program incorporates task-specific training to target reactive balance in daily life, especially in older clients in outpatient rehabilitation, falls clinic and private practice settings. Further refinement and demonstration of efficacy in various clinical groups is required before its clinical implementation.

AUTHOR CONTRIBUTIONS

Chrissie Ho: Conceptualization; methodology; validation; formal analysis; investigation; writing—original draft. **Shivam Sharma**: Visualization; writing—review & editing. **Tiffany Huang**: Writing—original draft. **Daniel Cheung**: Writing—review & editing. **Cameron Hicks**: Methodology; investigation; formal analysis; writing—review & editing. **Daniel Treacy**: Writing—review & editing. **Melanie K. Farlie**: Formal analysis; writing—review & editing. **Freddy M. H. Lam**: Writing—review & editing. **Stephen R. Lord**: Writing—review & editing. **Yoshiro Okubo**: Conceptualization; methodology; validation; formal analysis; investigation; writing—original draft.

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CONFLICT OF INTEREST STATEMENT

The authors report that there are no competing interests to declare.

DATA AVAILABILITY STATEMENT

The datasets analyzed for this study can be provided upon reasonable request approved by the University of New South Wales Human Research Ethics Committee. Requests to access the datasets should be directed to y.okubo@neura.edu.au.

ETHICS STATEMENT

The study protocol was reviewed and approved by the University of New South Wales (UNSW) Human Research Ethics Committee (HC210350).

PARTICIPANT CONSENT

All study participants provided electronic informed consent.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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