Applying the Clinical Practice Guidelines and the Literature on Ankle Instability: A Case Series

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ABSTRACT

Background and Purpose: Ankle sprains account for 80% of most ankle injuries and 77% of these ankle sprains are lateral ankle injuries.[1] Due to the high prevalence of ankle sprains and resultant ankle instability, it is important to select effective clinical measures and appropriate interventions to properly manage these injuries. The purpose of this study was to examine the clinical application of the Ankle Clinical Practice Guidelines and current evidence in a case series for individuals with a history of chronic ankle instability. **Methods:** Four individuals with a history of ankle sprains aged 22 to 25 years old participated in an exercise program for 4 weeks. A pretest/posttest design was used including the Cumberland Ankle Instability Tool, the Quick Foot and Ankle Ability Measure, and 3 functional hop tests. **Findings:** All 4 individuals demonstrated an increase in their Cumberland Ankle Instability Tool score. All individuals were able to decrease their time on the 6-meter Hop Test and the Figure-of-8 Hop Test. **Clinical Relevance:** Use of these patient-reported Outcome measures and objective tests did not show clinical significance except for the 6-Meter Hop Test. The 6-Meter Hop test would be beneficial for clinicians to use as it is an ideal way to document functional improvement. **Conclusion:** When considering the Ankle Clinical Practice Guidelines and the outcome of 4 individuals with varied levels of ankle instability, the authors found mixed results in terms of completing a home exercise program that focused on balance and proprioception. The clinical application of the clinical practice guidelines should continue to be explored in future studies to demonstrate their effectiveness for examination and intervention of patients with ankle instability.

Key Words: Cumberland Ankle Instability Tool, functional hop tests, Quick Foot and Ankle Ability Measure

INTRODUCTION

Ankle sprains account for 80% of most ankle injuries and 77% of these ankle sprains are lateral ankle injuries.[1] Chan et al[2] state that acute ankle sprains account for 10% of all emergency room visits with an incidence of 30,000 ankle sprains per day. The authors note that 80% make a full recovery with conservative treatment, while the remainder will develop chronic ankle instability. Tanen et al[3] define chronic ankle instability as a history of recurrent sprains and a sensation of "giving way." Based on the literature, there is a strong correlation between individuals with a history of ankle sprains and chronic ankle instability. Due to the high prevalence of ankle injuries, it is important to have an effective evaluation and appropriate management of patients with these injuries.

One of the ways to identify the best examination techniques and interventions for the treatment of ankle instability is by reviewing the best evidence in the literature. The Academy of Orthopaedics have developed Clinical Practice Guidelines (CPGs) on ankle stability and movement coordination impairments.[4] Experts were chosen to develop the CPG to determine best practice based on the current evidence. The CPG was created in 2013 in order to provide recommendations for physical therapists to implement evidence-based practice for the diagnosis and treatment of ankle injuries.

In the current study, an exploration of the CPG application is considered using the guidelines to treat chronic or acute ankle instability with two purposes in mind. The first purpose is to consider the evidence that has emerged since the CPG was published, specifically articles from 2013-2018. Articles prior to 2013 were not a focus of this study since this evidence would have been included in the creation of the guidelines. The second purpose is to combine new and old evidence from the CPG related to diagnostic tools, clinical tests and measures, and intervention techniques. The application and effectiveness of this research will be examined by applying these principles to 4 participants in a case series format.

REVIEW OF CURRENT EVIDENCE RELATED TO CLINICAL TESTS AND MEASURES

From the CPG, two outcome measures were selected for use in this case series. These two outcome measures were chosen by the authors because the evidence from the CPG and since the CPG was published supports their use to determine ankle instability and functional impairments that exist after ankle injury. The first of these self-report outcome measures is the Cumberland Ankle Instability Tool, which is used to determine if a person is experiencing ankle instability or not. The CPG stated that a score of less than 28 indicated ankle instability, and the authors of the CPG determined that this outcome tool is a valid and reliable way to diagnose ankle instability.[4] A research study by Vuuberg et al[5] supported the findings from the CPG by showing significant correlation with self-reported ankle instability. The authors concluded that the Cumberland Ankle Instability Tool does not have a floor or ceiling effect. The minimal clinically important difference (MCID) of the Cumberland Ankle Instability Tool is a change of 3 points or greater.[6] The MCID is defined as the minimal level of change required in response to an intervention before the outcome would be considered worthwhile in terms of patient function or quality of life.[7]

The second self-report outcome measure that was used in this study is the Quick-Foot and Ankle Ability Measure (FAAM). The FAAM had evidence in the CPG that gave it a level I rating. A 2016 study by Hoch et al[8] determined that the FAAM was too time consuming for clinical purposes, thus they developed the Quick-FAAM. The Quick-FAAM includes functional and recreational activities, which may include walking up and down hills, walking on uneven ground, stepping up and down curbs, and the ability to participate in sports. After analyzing the data, the authors determined that the Quick-FAAM "demonstrated favorable internal consistency as well as convergent validity based on moderate-to-strong relationships with

the original foot and ankle ability measure, global ratings of function, activities of daily living, sport, and short form-12 Physical Component Summary score."[8] The MCID of the Quick-FAAM was found to be a change of greater than 6.5%.[9]

Tests and measures chosen from the CPG in this case series include the Side Hop Test and the Figure-of-8 Hop Test. Original research cited in the CPG suggests that these tests have the ability to differentiate between the affected ankle and the unaffected ankle. The Side Hop and Figure-of-8 Hop Test received level II evidence and newer evidence confirms the usefulness of these tests. Linens et al[10] reviewed the studies completed by Caffrey et al[11] and Hertel et al[12] and concluded that these two tests had cutoff scores that were useful in determining patients who would benefit from rehabilitation. The researchers reported the cutoff scores for the Side Hop Test as >12.87 seconds and for Figure-of-8 Hop Test >17.35 seconds.[10] The minimal detectable change (MDC) defined as the amount of change that just exceeds the standard error of measurement of an instrument,[7] for the Side Hop Test was found to be 5.82 seconds, and for the Figure-of-8 Test as 4.59 seconds.[11] In addition to these two tests, the 6-Meter Hop Test was used. A study by Cho et al[13] the 6-Meter Hop Test was shown to be reliable at detecting ankle instability. The 6-Meter Hop Test has a cut off score of 87.7% limb symmetry index and an MDC of .233 seconds for males and .211 seconds for females.[14,15] Based on the CPG and more recent evidence, the authors of the current study selected the Side Hop Test, 6-Meter Hop Test, and the Figure-of-8 Hop Test as appropriate tests and measures for this case series to determine if patients with functional ankle instability improve with rehabilitation.

REVIEW OF CURRENT EVIDENCE RELATED TO INTERVENTION

The intervention section of the CPG contains a comprehensive list of interventions that have been researched in regards to acute lateral ankle sprains. A literature search was conducted to review literature from 2013-2018 to consider more recent evidence since the CPG was published. Interventions of focus include electrotherapy, low level laser therapy, early weight bearing with support, manual therapy, therapeutic exercise, and balance/proprioception exercises. Electrotherapy and low level laser therapy was chosen secondary to the authors of the CPG reporting a grade of "D," conflicting evidence, on their effectiveness based on the evidence. A literature search was performed for the additional interventions to review recent evidence on the efficacy of these techniques which were highly rated in the CPG.

In regard to the use of electrical stimulation for ankle injuries, the CPG states there is moderate evidence both to support its use and also evidence reported that supports its ineffectiveness.[4] There was one study that was cited in support of electrical stimulation which was completed in 1972.[16] Upon further investigation, a systematic review published in 2015 suggests that electrical stimulation is not effective in treating acute ankle sprains. Feger et al.[17] conclude that there is high-quality evidence against the use of electrical stimulation for pain reduction, swelling, and improvement in functional impairment. The article identified 4 randomized control trials that examined the use of neuromuscular electrical stimulation and high-voltage pulsed electrical stimulation. The ankle instability CPG was updated in 2013, so this systematic review was not included.[4] This systematic review provides information to further suggest against the use of electrical stimulation in the treatment of ankle sprains.

In terms of low level laser therapy evidence the CPG authors note there is mixed evidence for this population. One of the studies that was cited in the CPG was completed in 1989 and found that there was rapid reduction in pain and faster return to work; however, an additional 1988 study reported that low level laser was ineffective.[4] In contrast to this suggestion, De Moraes et al[18] in a randomized controlled trial state that low level laser was effective. The researchers found that the group that was treated with the active light-emitting diode showed statistically decreased pain compared to the placebo group. The authors found that the levels of edema were decreased on the third and sixth days in the light-emitting diode treatment group. From these results, the researchers concluded that using their testing dosage, light-emitting diode is effective for pain and edema reduction in the acute phase of ankle sprains.[18] This research, which was conducted following the publication of the CPG, helps to provide more evidence in support of the use of laser therapy. However, a limitation of this study is potential bias since the publisher of this journal is a manufacturer of lasers.

Early weight bearing with support received a grade of A by the CPG authors. Current research continues to support the CPG findings. A systematic review by Peterson et al[19] concluded that long term non-weight bearing should be avoided following nonsurgical treatment of lateral ankle sprains. A below the knee cast helps to reduce swelling and pain during the early inflammatory phases of healing. For ankle sprains of grade III, a short period of nonweight bearing with a cast below the knee could be beneficial for a maximum of 10 days. Later during the proliferative phase and remodeling phase, immobilization would be detrimental for the healing process. Following this phase, the ankle is best to be protected from further inversion injury using a semi-rigid ankle brace. The authors report that prolonged immobilization has a detrimental effect on muscles, ligaments, and joint surfaces. This research supports the statements in the CPG related to the importance of early weight bearing.

Manual therapy is an additional intervention technique discussed in the CPG. The CPG identified that mobilizations with movement were an appropriate treatment approach to use in the progressive loading phase of treatment but was not mentioned for use in the acute phase. A 2017 case series was conducted by Hudson et al[20] on the effect of the Mulligan mobilization with movement (MWM) when used to treat acute ankle sprains. The mobilization was done at the distal fibula or 2 to 3 inches proximal if it was modified. The treatment was administered for a total of 9 days and patients reported a decrease in pain, decrease in disability, and an increase in function. The authors reported an immediate decrease in pain following the first treatment with MWM. This evidence indicates that the use of MWM is beneficial in both the acute and the progressive loading phases of ankle sprains.

Many other manual therapy techniques can be beneficial in treatment of ankle sprains. A randomized controlled trial was conducted later in 2013 that compared the effectiveness of manual therapy and exercise to a home exercise program alone in the treatment of inversion ankle sprains. From this study,[21] the researchers concluded there were improvements on both the activities of daily living and sports subscale of the FAAM, improvements of the Lower Extremity Functional Scale, and improvements on the Numeric Pain Rating Scale that were greater in the group who received manual therapy at both 4 weeks and 6 months. The manual therapy that was received by these individuals included mobilizations at the proximal and distal tibiofibular joint, subtalar joint, and the talocrural joint.[21] This research further supports the information that is included in the CPG by providing evidence in support of using mobilizations in the treatment of

ankle sprains in both the acute and progressive loading phases.

There is a significant amount of evidence on therapeutic exercise as an intervention for ankle sprains. In 2010, Bleakley et al[22] reported a significant increase in lower extremity function for those who received exercise in combination with early progressive weight bearing. Early progressive weight bearing is also highly recommended within the CPG. As for the subacute/chronic stage, evidence by Hall et al[23] suggests that TheraBand® and proprioceptive neuromuscular facilitation techniques are both effective treatments to improve strength, pain, and how patients perceive their instability. These two different therapeutic exercise techniques were compared to a control group who did not receive any exercise. Both proprioceptive neuromuscular facilitation and resistance band groups had improvements in strength and in pain levels but there were no improvements in the control group.[23] This research provides further support for the CPG recommendation in the use of therapeutic exercise in the progressive loading phase for reduction in pain and increases in strength in chronic ankle instability.

The CPG intervention section provides useful information about proprioception and balance training. Overall, the CPG reports that this type of training helps to improve postural sway and functional ankle instability.[4] In a systematic review, Doherty et al[24] concluded that with the addition of balance and proprioceptive training, there was a reduction in repeat ankle sprain incidence and subjective instability, improved postural control, and decreased incidence of "giving way" episodes. Another study by Lasarou et al[25] concluded that balance and proprioception interventions were very effective in improving ankle range of motion (ROM) and functional performance in individuals with ankle instability. Both of these studies support the CPGs recommendation for including balance and proprioceptive training in the treatment for ankle instability.

Research Summary

The CPG was used as a guide to implement selected examination and intervention techniques in the individuals within this case series. Based on the CPG review and additional studies through a literature search, clinical tests and measures, and interventions that are best supported by the evidence were applied to the individuals in this case series. The Side Hop Test, 6-Meter Hop Test, and Figure-of-8 Hop Test were used to determine the individual's functional abilities and potential need for rehabilitation. Following examination, the Quick-FAAM and the Cumberland Ankle Instability Tool were used as the outcome tools to measure functional progress. Cut off scores for the Cumberland Ankle Instability Tool were used to identify ankle instability. Intervention for the treatment of the individuals' lateral ankle sprain included a focus on therapeutic exercise, particularly on balance and proprioception due to the chronic nature of the individual's injury. The goal was to combine the new evidence obtained through this literature review and the CPG in order to determine the effectiveness of these guidelines in a clinical setting.

CASE PRESENTATIONS

Case 1

Examination: A 25-year-old female presented to clinic with a history of chronic right ankle instability. She had a history of multiple sprains over the last 5 years with the most recent episode 2 weeks prior to examination. Tenderness was located over the anterior talofibular ligament with palpation; however, no pain was described. No swelling or ecchymosis was observed. The individual reported that her ankles "felt weak," however, this did not limit her activity level. Prior treatment included strengthening ankle musculature with TheraBand and use of a brace. She was in good health with no significant past medical history. Examination of the ankle revealed active motion within normal limits and equal bilaterally. Laxity noted 3/4 (0 = no mobility, 3 = normal mobility, 6 = complete instability) on the right and 2/4 on the left with an anterior drawer test.[26,27] Manual muscle testing revealed 5/5 strength in anterior tibialis and peroneal longus and brevis with 4/5 strength in posterior tibialis on the right.[28] The individual was able to perform 8 heel raises on the right. During the examination, the patient performed the Side Hop Test, 6-Meter Hop Test, and the Figure-of-8 Hop Test (Table 1).

Management and Outcome: At the start of treatment, the individual completed the Cumberland Ankle Instability and Quick-FAAM outcome measures (Table 2). Based on the cut off score for the Cumberland Ankle Instability Tool, her score was consistent with a diagnosis of ankle instability. The individual performed a home program of therapeutic exercises instructed by the physical therapist. An emphasis on balance and proprioceptive activities was provided with a goal of performing the exercises 5 times per week for 4 weeks. This was recorded on a chart (Table 3). Additionally, she was instructed in transverse friction massage to the anterior talofibular ligament to be performed once per day for 15 minutes. The individual was able to perform the home program independently. Upon return for the follow-up visit, she reported no difficulty with performing the exercises and had less tenderness with palpation of the anterior talofibular ligament. Overall, she reported her ankle felt stronger when performing sport activities including volleyball. At this time, a Cumberland Ankle Instability and Quick-FAAM was completed again. She was re-tested on the Side Hop Test, 6-Meter Hop, and Figure-of-8 Hop Test (see Tables 1 and 2). Over a 4-week period, she participated in a total of 8 exercise sessions.

Case 2

Examination: A 24-year-old male presented to the clinic with a prior ankle sprain 5 months ago. He reported only one episode of injury to his right ankle and denied any pain or tenderness with palpation in the ankle. No laxity was noted with an anterior drawer test. Ankle ROM was within normal limits bilaterally. Manual muscle test revealed 5/5 strength in anterior tibialis, posterior tibialis, peroneus longus, and peroneus brevis. He was able to perform 18 heel raises on the right and 23 on the left. Prior home exercises included pain-free ankle ROM and heel raises. The individual did not receive any prior physical therapy intervention. His past medical history was unremarkable. During the examination, he performed the Side Hop Test, the 6-Meter Test, and the Figure-of-8 Hop Test.

Management and Outcome: At the start of treatment, he completed the Cumberland Ankle Instability and Quick-FAAM outcome measures. Based on the cut off score for the Cumberland Ankle Instability Tool, his score was consistent with a diagnosis of ankle instability. The individual performed a home program of therapeutic exercises, with an emphasis on balance and proprioceptive activities with a goal of performing the exercises 5 times per week for 4 weeks. He was instructed by the physical therapist on proper performance of the exercises and demonstrated correct performance of the exercises. The individual was given a list of the home exercise program and a chart to document each time he performed the prescribed exercises. He was able to perform the home program independently. Upon return for the follow-up visit, he reported no dif-

Table 1. Pre and Post Data from Functional Hop Tests for the Four Individuals in this Case Series

	6-Meter Hop Test		Figure-of-8 Hop Test		Side Hop Test	
Patient 1	18.25 sec	12.06 sec	21.55 sec	19.28 sec	22.0 sec	22.65 sec
Patient 2	9.125 sec	5.45 sec	12.9 sec	11.56 sec	9.2 sec	8.67 sec
Patient 3	5.39 sec	3.34 sec	15.0 sec	12.3 sec	9.33 sec	7.94 sec
Patient 4	4.44 sec	3.27 sec	13.45 sec	10.63 sec	11.3 sec	8.4 sec

Table 2. Self-Report Outcome Tool Scores for the Four Individuals in this Case Series

	Cumberland Ankle Instability Tool		Quick-Foot and Ankle Mobility Measure Hop Test	
	Pre	Post	Pre	Post
Patient 1	17/30	18/30	39/48 (81%)	34/48 (70%)
Patient 2	25/30	27/30	30/32 (92%)	32/32 (100%)
Patient 3	23/30	24/30	48/48 (100%)	44/48 (91%)
Patient 4	16/30	26/30	36/44 (81%)	N/A

Table 3. Description of the Initial Home Exercise Program for the Four Individuals in this Case Series

Initial Home Exercise Program
BOSU ball single leg balance 30 seconds 3 – 5 times
BAPS board clockwise and counterclockwise in standing 3 sets
Single leg heel raises 10 reps/5 sets
Marching on trampoline 5 – 15 minutes based on patient tolerance

ficulty with performing the exercises. He stated he had slightly more confidence in his ankle and felt he could perform single leg squats with less difficulty. At the follow-up appointment, he completed the Cumberland Ankle Instability and Quick-FAAM. Over a 4-week period, he participated in a total of 16 exercise sessions.

Case 3

Examination: A 23-year-old male presented to clinic with chronic left ankle instability. He had a history of 5 to 7 ankle sprains over the last 5 years. The most recent ankle sprain was 3 months ago. There was no current complaints of pain or edema. No tenderness with palpation of the lateral ligaments of the left ankle. Ankle ROM was within normal limits bilaterally. Manual muscle testing revealed 5/5 strength in anterior tibialis, posterior tibialis, peroneus longus, and brevis. The individual was able to perform 23 repetitions of heel raises on the left and 25 on the right. Anterior drawer test revealed 2/4 laxity bilaterally. He had no formal treatment for his prior ankle sprains and was in good health with no significant past medical history. During the examination, he performed the Side Hop Test, 6-Meter Hop Test, and the Figure-of-8 Hop Test.

Management and Outcome: At the start of treatment, he completed the Cumberland Ankle Instability and Quick-FAAM outcome measures. Based on the cut off score for the Cumberland Ankle Instability Tool, his score was consistent with a diagnosis of ankle instability. He performed a home program of therapeutic exercises, with an emphasis on balance and proprioceptive activities with a goal of performing the exercises 5 times per week for 4 weeks. He was instructed by the physical therapist on proper performance of the exercises and demonstrated correct performance of the exercises. The individual was given a list of the home exercise program and a chart to document each time he performed the prescribed exercises. He was able to perform the home program independently. Upon return for the follow-up visit, he reported no difficulty with performing the exercises. He stated his ankle was feeling better until he landed on a player's foot playing volleyball and "rolled" his left ankle again 5 days later. He denied any edema following the reinjury. He stated he was able to continue his exercise program; however, complained of "popping" in his ankle with exercise. At the follow-up appointment, the Cumberland Ankle Instability and Quick-FAAM were completed again. He was re-tested on the Side Hop Test, 6-Meter Hop Test, and Figure-of-8 Hop Test. Over a 4-week period, he participated in a total of 17 days of exercise sessions.

Case 4

Examination: A 22-year-old female presented to clinic with a prior history of left ankle instability. She reports 3 prior ankle sprains with the most recent 1.5 years ago and denied any pain in her ankle. Ankle ROM was within normal limits bilaterally. Manual muscle testing revealed 5/5 strength in anterior tibialis, posterior tibialis, peroneus longus, and brevis. She was able to perform 20 heel raises on the left and 25 heel raises on the right. The anterior drawer test revealed 2/4 laxity bilaterally. She did not report any prior formal treatment for the ankle sprains. The individual's past medical history was unremarkable. During the examination, she performed the Side Hop Test, 6-Meter Hop Test, and the Figure-of-8 Hop Test.

Management and Outcome: At the start of treatment, she completed the Cumberland Ankle Instability and Quick-FAAM outcome measures. Based upon the cut off score for the Cumberland Ankle Instability Tool, her score was consistent with a diagnosis of ankle instability. She performed a home program of therapeutic exercises, with an emphasis on balance and proprioceptive activities with a goal of performing the exercises 5 times per week for 4 weeks. The physical therapist instructed her on proper performance of the exercises and demonstrated correct perfor-

mance of the exercises. She was given a list of the home exercise program and a chart to document each time she performed the prescribed exercises. She was able to perform the home program independently. Upon return for the follow-up visit, she reported no difficulty with performing the exercises; however, compliance in performing the exercises was difficult. At the follow-up appointment, she completed the Cumberland Ankle Instability and Quick-FAAM again. The individual was re-tested on the Side Hop Test, 6-Meter Hop Test, and Figure-of-8 Hop Test. Over a 4-week period, she participated in a total of 14 exercise sessions.

DISCUSSION

The purpose of this case series was to determine if the evidence in the Clinical Practice Guidelines and most recent evidence were applicable in a clinical setting. After analyzing the data from the 4 individual cases, multiple observations were noted.

Cumberland Ankle Instability

All the individuals in the study scored lower than a 28 on the Cumberland Ankle Instability Tool indicating that they did have ankle instability at the initial evaluation. It is also important to note that none of the individuals scored higher than 28 on their posttreatment scores indicating that each individual still had some degree of ankle instability. It was observed that all 4 cases had an increase in their score from pre- to posttesting. However, only one individual, Case 4 as described above, had a clinically significant change of 10 points. As mentioned in the research section on outcome tools, the MCID for the Cumberland Ankle Instability Tool is ≥ a 3-point change.[6] Case 1 and 3 had one-point improvements and Case 2 had a two-point increase; however, these were not clinically significant for the Cumberland Ankle Instability Tool.

Quick-Foot and Ankle Ability Measure

The second outcome tool we used was the Quick-FAAM. It was noted that Case 4 did not complete the Quick-FAAM in its entirety. Therefore, her score was unreliable and was not included in the data analysis. Two of the remaining 3 individuals, Cases 1 and 3, showed a decrease in their pre and post scores of 11% and 9%, respectively. These percentages demonstrate a decrease in the individual's ability to perform the tasks included in the Quick-FAAM because the MDC is greater than 6.5%.[10] One individual, Case 2, showed an increase in his score by 8%, indicating an increase in his ability to perform the tasks on the Quick-FAAM.

Functional Examination Techniques

For the 6-Meter Hop Test, all 4 individuals decreased their time. All of the differences in time were greater than the reported MDC of 0.233 seconds for males, and 0.211 seconds for females.[16] Therefore, the results show that participation in proprioception and balance exercises, as recommended by the Ankle Stability Clinical Practice Guidelines improves the individual's ability to perform the 6-Meter Hop Test with improved ankle stability. The second functional hop test used was the Figure-of-8 Test. Case 1 had an improvement in her time of 2.27 seconds. Case 2 showed an improvement of 1.34 seconds. Case 3 exhibited an improvement of 2.70 seconds. Finally, Case 4 showed improvement of 2.82 seconds. Overall, the times varied when it came to completing the test. The fastest completion time was noted to be 13.45 seconds during the pretest and 10.63 seconds for the posttest. Interestingly, these scores were achieved by the same individual. After analyzing the data, all 4 individuals experienced a decrease in their overall time. However, based on the MDC of 4.59 seconds, these results show that the individuals did not have a significant increase in their overall function.[10] It was also noted that higher pretest level of function (shorter completion times) seems to coincide with higher posttest function. Lastly, the Side Hop Test was analyzed. According to the previous research, the MDC for the Side Hop Test is 5.82 seconds.[10] When comparing the MDC to the differences in individual's completion time, some interesting results are yielded. Of the 4 individuals, Case 1 experienced a 0.15 second increase in her overall time. The other 3 individuals all experienced a decrease in their completion time. Case 2 had a difference of 0.53 seconds. Case 3 exhibited a difference of 1.39 seconds and Case 4 showed a 2.90 second change in her time. The differences in times were all less than the MDC. As a result, these times were not indicative of a significant improvement in overall function on the affected ankle. As a side note, Case 1 performed the worst on all three functional hop tests by a significant amount of time. It is hypothesized that this participant performed the worst on the functional tests because her injury was rather acute occurring only two weeks prior to initiation of treatment sessions. She also had the most complaints about ankle pain, as well as ankle limitations at the beginning of the treatment sessions.

There were a number of limitations to this case series that include the following: all of the individuals that were recruited for the case series had chronic ankle instability; however, one individual had an acute re-injury two weeks prior to the study. During the initial research of the Ankle Stability Clinical Practice Guidelines, the majority of the evidence was for acute ankle sprains, making it difficult to apply certain aspects of the Clinical Practice Guidelines to the individuals of the case series. The next limitation of the case series was that due to circumstances of the study, the individuals were instructed to complete a home exercise program 5 times per week for 4 weeks and increase their exercises on their own, making it difficult to assess whether their responses and reporting were accurate or not. Participant adherence was difficult to determine and exercises were not completed all 20 days that were recommended (ranging from 8-17 days). The third limitation was that one of the individuals did not fill out the Quick-FAAM completely creating an inaccurate representation of the function and ability of their ankle. The other limitation with Quick-FAAM was that the individuals had very high scores prior to treatment, resulting in a possible ceiling effect for the individuals. The last limitation is that the uninvolved ankle was not assessed during completion of the anterior drawer test or the other functional tests, which made it difficult to compare the affected ankle to the unaffected ankle for laxity and function.

Further research should be completed in order to apply the Ankle Stability Clinical Practice Guidelines throughout a typical physical therapy plan of care in those with acute or chronic ankle sprains to determine the effectiveness of the CPG application.

CONCLUSION

In conclusion, this case series examined the benefits of balance and proprioceptive exercise training on individuals with a history ankle instability. Prior to beginning treatment, all individuals completed 2 outcome measures, 3 functional tests, and the anterior drawer test. These tests and measures were chosen based on evidence from the Clinical Practice Guidelines and current evidence. The following tests and measures showed mixed results for individuals with ankle instability: Cumberland Ankle Instability Tool was not clinically significant, the Quick-FAAM showed mixed results, 6-Meter Hop Test showed clinically significant improvement, Figure-of-8 Test showed improvement but was not clinically significant, and

the Side Hop Test showed improvement but was not clinically significant. Overall, mixed results were found for the completion of a home exercise program that focused on balance and proprioceptive exercises for individuals with a history of ankle instability. The clinical application of the CPGs should continue to be researched in future studies to demonstrate their effectiveness for examination and intervention of patients with ankle instability.

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