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The Effects of a Telehealth Exercise Intervention on Balance in Adults with Down Syndrome

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THE EFFECTS OF A TELEHEALTH EXERCISE INTERVENTION ON BALANCE IN
ADULTS WITH DOWN SYNDROME

By

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A doctoral project submitted in partial fulfillment
of the requirements for the

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Abstract

Background People with Down syndrome (Ds) often present with balance deficits, which compromise their safety during daily activity. While evidence shows that exercise can improve balance in the Ds population, it is unclear if a telehealth method will elicit similar benefits. We aimed to examine the effects of a virtual exercise program on balance in adults with Ds. **Methods** Twenty participants completed a 12-week telehealth exercise program based on the Mann Method. Balance testing took place before and after the intervention, which included: Timed Up and Go (TUG), Modified Clinical Test of Sensory Interaction in Balance (MCTSIB), Frailty and Injuries: Cooperative Studies of Intervention Techniques (FICSIT-4), and Functional Reach Test (FRT). **Results** Significant improvement was seen in the TUG ($p=0.043$), FICSIT-4 ($p=0.019$) and FRT ($p=0.030$). All participants achieved maximum scores on the MCTSIB in pre- and post- testing. **Conclusions** Balance in adults with Ds significantly improved following the telehealth exercise program, which we attribute to the tailored exercises that address visual/vestibular deficits and hip muscle weakness.

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Table of Contents

<u>Abstract</u>	iii
<u>Acknowledgements</u>	iv
<u>Background of Research</u>	1
<u>Methods</u>	5
<u>Participants</u>	5
<u>Procedure</u>	5
<u>Exercise Intervention</u>	5
<u>Balance Measures (Primary Outcomes)</u>	6
<u>Strength Measures (Secondary Outcomes)</u>	8
<u>Statistical Analysis</u>	9
<u>Results</u>	10
<u>Discussion</u>	12
<u>Recommendations</u>	14
<u>Clinical Implications</u>	14
<u>Limitations</u>	15
<u>Conclusion</u>	16
<u>References</u>	17
<u>Curriculum Vitae</u>	20

Background of Research

Down syndrome (Ds) is the most common genetic disorder affecting more than 200,000 children and adults in the United States [1]. Ds is usually caused by trisomy 21, which occurs when three, rather than two, full or partial copies of the 21st chromosome are present in the cells. This alteration of the genes results in a unique presentation that is characterized by cognitive and physical impairments [2]. These impairments contribute to a deficit in static and dynamic balance, which poses a challenge to daily activities as well as more demanding endeavors. Difficulties maintaining balance and postural control increase the risk of falling and injury, compromising the safety of individuals with Ds [3]. Many studies have identified patterns of decreased participation in physical activity, which limits social interaction and often leads to sedentary behavior [4]. It is critical to quantify these balance deficits and consider possible solutions to improve these impairments to consequently enhance activity, participation, and overall quality of life.

Several studies have attributed these balance issues to both structural and neurological factors prevalent in individuals with Ds. A few of the anatomical features are referenced as contributing factors to impaired balance including hypotonia and joint ligamentous laxity, which together can result in functional weakness and reduced dynamic joint stability [5]. Starting at the upper cervical spine, instability at the atlanto-occipital or the atlanto-axial joint can impair adequate support of the head over the body and can be detrimental in the case of an accident or fall [6]. In the lower extremities, hip and patellofemoral instability can impair optimal alignment needed to achieve proper balance [7]. Ligamentous laxity in the foot causes pes planus abnormalities, which prevent normal foot posture and orientation of the body, reducing standing balance [6]. Previous studies have used specific balance measurements to demonstrate the link between balance deficits and musculoskeletal impairments. Malak and colleagues [8] found correlations between low motor function scores and low balance scores, which reflect the delayed motor development associated with Ds. Another study using a force plate to measure center of pressure displacement during static standing concluded that those with Ds demonstrated greater

anterior-posterior and medial-lateral sway in eyes open and eyes closed conditions [9]. Both studies suggested that the anatomical features in combination with the neurological deficits related to Ds cause a difficulty maintaining equilibrium when attempting balance, especially in changing environments [8,9].

The neurological components required for proper balance include the somatosensory, visual, vestibular systems, each of which seems to be altered in people with Ds. Research conducted by Villarroya et al. [10] utilized multiple balance conditions (e.g. eyes open, fixed-support, etc.) and found that children with Ds have difficulty interpreting somatosensory input to achieve postural control for maintaining balance. An accurate somatosensory system is essential for proprioception, which allows the body to understand where it is in space. When the somatosensory system is impaired, the body misinterprets proprioceptive input and has difficulty adjusting posture and equilibrium, especially in situations that challenge the somatosensory system, i.e., compliant surfaces such as grass or carpeted floors. Another study found that adults with Ds have impairments in their visual systems, such as depth perception, color discrimination, and reduced sensitivity [11]. Visual input is critical to guide accurate responses to balance situations as it can anticipate how the body should move to correct posture and avoid a fall or injury. Additionally, potentially faulty connections between the vestibular system and the cortex may be a contributing factor to balance dysfunction in individuals with cognitive deficits [12]. The vestibular system allows the body to maintain equilibrium with head and trunk movement and facilitates accurate righting reflexes to maintain posture and alignment relative to the environment. Inaccurate vestibular input can result in events such as dizziness, vertigo, and/or an impaired ability to correct posture when navigating the environment. In addition to the impairments in these three systems, Villarroya and colleagues [10] further suggest an inability to efficiently shift between the three systems for proper balance [10]. This inefficiency prevents those with Ds to appropriately adapt their balance strategies to changing environments. Taken together, an impairment in one or more of these systems is detrimental to the complete balance system necessary for equilibrium and predisposes those with Ds to higher risks of loss of balance episodes.

As individuals with Ds experience specific balance challenges, they may require specific interventions that address these issues. Current literature supports the effectiveness of exercise interventions on improving balance in those with Ds. A recent study showed treadmill training and core stabilization exercise in children with Ds improved their core and lower extremity strength, resulting in improved objective balance scores [13]. Additionally, strength programs were found to improve leg strength, balance, and walking function in both young adults with Ds [14] and older adult participants with Ds [15]. The same benefits were found in children with Ds who completed a 6-month physical therapy program [16]. However, in the face of the COVID-19 pandemic, research is needed to determine if a telehealth exercise program will elicit the same improvements in balance for populations with Ds.

Emerging research shows promise in the success of telehealth physical therapy interventions for individuals in other neurologic populations. One study examined the effectiveness of a home-based telephone guided exercise program in older adults when compared to a control group who received educational calls to discuss health related topics. After 3, 6, and 12 months of the remote intervention, improvements were seen in strength, balance, and depressive symptoms [17]. In two RCTs a post-stroke rehabilitation program was administered to patients in a conventional setting and a telehealth setting. In both studies, researchers found that the telehealth group improved as much as the conventional group in Berg Balance scores, State Self-Esteem Scale and SF-36 [18], and the Barthel Index, indicating increased ability to perform self-care and daily activities [19].

In addition to the unique physical and neurological characteristics of Ds, reported participation in physical activity among people with Ds is limited by social and environmental factors. Access to physical activity opportunities may also be limited by social support aspects, such as reliance on others for transportation [4]. The current COVID-19 pandemic further increases their difficulty to participate in exercise programs and therefore, increases the need to introduce opportunities for exercise via telehealth. Therefore, we aimed to examine the effect of a 12-week virtual exercise program including foundational strengthening, neuromuscular rehabilitation, and cardiovascular activity on their balance function. We hypothesized that participants with Ds would exhibit lower scores on the balance assessment than

expected based on literature of the general population and that delivering a virtual exercise program to individuals with Ds would have significant benefits on improving measures of balance.

Methods

Participants

Individuals with Ds between 18 and 35 years old who are sedentary (≤ 1.5 METs expended while in a sitting or reclined position when awake) were recruited [20]. Exclusion criteria for this study included vascular disease, pulmonary disease such as asthma, hypertension, hypotension, history of presyncope and syncope, diabetes, severe obesity, current smoking, pregnancy, anti-inflammatory medication and medication for heart rate and blood pressure. Based on Rimmer et al., the calculated effect size for a repeated measures design of an exercise intervention in individuals with Down syndrome was 0.71 [21]. Using a power of 0.8, alpha level set at 0.05 and assumed correlation between pre and post of 0.7, the required sample to detect a difference with a repeated design is $n=18$, using G*Power software. To account for an estimated 5% drop out, we aimed to recruit $n=20$ participants.

Procedure

Balance measures were obtained before and after a 12-week exercise intervention program. These assessments took place remotely from the participants' homes and were conducted by a team of trained researchers via Zoom with in-person assistance from a caretaker. Materials and instructions (written and in video online) for these measures were sent to the participants prior to beginning the study.

Exercise Intervention

The participants completed a virtual 12-week progressive exercise program (3 sessions/week, 1 hour per session) based on the Mann Method PT Principles (manuscript under review). The intervention included: 1) foundational movements focusing on abdominal activation, gluteal activation, hip stabilization, and neuromuscular sequencing, 2) hip strengthening activities targeting gluteal and lateral hip musculature, 3) visual/vestibular activities for improving weight shift, balance, righting reactions, and visual-vestibular coordination, and 4) cardiovascular activities focusing on foot position, gait mechanics,

reciprocal movement patterns, weight shifting and balance, as well as cardiovascular efforts. A detailed list of the exercises are included in Table 1. Trained examiners attended the Zoom calls to monitor participant adherence, intensity, form, and overall mood. Each examiner used an observation checklist to quantify deviations in exercise form and noted any changes in attitude and endurance between each session.

Table 1. Mann Method PT Exercise Program

Foundational Movements	Squats Squats with Overhead Reaches Push-ups Planks Quadruped Reaches and Kicks
Hip Strengthening	Gluteal bridges Clamshells Tall Kneel to Half Kneel Standing to Half Kneel to Tall Kneel
Visual/Vestibular Activities	Under/Over Reaches Side-to-Side Passes Diagonal Passes Rainbow Reaches in Half Kneeling Lateral Weight Shifts with Holds Anterior-Posterior Weight Shifts with Holds
Cardiovascular Activities	Forward Jumps Lateral Jumps Open/Close Jumps Standing Marches Freestyle Dancing

Balance Measures (Primary Outcomes)

The balance assessments that were used include the Timed Up and Go Test (TUG), Functional Reach Test (FRT), Frailty and Injuries: Cooperative Studies of Intervention Techniques (FICSIT-4), and Modified Clinical Test of Sensory Interaction on Balance (MCTSIB). These were administered to the

participants via Zoom calls by a team of trained researchers. Participants were provided with detailed instructions on how to set up their devices prior to each balance test.

The TUG analyzes an individual's dynamic balance, mobility, and fall risk. To participate in the TUG, participants required a clear walkway, a chair, rope that measured 10 feet, and tape. Participants were provided rope and tape to allow for accurate measurements. The 10-foot rope was placed in front of the chair and extended in a straight line, tethered by the tape. Participants were instructed to begin the test sitting in the chair and to wait for their caregiver to say "Go" before standing and walking as fast as they could without running to the tape and back before sitting down. The caregiver used a timer to time the participants in seconds and a researcher recorded the time for each trial. Meanwhile, another researcher observed the participant for any dynamic balance impairments with gait. The test was performed two more times and the average time was then calculated for the participant's score [22].

The MCTSIB is an easily administered balance test that allows assessment of the three neurological systems (i.e., somatosensory, visual, and vestibular) and has been shown to have excellent reliability and validity [23]. To perform this test, participants required access to a firm surface as well as a foam pad which was provided to them. Participants were instructed to attempt to maintain balance for 30 seconds in four conditions: a firm surface with eyes open (EO), firm surface with eyes closed (EC), compliant surface with EO, and compliant surface with EC. If any participant was not able to achieve 30 seconds without loss of balance on the first trial, they were allotted two more trials for each condition. One researcher recorded time for each trial while another observed the participants for balance deviations that indicated termination of the trial. The best time for every condition was used and the total score could add up to 120 seconds.

The FICSIT-4 is a 7-item balance assessment requiring minimal time and energy and has been shown to have good reliability and validity, as well as discrimination across a wide range of health statuses [24]. No materials were required for this assessment. Participants were instructed to attempt balance for ten seconds in seven balance positions on a firm surface: feet together with eyes open and eyes closed, semi-tandem stance with eyes open and eyes closed, tandem stance with eyes open and eyes

closed, and a single leg stance with eyes open. Each trial was graded on a 0-4 point scale with 0 indicating the need for help to prevent falling and 4 indicating the person being able to successfully hold the position for ten seconds. The highest possible total score was 28 points.

The FRT assesses stability by having the participant reach forward as far as they can in a fixed position without losing balance. Study participants were asked to stand next to a wall, and were instructed to tape a tape measure to the wall at axilla height. They were then directed to stand at the “0” end with their arms straight out in front of them at 90° of shoulder flexion. Participants were instructed to line up with their middle knuckle at the “0” on the tape and reach forward as far as they could without taking a step. Their caretaker provided stand-by assistance and measured each trial by marking the distance traveled with a piece of tape and recording it. They were allowed 2 practice trials and 3 test trials with their score being the average of the 3. This test has demonstrated great reliability and validity with populations demonstrating similar balance deficits [25,26].

Strength Measures (Secondary Outcomes)

In the 5 time Sit-to-Stand (5xSTS) test, the participant is required to stand from sitting in a chair without armrests for 5 repetitions as quickly as possible. The participant begins the test seated in the chair and begins when the instructor starts the timer. The timer is stopped when the participant sits in the chair at the end of the fifth repetition and the test concludes.

The 30 second chair stand (30secCS) test requires the participant to perform as many repetitions of sit-to-stands as possible from a chair without armrests within a 30 second window. The participant starts the test seated in the chair and begins when the instructor starts the timer. The participant attempts as many repetitions of sit-to-stands as possible in the 30 second timeframe. One repetition is fully counted when the participant stands from the chair and returns to a seated position. The instructor announces when the 30 second interval is complete. Any repetition that is not fully completed at the end of the time interval is not counted toward the total number of repetitions.

Statistical Analysis

Baseline characteristics of the group were calculated with descriptive statistics. Baseline values were compared to reference values for the general population. Normality of the outcome variables was tested with the Shapiro-Wilk test. In case of normality, differences between the pre-test and post-test were analyzed and compared using t-tests. The non-normally distributed outcome variables were analyzed with the Wilcoxon Signed rank test. Significance level was set at an alpha level of 0.05, all analyses were performed using IBM SPSS Statistics 26 (International Business Machines Corp, Armonk, NY, USA). Balance assessment scores were also evaluated for minimally detectable change (MDC), which is reported as 1.26 seconds for the TUG [27], 1.83 cm for the FRT [28], 1.52 points for the FICSIT-4 [29].

Results

Out of the twenty participants who consented to participate in this study, a total of eighteen participants (female=5 and male=13) with respect to the TUG, FICSIT-4, MCTSIB, 5xSTS, and 30 second chair stand, and a total of sixteen participants (female=5 and male=11) with respect to the FRT completed the 12-week intervention. The number of participants who completed the pre- and post-balance testing varied for several reasons. One participant dropped out early in the intervention for reasons unrelated to the program. One participant was excluded for all post-testing measures due to an ankle injury sustained from activity outside the program. Two other participants were excluded from the FRT in pre- and post-testing due to invalid test execution. Demographic and anthropometric information is included in Table 2.

The balance measurement results are displayed in Table 3. Overall, the participants' pre-intervention balance scores were lower when compared to the general population. The participants in this study achieved a TUG score of 9.1 ± 2.7 seconds, while TUG scores for age-matched peers without Ds average 8.57 ± 1.40 seconds [30]. Our participants also achieved lower FRT scores (27.8 ± 6.8 cm) than that of their age-matched peers (20-39 years) without Ds, which recent studies have shown to be 43.82 ± 4.62 cm [31] and 39.50 ± 3.01 cm [32]. The mean FICSIT-4 scores for this group of participants was 24.2 ± 2.9 points. There are no studies that use the FICSIT-4 assessment for people with Ds or a young adult population. Based on available evidence, the average scores for this measurement are 26.91 ± 1.81 points in middle-aged women [33] and 24.8 ± 3.5 points in older adults with a mean age of 74.6 [34].

All balance tests showed a significant improvement from pre-intervention to post-intervention (TUG, FICSIT-4 and FRT), except for the MCTSIB, as all participants achieved maximum scores of 120 seconds on the MCTSIB in pre- and post- testing and therefore showed no significant difference. Analysis of individual participant scores show that more than half of the participants achieved the MDC in both the FRT and FICSIT-4. Twelve participants increased their FRT distance by 1.83 cm or more, with the greatest increase being 12 cm [28]. Eleven participants increased their FICSIT-4 score by 1.52 points or

higher, with the greatest increase being 19 points [29]. Six participants improved their TUG score by 1.26 seconds or higher [27].

The secondary outcome measures for leg strength results are also displayed in Table 3. The Wilcoxon signed rank test and the paired t-test demonstrated significant improvements in the 30 second chair stand and 5 times sit to stand, respectively.

Table 2. Participant Demographics & Anthropometrics

Variable	Baseline
Sex	F=5, M=14
Age (years)	25.4±4.8
Height (m)	1.57±0.1
Weight (kg)	72.5±14.6
BMI (kg/m ²)	29.5±5.7
Waist Circumference (cm)	92.8±12.4
Left Calf Circumference (cm)	37.7±4.4
Right Calf Circumference (cm)	37.8±4.6

Table 3. Outcome Measure Score

Test Name	Participants (n)	Pre-intervention	Post-intervention	P-value
TUG	n=18	9.1±2.7 sec	8.7±4.2 sec	0.043*
MCTSIB	n=18	120±0 sec	120±0 sec	1
FICSIT-4	n=17	24.2±2.9 points	25.4±2.68 points	0.019*
FRT	n=16	27.8±6.8 cm	31.0±5.1 cm	0.030*
5xSTS	n=18	12.8±4.7 sec	11.0±3.7 sec	0.014*
30 sec CS	n=18	13.9±4.2 reps	15.7±4.1 reps	0.032*

All values are reported as mean ± standard deviation

*P-value <0.05 indicates statistical significance

Abbreviations: TUG = Timed Up and Go; MCTSIB = Modified Clinical Test of Sensory Interaction in Balance; FICSIT-4= Frailty and Injuries: Cooperative Studies of Intervention Techniques 4; FRT = Functional Reach Test; 5xSTS= Five Times Sit to Stand; 30secCS = 30 second Chair Stand

Discussion

The purpose of this study was to quantify the balance function in adults with Ds using standardized balance tests and investigate the effects of a remote exercise program on these balance measures. This study confirmed that individuals with Ds had worse balance performance at baseline than seen in the general population and demonstrated improved balance performance after the 12-week online combined exercise intervention.

Our hypothesis that participants with Ds would exhibit lower scores than the general population on the balance assessments was confirmed. Their pre-intervention balance scores were lower than age-matched peers on the TUG and FRT, and were lower than middle-aged women for the FICSIT-4. Although all participants achieved maximum scores on the MCTSIB, their overall balance performance across all tests was worse than the general population. This underscores the risk of falling and injury for young adults with Ds. These poorer balance outcomes observed in our work are likely due to the impaired function of the balance systems experienced in people with Ds. We suspect that maximum scores were achieved on the MCTSIB because this balance test assessed static balance with no changes to the base of support (BOS), meaning participants were able to stand in their comfortable BOS. Conversely, the FRT assessed dynamic balance and the FICSIT-4 included progressive narrowing of the BOS, both requiring greater challenges to balance. The results of this study demonstrated that people with Ds experience increased difficulty performing balance tasks when decreasing their BOS and with dynamic balance challenges. An impaired ability to adapt to changing surfaces and achieve stabilization before movement create safety concerns for daily and extracurricular physical activity.

The results confirmed the second hypothesis and revealed a significant increase in scores on the balance measures: TUG , FRT and FICSIT-4 test and the strength measures: 5xSTS and 30 sec CS following the telehealth exercise intervention. The results of the virtual exercise program are in line with studies done previously in that exercise programs improved balance and strength in children, young adults, and older adults with Ds [14], [15], [16]. These improvements in our study can likely be attributed to the specific movements in the Mann Method exercise program that addressed visual/vestibular deficits

and hip muscle weakness. The TUG requires adequate strength to perform a sit to stand and return to sitting position, as well as maintain stability for dynamic base of support changes during ambulation. The squats and anterior-posterior weight shifts from the exercise program most resemble the movements required for the TUG and can be seen as specific training to perform this task. The FRT requires adequate hip and trunk muscle activation to provide a stable base of support to allow the extremities to move away from the body. The exercises that likely contributed to the improvement with this test are the foundational movements and vestibular activity such as quadruped movements and anterior-posterior weight shifts. The FICSIT-4 assessment requires the use of 1 or more of the 3 balance systems (vision, vestibular, somatosensory) to maintain various standing positions. The specific exercises in the intervention that train these balance systems include the visual and vestibular activity section of the program found in Table 1. In addition, the significant improvements in our secondary outcome measures of strength (5xSTS and 30secCS) can be attributed to the hip strengthening and foundational movements sections of the program. The exercise program conditioned the muscles and systems required for the balance assessments and consequently, for daily activity and function.

While the average group results show significant improvement, not all participants' score changes exceeded the minimal detectable change (MDC). Based on available evidence, their scores were compared to other populations as there are no established norms for the MDC in these balance tests specifically for adults with Ds. According to Martin and colleagues, the MDC for the TUG was found to be 1.26 seconds in children with Ds [27]. Less than half of the participants (n=6) decreased their scores on the TUG to meet the MDC, with the highest improvement being 3.48 seconds. However, as a group, the participants improved their mean scores to nearly the average of their age-matched peers [30]. In young healthy males, the MDC for the FRT is 1.83 cm, as studied by Suzuki et al [28]. More than half the participants (n=12) increased their FRT distance by 1.83 cm or more, with the greatest increase being 12 cm. According to Blankevoort et al., a MDC in the FICSIT-4 test is 1.52 points in older adults with dementia [29]. More than half the participants (n=11) increased their FICSIT-4 score by 1.52 points or higher, with the greatest increase being 19 points. These MDC values demonstrate that 12 weeks of an

exercise program helped improve balance in most of our participants. Thus, further research should investigate the effects of a longer-term exercise program on MDC for the balance measures. Future research is also needed to establish norms and MDC values for adults with Ds.

Recommendations

This study had a sample size (n=19) that was sufficiently powered to answer our questions. However, with a narrow age range of 19-34 years, these results are only generalizable to young adults with Ds. Future research is necessary to determine the efficacy of the exercise program based on the Mann Method PT principles in the pediatric and geriatric Ds populations. We also recommend future research to examine the potential benefits of an exercise program longer than 12 weeks as we suspect more participants will be able to achieve the MDC on their balance scores.

Clinical Implications

This study supports the use of a specific telehealth exercise program to address balance impairments in adults with Ds. We found that the FRT and FICSIT-4 balance measures are appropriate evaluation measures for balance in adults with Ds, whereas the ceiling effect on the MCTSIB limits its usability for similar studies in adults with Ds. This is the first study demonstrating that telehealth is a suitable method for delivering an exercise intervention to adults with Ds. This study serves as a starting point to further develop telehealth interventions to best serve this population. Future studies or interventions would likely benefit from having a smaller group to monitor every session for less experienced instructors. Recent research also shows that patient satisfaction is not significantly different among patients receiving physical therapy via in-person care as compared to telehealth [35]. Physical therapists who are planning to give telehealth care to patients with Ds need to have an advanced level of movement pattern analysis, motivational skills, and must be proficient with all required technology.

Limitations

The exercise program was completed with adults with Ds between the ages of 19-34, therefore these results cannot be generalized to the pediatric or geriatric Ds population. In addition, since our study lacked a control group, we cannot definitively attribute our results to the intervention. Natural progression in the participants over 3 months could have contributed to our findings. However, previous research on balance in Ds does support poor balance to be highly prevalent and present across the lifespan, which makes natural progression an unlikely explanation for the improvements in balance we measured in this study. While the telehealth program allowed us to expand our reach internationally, there were challenges with the telehealth based format. The study design limited our ability to provide in-person pre- and post-assessments which may have reduced accuracy of the measures due to inconsistencies from different caregivers, test administrators and technological difficulties such as poor sound quality, poor camera quality, and internet connectivity issues. The amount of space needed to set up an exercise area and accommodate for optimal camera viewing was included in the set-up instructions, however, not all the participants' home spaces were amenable to those requirements. Additionally, some participants had technological issues that did not allow optimal viewing for the exercise instructor and student observers.

Conclusion

In conclusion, we found that adults with Ds do not perform as well as the general population in balance activities, but that they improve with a 12-week telehealth exercise program. Clinicians are advised to assess for these balance impairments in their patients with Ds and implement an exercise program that is specifically tailored to address visual/vestibular deficits and hip muscle weakness.

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Curriculum Vitae

Alexandria Umagat, SPT

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Education

University of Nevada, Las Vegas
Doctorate of Physical Therapy

Las Vegas, NV
Expected May 2022

Seattle University
Bachelor of Arts and Sciences in Sport and Exercise Science, Cum Laude

Seattle, WA
June 2017

Experience

St. Rose Dominican Hospital | Acute Care

Las Vegas, NV Jan-Apr 2022

- Evaluated and treated patients with a variety of conditions, including neurological and COVID
- Disseminated research through in-service presentation for the department
- Participated in volunteer events to promote health and wellness in the community

Dignity Health Pediatrics | Outpatient

Las Vegas, NV Sept-Dec 2022

- Evaluated and treated pediatric patients with a variety of injuries and disabilities
- Effectively collaborated with OT, SLP, and families of patients to provide holistic care
- Developed creative home programs for patients to improve activity and participation

Post Acute Medical | Long-term Acute Care

Las Vegas, NV July-Sept 2022

- Evaluated and treated patients, focusing on functional mobility and ADL training
- Assessed patients for return to home requirements to determine safety for discharge
- Provided, educated, and trained patients on assistive devices when necessary

Leavitt Physical Therapy | Outpatient

Las Vegas, NV July-Aug 2020

- Evaluated and treated patients mainly with musculoskeletal injuries
- Educated patients on pain neuroscience, therapeutic exercise, and general wellness
- Completed daily documentation and updated patient goals and plan of care

Core Physical Therapy | Physical Therapy Technician

Seattle, WA Jan 2018-Oct 2018

- Instructed and guided patients through therapeutic exercises and modalities
- Maintained cleanliness and safety of gym and treatment areas, and upkeep of laundry
- Performed administrative duties such as scheduling, organizing and filing paperwork, answering phones, and collecting payments

Virginia Mason Medical Center | Physical Medicine & Rehabilitation Intern **Seattle, WA** 150 hrs

- Assisted with patient treatments as appropriate under supervision of a licensed PT
- Provided administrative support including scheduling patients, clerical tasks and data entry
- Issued assistive devices and equipment for in-facility use and patient discharge

Service

Professional

- 06/30/2021: EBS/APTA Knowledge Bowl (4 hrs)
 - Served as a team member to represent UNLVPT in an interscholastic knowledge competition hosted by the APTA and EBS healthcare
- 09/23/2020: Fall Risk Screening (5 hrs)
 - Performed virtual fall screening questionnaire and testing for elderly participants
- 01/24-25/2020: UNLVPT Interview Day Volunteer (7 hrs)
 - Assisted in greeting, answering questions, and providing campus tours to prospective students

Community

- 2/27/2022: GigiFIT Class and Coffee Corner (2 hrs)
 - Led an exercise program for participants with Down syndrome
- 03/2021 to present: Down Syndrome Organization of Southern Nevada (1.5 hrs/month)
 - Assist with providing monthly workshops to members of the DSOSN
- 10/11/2019: Clean the World (2.5 hrs)
 - Organized recycled hygiene products and assembled final products

Leadership

Qualities/Roles/Positions

- 01/2021 to present: Mann Method Physical Therapy
 - Lead a weekly virtual exercise program for adults with Ds under the mentorship of Dr. Sarah Mann, PT, DPT, MBA, NSCA-CPT

Leadership skill development pathways

- 4/1/2021: APTA Learning Center – “APPT Clinical Reasoning Theater: Congenital Muscular Torticollis”, Presented by Kenyon, Lisa, PT, DPT, PhD, PCS
- 03/14/2021: The OTAGO Exercise Program: Falls Prevention Training
- 10/08/2020: STEADI Older Adult Fall Prevention Online Certification
- 03/13/2020: CITI Certification – Human Subjects Research, Biomedical IRB
- 11/07/2019: UNLV LKD (Pre-PT) Q&A Panel
 - Attended LKD meeting to answer questions and share advice/experiences with students considering PT school
- 10/04/2019: Poverty Simulation
 - Participated in inter-professional live simulation and group discussion to gain a deeper understanding of the reality of living in poverty

Research

Participate/Create

- In-service presentations:
 - St. Rose Dominican Hospital: “A Patient’s Guide to Hospital-Based Physical Therapy”
 - Dignity Health Pediatrics: “The Effects of a Telehealth Exercise Intervention on Balance in Adults with Down Syndrome”
 - PAM Specialty Hospital: “COVID19: Looking Beyond the Respiratory Effects”
 - Leavitt PT: “Treatment of Fibromyalgia”
- Research participant:
 - Mental Health Stigma in Pacific Islanders – Brandon Eddy, PhD, Katelyn Usam, BA, and Daisy Trajano, BA

- Neuromechanical Interaction Between Limbs During Amputee Locomotion – Dr. Hui-Ting Shih, PT, MSPT
- Cardiac Rehab at Good Samaritan Clinic – Dr. Kevin Minchin
- Co-investigator: The Effects of a Telehealth Exercise Intervention on Balance in Adults with Down Syndrome, *submission phase*

Consume/Share

- APTA Combined Sections Meeting 2022
 - Poster Presentation on “The Effects of a Telehealth Exercise Intervention on Balance in Adults with Down Syndrome”
- 04/30/2021: Adriaan Louw Lecture: “Teaching People About Pain: Pain Neuroscience Education”
- 03/24/2021: NV APTA SSIG Zoom Speaker Series: Lisa Russell, DPT C-PS
- 11/12/2020: Amplify Equality Webinar: “COVID-19 Impact on the LGBTQI+ Community”
- APTA Combined Sections Meeting 2020
- UNLVPT Brown Bag
 - 3/5/2021: Lisa Copeland, PT, DPT, “Physical Therapists in Case Management”
 - 2/19/2021: Danielle Garcia, PT, DPT, and Ron Garcia, PT, DPT, “How Two UNLVPT Alums Paid Off \$300,000 in Student Loans In Under 3 years”
 - 10/09/2020: Aaron Copeland, PT, DPT, NHA, “Going into Administration: Director of Rehabilitation”
 - 09/25/2020: Ashley Reagor, PT, MSPT, ACT, “Now that I’m a licensed therapist, how do I start my own private practice?”
 - 09/18/2020: Natalie Weeks-O’Neil, PT, DPT, DRPH, “Native American Health and Cultural Competency”
 - 06/19/2020: Lisa VanHoose, PT, MPH, PhD, “Grief and Loss Felt by All During Social Crisis”
 - 06/12/2020: Rocky Barrett, PT, DPT, “Respiratory Dysfunction with COVID-19”
- Sports Didactic
 - 09/21/2020: Glenn Barnes, DO CAQSM, “Cervical Spine Injuries”
 - 09/28/2020: Meghan Wonderling, LAT, ATC, CSCS, SPT, “Lumbar Spine Rehabilitation: Stability vs. Flexibility”
 - 09/21/2020: Andrea Perloff, DO, “Traumatic Anterior Shoulder Instability”
 - 04/27/2020: Daniel Diaz, DO, “COVID-19”
- UNLVPT Distinguished Lecture Series
 - 11/06/2020: Catherine Lang, ““Attempting to Improve Stroke Rehabilitation across a Transitional Pathway”
 - 11/05/2020: Catherine Lang, “Wearable Sensors Are Changing How We Think About Movement and Rehabilitation”

Membership in Professional Organizations

- American Physical Therapy Association (2019-present) Member #: 866859

Andrew Rene Martinez, LAT, ATC, SPT

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martinezandrew62@yahoo.com

www.linkedin.com/in/andrewr-martinez

Education

DPT	University of Nevada, Las Vegas – Las Vegas, NV	2019 – 2022	Doctor of Physical Therapy
BS	University of Nevada, Las Vegas – Las Vegas, NV	2013 – 2018	BS Athletic Training & BS Kinesiology

Licensure

- Nevada State Board of Physical Therapy Examiners – License Pending Graduation May 2022
- Nevada State Board of Athletic Trainers – License #0506513

Certifications

- Certified Athletic Trainer – Certification # 2000032742 (June 2018 – Present)
- American Heart Association, BLS for Healthcare Providers (June 2020 – June 2022)
- Blood-Borne Pathogens Training Certified (September 2019)

Clinical Experience

Jan 2022 – Fyzical Therapy and Balance Centers (Whitney Ranch) – Outpatient
Apr 2022 Orthopedics/Vestibular – 1590 W Sunset Rd #110, Henderson, NV 89014

Sep 2021 – Southern Hills Hospital and Medical Center – Inpatient Wound Care – 9300 W Sunset
Dec 2021 Rd, Las Vegas NV 89148

Jul 2021 – Sunrise Hospital and Medical Center – Underserved Acute Care – 3186 S Maryland
Sep 2021 Pkwy, Department of Rehabilitation, Las Vegas, Nevada 89109

Jul 2020 – Summit Therapy Services at William Bee Ririe Hospital – Rural Outpatient Orthopedics
Aug 2020 – 1500 Avenue H, Department of Physical Therapy, Ely, Nevada 89301

Membership in Professional Organizations

- Member American Physical Therapy Association (2018 – Present)

Current Research Activity

- Hilgenkamp T, Ho K, Guerrero K, Umagat A, Barton M, Martinez A. The effects of a telehealth intervention on balance in adults with down syndrome, *data collection stage*

Kristina Guerrero, SPT | Las Vegas, NV | 702-499-1181 | kristina.f.guerrero@gmail.com

Education

University of Nevada, Las Vegas | 2019 - 2022
Graduation May 2022

- *Doctorate of Physical Therapy (DPT): GPA 3.91*

University of Nevada, Las Vegas | 2016 - 2019

- *Attained credits via post baccalaureate program to attend Physical Therapy School*

University of Nevada, Las Vegas | 2009 - 2013

- *Bachelor of Arts: Journalism and Media Studies; Minor in Film*

Licensure

Nevada Physical Therapy Board (In Progress) | Estimated April 2022

Clinical Experience

Student Physical Therapist | Sunrise Children's Hospital – Las Vegas, NV | Jan 2022 – Apr 2022

- Evaluation, examination, and treatment of patients with developmental, orthopedic, neurological, and cardiopulmonary diagnoses in the outpatient and inpatient acute pediatric settings
- Provided in-service education on balance deficits in individuals with Down syndrome

Student Physical Therapist | MountainView Hospital – Las Vegas, NV | Sept 2021 – Dec 2021

- Evaluated, examined, and treated patient with orthopedic, neurologic, cardiopulmonary, and oncologic diagnoses in the acute hospital setting
- Provided in-service education on BPPV evaluation and treatment for patients admitted into the acute hospital

Student Physical Therapist | PAM Rehabilitation Hospital of Centennial Hills – Las Vegas, NV | July 2021 – Sept 2021

- Evaluated, examined, and treated patients with orthopedic, neurologic, and cardiopulmonary diagnoses in the inpatient rehabilitation setting
- Provided in-service education on the use of Immediate Postoperative Protheses for patients after lower extremity amputations

Student Physical Therapist | St. Luke's Magic Valley Health System – Twin Falls, ID | July 2020 – Aug 2020

- Coordinated plans of care for patients with orthopedic, neurologic and vestibular diagnoses in the outpatient orthopedic setting
- Provided in-service education on Functional Movement Disorders

Work Experience

Co-Social Chair | University of Nevada, Las Vegas – Physical Therapy | Aug 2019 - Present

- Coordinate social gatherings for the UNLVPT Class of 2022
- Assist and advocate for the members of the UNLVPT Class of 2022 as a class officer

Teaching Assistant | University of Nevada, Las Vegas – Physical Therapy | Aug 2020 – May 2021

- Provide supplemental instruction to first year students for Foundations and Neuroanatomy classes
- Assist faculty with class materials and grading assignments

Co-Social Media Manager | University of Nevada, Las Vegas – Physical Therapy | Nov 2020 – May 2021

- Create content for UNLVPT’s Instagram page
- Maintain a professional online environment for students, faculty, alumni and community members to engage with the program

Co-Founder and Co-Director | Enchanted Encounters | Aug 2014 – Jan 2020

- Established the organization to benefit underserved children in Southern Nevada
- Partnered with other non-profit organizations benefiting children in Southern Nevada

Rehabilitation Technician | ATI Physical Therapy | June 2018 – June 2019

- Assisted patients with exercises prescribed by the physical therapist
- Provided an inviting and clean environment for patients in the clinic

Social Media Specialist and Assistant Account Executive | MassMedia | Jan 2014 – Dec 2016

- Social Media Specialist
 - Managed online communities for health care and non-profit clients
 - Leveraged integrated marketing efforts through strategic social media campaigns
- Assistant Account Executive
 - Coordinated strategic integrated health care marketing campaigns with a diverse marketing team
 - Organized open enrollment events for health care clients

Research

Graduate Research | University of Nevada, Las Vegas – Physical Therapy | Feb 2019 – Present

- “The Effects of a Telehealth Exercise Intervention on Balance in Adults with Down Syndrome”
 - Research and investigation on the effects of virtual exercise training on balance outcomes in adults with Down syndrome

Membership in Organizations

Member | Diversity, Equity, & Inclusion Club – UNLVPT | Aug 2020 – Present

- Attend monthly meetings

Member (#865518) | American Physical Therapy Association | Aug 2019 – Present

- Attend Combined Sections Meeting to enhance evidence-based knowledge in the field of physical therapy
- Attend local events to build a network of physical therapy professionals
- Advocate for the field of physical therapy through legislative letter writing

Executive Board Member | UNLVPT Spanish Club | Aug 2019 – May 2021

- Established the club within the department to provide supplemental medical Spanish lessons to members
- Coordinate meetings with students, faculty and alumni

Service

Exercise Coach | UNLVPT | April 2021 – Present

- Teach online exercises to adults with Down syndrome
- Coordinate group exercise sessions with local organizations that serve individuals with Down syndrome and their families

Fall Risk Screener | Nevada Goes Falls Free Coalition | March 2020 and Sept 2020

- Conducted free fall risk screens for local community members
- Provided patient education about fall risk and community resources

Volunteer for PT Day of Service | Clean the World | Oct 2019

- Sorted toiletries from local hotels to be repurposed for donation to those in need of soap

Volunteer | Las Vegas Amputee Clinic | Sept 2019

- Assisted participants in the clinic by guiding them through obstacle courses and training

Educational Surrogate | Legal Aid Center of Southern Nevada | June 2016 – Feb 2020

- Advocated for the educational needs of foster children in Southern Nevada
- Collaborated with school faculty, social workers and foster parents to create educational plans for foster children

CASA Volunteer | CASA Las Vegas | Sept 2015 – Feb 2020

- Attend court hearings on behalf of foster children in Southern Nevada to advocate for their best interests
- Collaborate with a team of attorneys and social workers to attain safe permanency for foster children

Achievements and Awards

Social Responsibility Award Recipient | APTA Combined Sections Meeting | Feb 2022

Scholarship Recipient | University of Nevada, Las Vegas – Physical Therapy | Spring 2020

Outstanding Service Award Recipient | CASA Las Vegas | Sept 2018

Gold and Silver Awards: Public Relations Society of America | 2014 and 2015

1st Place Winner | National Student Advertising Competition | Apr 2013

Continuing Education

UNLVPT Brown Bag Lectures | 2019 - 2020

- Elizabeth McGehee, PT, DPT, OCS, “My Journey to Pelvic Health
- Greg Nordfelt – “TBI Survivorship”
- Brook Conway Kleven, PT, DPT, “Physical Therapy Service in Haiti”
- Istvan Takacs, PT, DPT, “The Emerging Role of Physical Therapists in Bike Fitting”
- Lisa Van Hoose, PT, PhD, MPH, “Grief and Loss Felt by All During Social Crises”
- Efosa Guobadia, PT, DPT, “Global and Community Health”
- Stephen Hunter, PT, DPT, OCS, FAPTA, “Standardized Care Processes, Patient Outcomes, and Clinical Decision Making”

APTA Combined Sections Meeting | Denver, CO | Feb 2020

- Julia Looper, PT, PhD, Alyssa LaForme Fiss, PT, PhD, Rebekah Johnson, SPT, “Current Physical Therapist Practice for Individuals with Down Syndrome”
- Corri Stuyvenberg, PT, DPT, MA, IMH-E, PCS, Kimberly Klug, PT, DSc, PCS, “Enhancing Pediatric Physical Therapy Practices by Applying Principles of Infant and Early Childhood Mental Health”
- Elizabeth Campione, PT, DPT, Certified Lymphedema Therapist, Aubrene Fiore, PT, DPT, Board Certified Specialist in Oncologic Physical Therapy, “Survivors of Childhood Cancer and Premature Physiologic Aging: What Physical Therapists Need to Know”
- Pamela Dunlap, PT, DPT, NCS, Jeffrey P. Staab, MD, MS, Janene M. Holmberge, PT, DPT, NCS, “Update on Managing Functional and Psychiatric Vestibular Disorders – Developing Successful Strategies”

APTA Combined Sections Meeting | San Antonio, TX | Feb 2022

- Katie Pellow, PT, DPT, Megan Steele, PT, DPT, Derrick Sueki, PT, PhD, DPT, “The Social Dilemma – The Impact of Social Media Use on Pediatric Pain and Health”
- Alyssa LaForme Fiss, PT, PhD, PCS, Gregory LaForme, PhD, FAAIDD, “Engaging the Child Who Exhibits Challenging Behaviors”

- Christopher McMillen, MAIS, Celia Pechak, PT, PhD, MPH, Clare Swietlik, PT, DPT, Sandra Terrazas, PT, MS, “¡Hablamos Español and American Sign Language! Preparing Students to Serve Linguistically-Diverse Patients”

Mark Barton

Las Vegas, NV | 916-335-1705 | mlbarton27@gmail.com

Education

University of Nevada, Las Vegas

Expected Graduation May 2022

Doctor of Physical Therapy (DPT)

University of Nevada, Reno

May 2017

Bachelor of Science (BS) in Biology, Minor in Spanish

Languages: Fluent in English and conversationally proficient in Spanish

Licensure/Certifications

- Nevada State Board of Physical Therapy Examiners - License Pending Graduation May 2022
- Basic Life Support – American Heart Association

Employment / Clinical Experience

Student Physical Therapist | *Dignity Health Physical Therapy – Las Vegas, NV* January – April 2022

- Treated vestibular, concussion, and general orthopedic patients
- Worked closely with high fall risk patients; developed strong assessment and treatment skill for this population
- Community engagement through baseline concussion testing, collaboration with local athletic trainers for patient care, and attending presentations with local experts to advance concussion care for athletes

Student Physical Therapist | *Renown Regional Medical Center – Reno, Nevada* Sep. – Dec. 2021

- Worked with interdisciplinary hospital team to treat patients on multiple floors throughout the hospital including general surgery, ortho, neurology, emergency department, neuro ICU, and cardiac
- Provided an in-service on physical therapy’s role in the emergency department

Student Physical Therapist | *Advanced Health Care of Reno – Reno, Nevada* July - September 2021

- Collaborated with interdisciplinary team to provide effective care for patients
- Developed POC and treated patients with varying cardiovascular, neurologic, pulmonary, and orthopedic conditions in the post-acute skilled nursing setting

Physical Therapy Tech | *Nevada Physical Therapy – Reno, Nevada*

March 2017 - May 2019

- Collaborated with UNR athletic trainers to provide care for D1 collegiate athletes
- Worked with a variety of orthopedic diagnoses and gained a strong understanding of strength progression

Membership in Professional Organizations

Member | *American Physical Therapy Association*

June 2019 - Present

- Collaborated with physical therapists and other student physical therapists to advocate for the profession
- Attended national conferences to learn current evidence-based practice, see new technology, and network
- Learned about legislative issues and took action at the state and federal level by writing letters to legislators

Member | *UNLV Spanish Club*

Fall 2019 – Spring 2021

- Developed Spanish skills related to physical therapy practice
- Discussed best practices for the Spanish speaking population with local physical therapists

Member | *UNLV Diversity, Equity, Inclusion (DEI) Club*

Summer 2020 – Spring 2021

- Participated in discussions relating to current political and social situations
- Collaborated with members on how to advocate for underrepresented groups

Service / Volunteer Activity

Volunteer

- Friends of Parkinson's Funny Bunny Race April 2021
 - o Assisted setting up event, checking in runners, and directing vendors
- Sandies for Shelby Golf Tournament
November 2020
 - o Assisted with fundraising money for Shelby following her SCI
- Fall Prevention Awareness Week
September 2020
 - o Provided virtual fall risk screenings

- Vegas Vengeance Wheelchair Rugby Tournament November 2019
 - o Assisted with management of games with scoreboard, substitutions, points, etc.
- Clean the World Organization
October 2019
 - o Helped package soap and distribute it to people in need
- Las Vegas Amputee Clinic Volunteer
September 2019
 - o Helped participants through exercises, supported and encouraged them

Current Research Activity

Graduate Research | University of Nevada, Las Vegas – Physical Therapy February 2020 – May 2022

- Investigation and research on the effects of a telehealth exercise program on balance outcomes in young adults with Down syndrome
- Poster presentation at 2022 Combined Sections Meeting in San Antonio, TX
 - o Won an award for Social Responsibility from the Global Health Special Interest Group

Continuing Education

Brown Bag Lectures

Fall 2019 – April 2022

- Attended several lectures on a variety of topics such as how to improve my patient care and knowledge of the physical therapy field, personal stories from physical therapists, and community engagement.

Distinguished Lecture Series

Fall 2019 – Fall 2021

- Attended lectures by experts in the field such as pain neuroscience, advanced activity tracking.