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Perceived Benefits of Kinesio Tape® Compared to Non-Kinesiology Tape and No Tape in Healthy Collegiate Athletes

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Perceived Benefits of Kinesio Tape® Compared to Non-Kinesiology Tape and No Tape in Healthy Collegiate Athletes

Abstract

Background: Sports participation is considered a meaningful occupation for people of all ages. Multiple disciplines use Kinesio Tape® during treatment (Kinesio Taping® Association International, 2013e) for sports-related injuries. While the use of Kinesio Tape® is becoming increasingly popular in sports, there is a lack of evidence supporting its effectiveness. The purpose of this study was to address the following question: Is there a perceived sports performance benefit of using Kinesio Tape® compared to non-kinesiology tape or no tape in healthy collegiate athletes?

Method: This quantitative pilot study used a convenience sampling method. The participants included eighteen healthy men's and women's lacrosse players from a division III university. A crossover design was used and consisted of three trials: Kinesio Tape®, non-kinesiology tape, and no tape. Perceived sports performance was measured using an 8-item, study-specific questionnaire.

Results: The results indicated that there were no significant differences between the Kinesio Tape® and no tape trials. There were statistically significant differences found between the non-kinesiology tape and no tape trials.

Conclusion: While non-kinesiology tape was the only tape that yielded significant differences, the participants perceived their sports performance to be better when wearing either non-kinesiology tape or KT than when wearing no tape, indicating a possible placebo effect.

Keywords

Kinesio Tape®, Non-Kinesiology Tape, No Tape, Healthy Collegiate Athletes

Cover Page Footnote

We would like to thank Dr. Neil Penny, Dr. Porrizzo, Coach Ryan Sheaffer, and Coach Kelly McCloskey for their support and guidance.

Credentials Display

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According to the National Electronic Injury Surveillance System, more than 1.9 million individuals in the United States had a sports-related injury that was treated in an emergency department in 2012 (Misra, 2014, p.1). The injuries that occur most often during participation in sports include sprains and strains, knee injuries, swollen muscles, Achilles tendon injuries, shin splints, rotator cuff injuries, fractures, and dislocations (National Institutes of Health, 2014). These injuries are often a result of accidents, failure to wear appropriate gear, not warming-up or stretching, and lack of stamina (National Institutes of Health, 2014). Injuries may also be caused by improper body mechanics (Lieber, Rudy, & Boston, 2000), overuse, and failure to treat pre-existing injuries (Agel & Schisel, 2013). Sports-related injuries can decrease participation in areas of occupation, such as activities of daily living (ADLs), instrumental activities of daily living (IADLs), leisure, and social participation (Donaldson & Ronan, 2006).

According to the *Occupational Therapy Practice Framework: Domain and Process*, sports are considered extracurricular activities in the occupation of education (American Occupational Therapy Association [AOTA], 2014a). However, sports can also be included in multiple areas of occupation, such as play, leisure, and social participation for people of all ages and from different populations. Multiple research studies have supported the benefits of sports participation in daily living (Crone & Guy, 2008; Ketteridge & Boshoff, 2008; Stephens, Neil, & Smith, 2012) and the positive impact sports participation can have on social well-being (Donaldson & Ronan, 2006).

The Kinesio Taping® Method is a therapeutic taping technique used to treat a variety of orthopedic, neuromuscular, neurological, and other medical conditions (Kinesio Taping Association International [KTAI], 2013a). Kinesio Tape® (KT) was designed to have the elasticity of a healthy muscle and the texture and elasticity similar to that of living human skin in order to treat the loss of muscle elasticity from injury or overuse (KTAI, 2013d). KT is a 100% cotton, latex-free, elastic, and heat-activated adhesive tape with over 1,200 application techniques (KTAI, 2013c). This method is designed to “facilitate the body’s natural healing process while providing support and stability to muscles and joints without restricting the body’s range of motion” (KTAI, 2013f, para. 1). KT has numerous application designs that “re-educate the neuromuscular system, reduce pain and inflammation, optimize performance, prevent injury and promote good circulation and healing, and assist in returning the body to homeostasis” (KTAI, 2013f, para. 2). KT may enhance performance, as well as decrease pain and inflammation (KTAI, 2013f). KT has become an increasingly popular treatment method among athletes to increase function and participation (KTAI, 2013b).

A meta-analysis by Williams, Whatman, Hume, and Sheerin (2012) reviewed and evaluated the effectiveness of KT. The authors located 96 articles through various databases. Of the 96 articles, the authors used 10 for the meta-analysis based on specific exclusion and inclusion criteria. The focus of the meta-analysis was to review and evaluate the effectiveness of KT in the treatment and prevention of sports injuries. The articles

reviewed studied the effects of KT on pain, ROM, strength, proprioception, and muscle activity. All of the reported statistically significant results from the studies were further assessed using magnitude-based inferences. It was found that no studies showed any significant clinical effects of wearing KT (Williams, Whatman, Hume, & Sheerin, 2012).

Drouin, McAlpine, Primak, and Kissel (2013) completed a literature synthesis to assess the effects of KT on the athletic performance of healthy, active individuals. Ten studies were chosen. Each author individually evaluated the results of the 10 studies and compared the results. The studies included in the review were considered to be of high methodological quality (Drouin, McAlpine, Primak, & Kissel, 2013). All of the studies analyzed the effects of KT on measureable athletic performance of healthy individuals, which included maximum voluntary contraction, grip strength, peak muscle torque, muscle bioelectrical activity, range of motion, vertical ground reaction force, and Orthodromic conduction. Also, the placement of the KT on the participants in the 10 studies varied between the forearm muscles; masseter muscles; quadriceps and hamstring muscles; lumbar erector muscles; and the gastrocnemius, soleus, and tibialis anterior (Drouin et al., 2013). Following the literature synthesis, the authors concluded that the evidence from the 10 studies was not strong enough to determine the effectiveness of KT on improving athletic-based performance outcomes in healthy individuals (Drouin et al., 2013). The authors recommended that future research should assess the potential

quality randomized control trials with large sample sizes (Drouin et al., 2013).

Despite the lack of substantial and supportive evidence of the effectiveness of KT, over 150,000 practitioners worldwide use the Kinesio Taping® Method (KTAI, 2013c) with the option to become certified in the taping application technique (KTAI, 2013c). Since the 2008 Beijing Olympics, KT has become a popular treatment and prevention method for sports-related conditions throughout various health care professions (Williams et al., 2012). Thus, the purpose of this study was to determine if there was a perceived sports performance benefit with the use of KT compared to non-kinesiology tape or no tape in healthy collegiate athletes. The following research question was proposed: Is there a perceived sports performance benefit of using KT compared to using non-kinesiology tape or no tape in healthy collegiate athletes? The null hypothesis was: There is no perceived sports performance difference between the use of KT, non-kinesiology tape, and no tape. The alternative hypothesis was: There is a perceived sports performance difference between the use of KT, non-kinesiology tape, and no tape.

Method

The design of this research study was a quantitative pilot study that used a convenience sampling method. A crossover design was used so that all of the participants were a part of all three trials. A single-blind approach was used, in which the participants were unaware of which tape (Kinesio Tape® or non-kinesiology tape [Elastikon®]) they received on which day. The authors experimented with non-kinesiology types of

tape that had similar texture, color, pliability and adherence to KT. Elastikon® was chosen as the non-kinesiology tape for the study. KT, a non-kinesiology tape, and no tape were the three independent variables. The dependent variable was perceived sports performance, which was measured by ratings on a self-made questionnaire.

The inclusion criteria was (a) 18 years of age or older, (b) on the roster of the men's or women's lacrosse team at the small division III university where the study took place, (c) able to attend three extended practices, (d) had not experienced a skin sensitivity or allergic reaction to adhesive tape, and (e) had not seen a doctor for an upper-extremity injury in the last 6 months. For the purpose of this research study, upper-extremity injuries included an injury to the arm, neck, scapula, or shoulder, since this was the region being taped.

The collegiate athletes who met the inclusion criteria and consented to participate provided the researchers with a four-digit, self-selected, confidential identification number. The participants were randomly assigned to one of three groups by their identification number via an online randomizer. The groups were Group A, Group B, and Group C. The participants were sent an individual email, through the university's email directory, to notify them that they were eligible to participate in this research study. Emails were also sent to the participants to remind them of when the student researchers would be attending their practices to collect data.

Based on a thorough literature review, no standardized assessment tool was found that was relevant to this study. Therefore, the researchers

developed an 8-item, study-specific questionnaire regarding the use of taping on the perceived sports performance of lacrosse players. This questionnaire used a 7-point Likert scale. A score of 1 represented that the participant felt he or she performed significantly worse than usual, a score of 4 represented that the participant felt he or she performed the same as usual, and a score of 7 represented that the participant felt he or she performed significantly better than usual. Therefore, a higher mean score indicated better perceived performance.

Approval from the division III university was obtained along with informed consent from the participants. The participants were asked to meet the researchers 15 to 30 min prior to the start time of three team practices. Prior to the practices, the student researchers prepared the questionnaires by writing the date, group, and identification number on each of the questionnaires in order to ensure accuracy of tracking the data. The participants received either KT, non-kinesiology tape, or no tape based on their assigned group. Group A received KT during the first practice, a non-kinesiology tape during the second practice, and no tape during the third practice. Group B received a non-kinesiology tape during the first practice, no tape during the second practice, and KT during the third practice. Group C received no tape during the first practice, KT during the second practice, and a non-kinesiology tape during the third practice. The participants were taped while they faced away from the supplies, which were covered by a towel to blind the participants from which tape they were receiving. To standardize the taping method, the

principal investigator, who is certified in the Kinesio Taping® Method, performed two, 1-hr training sessions with the co-investigators to practice the shoulder impingement deltoid inhibition application.

Two application concepts of KT include inhibition and facilitation. The inhibition concept is used for overused muscles, acute conditions, and muscle spasms, while the facilitation concept is used for muscle weakness, chronic conditions, and rehabilitation (KTAI, 2013e). The inhibition application was chosen since the sample consisted of healthy athletes who did not have a chronic condition of the shoulder or muscle weakness and who frequently used the shoulder muscles group. The shoulder impingement deltoid inhibition application (KTAI, 2013e) was the taping method used for the participants who received KT and the non-kinesiology tape. The tape was applied to the participants' dominant shoulder, due to the predominant use of the shoulder in lacrosse.

The first component of this application method consisted of measuring and cutting a Y-shaped strip of tape and applying an anchor “with no tension at Greater Tubercle of the Humerus” (KTAI, 2013e, p. 33). The second component of this application method consisted of measuring and cutting a Y-shaped strip of tape and applying an anchor, “below Deltoid Tuberosity of the Humerus, with no tension” (KTAI, 2013e, p. 35). Figure 1 displays the taping application demonstrated on one of the researchers.



Figure 1. The shoulder impingement deltoid inhibition application.

The participants who wore KT or non-kinesiology tape completed practice immediately after the tape was applied. Likewise, the participants who did not receive tape that day also completed practice. At the completion of team practice, the participants provided the student researchers with their four-digit, self-selected, confidential identification number, and the researchers then handed the participants their corresponding questionnaire. The participants were then asked to complete the questionnaire, which was immediately placed in a lockbox. Those who received tape had the tape removed by the researchers with an adhesive remover, if needed. The participants had the option to have the tape removed at any time during their practice. The data collection concluded after the third session.

Results

A meeting with the men's lacrosse team was held and 24 members of the team attended. Twenty-two male lacrosse players signed the informed consent form during the meeting, and 17 met the inclusion criteria. Three men were

excluded because of scheduling conflicts, and two were excluded due to a self-reported upper-extremity injury. Because of the time required to tape several players just before practice, nine of the 17 men that met the inclusion criteria were chosen using an online randomizer. After the completion of the first taping session, one male participant left the lacrosse team, making him ineligible to participate in the last two taping sessions. The results from the session that he did attend were still included in the analysis of data. Another male participant missed one session. The results from the two sessions that he did attend were still included in the analysis of data. Seven male participants attended all three sessions and completed the questionnaire for each session. Figure 2 displays the recruitment of the men's lacrosse players, as well as attrition of the male participants throughout the duration of the research study.

A meeting with the women's lacrosse team was held and 14 members attended. Thirteen female lacrosse players signed the informed consent form during this meeting. Of the 13 females, 12 met the inclusion criteria. One female was excluded because of scheduling conflicts. Because of the time required to tape several athletes just before practice, nine of the 12 women who met the inclusion criteria were randomly selected using an online randomizer. Throughout the course of this study, two female participants each missed one session due to illness that was unrelated to the study. The results from the two sessions they did

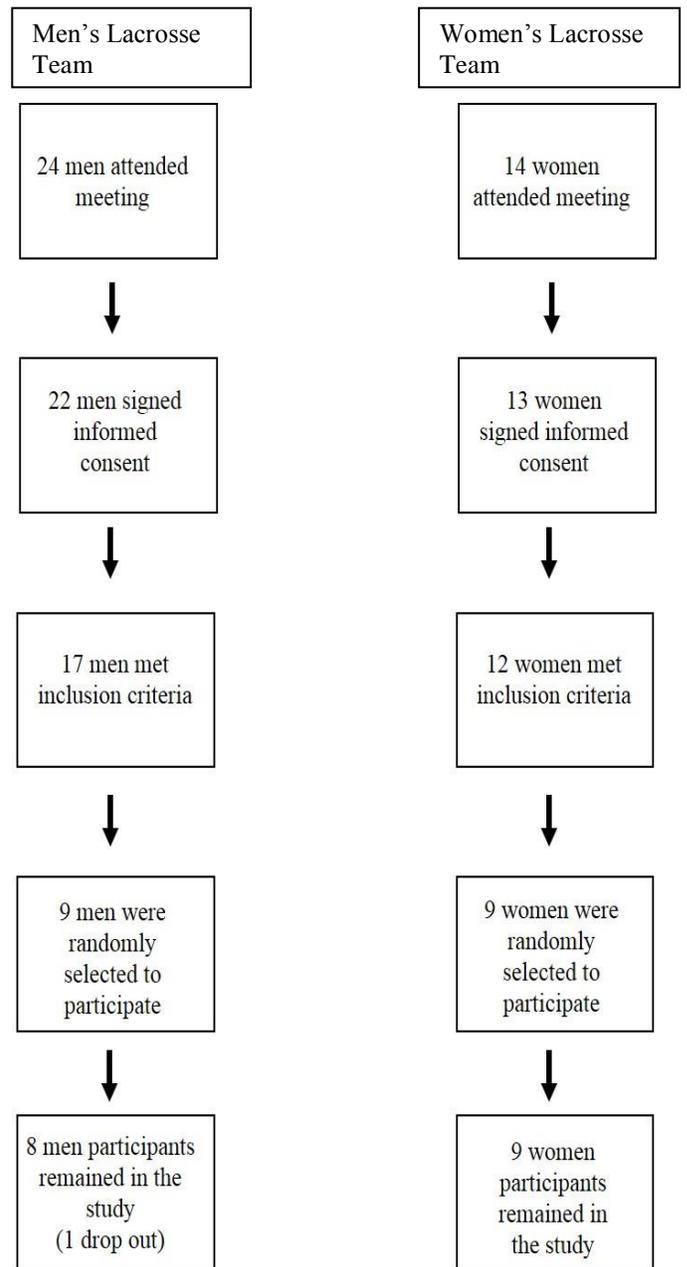


Figure 2. Flow chart of participant recruitment and attrition.

attend were still included in the analysis of data. Seven female participants attended all three sessions and completed the questionnaire three times. Figure 2 displays the recruitment of the women's lacrosse players, as well as attrition of the female participants throughout the duration of the research study.

Table 1 displays the mean and standard deviation of each question for the men's and women's lacrosse teams for the three trials: KT, non-kinesiology tape, and no tape. The average mean for questions one through six was calculated in order to describe the overall sports performance for each of the three trials. The means and standard deviations of questions seven and eight were not included in the average mean score, since these questions were not always relevant to each participant. Question seven only related to participants who experienced pain at practice, and question eight only related to participants when wearing KT or non-kinesiology tape.

The means for questions one through eight for the KT trial ranged from 4.00 to 4.47, and for the non-kinesiology tape trial from 4.27 to 5.00.

The means for questions one through seven for the no tape trial ranged from 3.87 to 4.13. The average mean score for questions one through six for the non-kinesiology tape trial ($M = 4.69$, $SD = 0.85$) was higher than both the KT trial ($M = 4.22$, $SD = 0.73$) and the no tape trial ($M = 3.99$, $SD = 0.36$). The mean for question seven, which addressed dominant arm pain, was higher for the non-kinesiology tape trial ($M = 4.27$, $SD = 0.65$) when compared to the KT trial ($M = 4.17$, $SD = 0.41$) and the no tape trial ($M = 4.00$, $SD = 0.00$). The mean for question eight, which addressed overall performance at practice when wearing tape, was higher for the non-kinesiology tape trial ($M = 4.69$, $SD = 0.85$) when compared to the KT trial ($M = 4.22$, $SD = 0.73$).

Table 1

Means and Standard Deviations of the Combined Men's and Women's Lacrosse Teams

Question	Kinesio Tape®		Non kinesiology Tape		No Tape	
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
1 (performance)	4.12	(0.70)	4.47	(0.62)	4.00	(0.38)
2 (fatigue)	4.24	(0.56)	4.35	(0.70)	4.13	(0.52)
3 (soreness)	4.29	(0.77)	4.71	(0.99)	3.93	(0.26)
4 (arm stability)	4.47	(0.94)	5.00	(0.94)	4.00	(0.00)
5 (passing)	4.18	(0.81)	5.00	(1.06)	4.00	(0.65)
6 (shooting)	4.00	(0.61)	4.59	(0.80)	3.87	(0.35)
Avg. 1-6	4.22	(0.73)	4.69	(0.85)	3.99	(0.36)
7 (pain)	4.17	(0.41)	4.27	(0.65)	4.00	(0.00)
8 (performance with tape)	4.13	(0.62)	4.69	(0.87)	-	

A one-way ANOVA was conducted to determine if there was a perceived difference between the three trials for the combined men's and women's lacrosse teams (see Table 2). When the one-way ANOVA reported a statistically significant difference, a Bonferroni post-hoc test was used. There were no statistically significant differences found for question one, which addressed performance, question two, which addressed fatigue, and question seven, which addressed pain, between any of the trials.

However, there were statistically significant differences for question three, which addressed soreness ($p = .021$), question four, which addressed arm stability ($p = .003$), question five, which addressed accuracy of passes ($p = .004$), and question six, which addressed accuracy of shots ($p = .004$). The Bonferroni post-hoc test revealed statistically significant differences for questions three ($p = .021$) and four ($p = .003$) between the

non-kinesiology tape and no tape trials, in favor of the non-kinesiology tape trial and revealed no statistically significant differences between the KT and non-kinesiology tape or the KT and no tape. The Bonferroni post-hoc test revealed statistically significant differences for question five, which addressed passing ($p = .004$), and question six, which addressed shooting ($p = .004$), between the KT and non-kinesiology tape trials, in favor of the non-kinesiology tape trial. Statistically significant differences for questions five ($p = .004$) and six ($p = .004$) were also noted between the non-kinesiology tape and no tape trials, in favor of the non-kinesiology tape trial; however, no statistically significant differences between the KT and no tape trials were found. A t -test was conducted for question eight to examine the difference between the KT and non-kinesiology tape trials regarding overall performance, which revealed no statistically significant difference ($t(34) = 0.94, p = .783$).

Table 2

One-way ANOVA for the Combined Men's and Women's Lacrosse Teams

Question		Sum of Squares	df	Mean Square	F	p
1 (performance)	Between	1.96	2	0.98	2.82	.070
	Within	16.00	46	0.35		
2 (fatigue)	Between	0.39	2	0.19	0.53	.590
	Within	16.68	46	0.36		
3 (soreness)	Between	4.78	2	2.40	4.23	.021
	Within	26.00	46	0.57		
4 (arm stability)	Between	8.01	2	4.01	6.52	.003
	Within	28.24	46	0.61		
5 (passing)	Between	9.37	2	4.68	6.25	.004
	Within	34.47	46	0.75		
6 (shooting)	Between	4.84	2	2.42	6.24	.004
	Within	17.85	46	0.39		
7 (pain)	Between	0.22	2	0.11	0.40	.676
	Within	5.02	18	0.28		

Discussion

The findings for the combined men's and women's lacrosse teams revealed that, overall, there were no statistically significant differences between the KT and no tape trials. However, for two out of seven questions, statistically significant differences were found between the KT and non-kinesiology tape trials, in favor of the non-kinesiology tape trial. The participants who wore non-kinesiology tape perceived their performance to be significantly better in regard to accuracy of passes and accuracy of shots when compared to those who wore KT. Statistically significant differences were found between the non-kinesiology tape and no tape trials for four out of seven questions, in favor of the non-kinesiology tape trial. The results indicated that the participants who wore non-kinesiology tape perceived their performance to be significantly better in regard to soreness, arm stability, accuracy of passes, and accuracy of shots, as compared to those who wore no tape. As per question eight, the participants who wore the non-kinesiology tape perceived their overall performance at practice to be better than those who wore KT.

Despite there being no significant differences between the participants who wore KT and the participants who wore no tape, the participants who wore either tape reported on average improvements in performance, fatigue, soreness, arm stability, accuracy of passes, accuracy of shots, and pain. This mean difference between taping and no taping may have been due to a placebo effect. A study by Hunt and Short (2006) found that perceptions of wearing adhesive ankle

increased strength, decreased anxiety for injury or re-injury, mental preparation prior to performance, part of preperformance routines, and even part of superstitious behaviors" (p. 297).

Another possible explanation as to why the participants who wore either tape reported better perceived sports performance than those who wore no tape may be the gate control theory. Pressure and touch have the ability to override the sensation of pain through activation of sensory nerve fibers, which may close the gate and prevent pain messages from reaching the brain and spinal cord (Deardorff, 2003). In this research study, KT and non-kinesiology tape both provided tactile input to the participant's shoulder. It is speculated that this theory could explain why the participants who wore KT ($M = 4.17, SD = 0.41$) and non-kinesiology tape ($M = 4.27, SD = 0.65$) reported that their pain was better than usual when compared to the participants who wore no tape ($M = 4.00, SD = 0.00$).

Limitations

A limitation of the study was the use of a self-made questionnaire; however, a Cronbach's alpha was conducted for questions one through six and revealed a reliability of 0.81. Questions seven and eight were not included in the computation of the Cronbach's alpha since these were not relevant to all of the participants. Due to the sample, generalizing the finding should be used with caution. Confounding variables, such as taking pain medication or receiving any type of physical agent modality before practice may have been present, causing a potential decrease in pain. Other confounding variables may have included the participants experiencing soreness from a previous

practice. Recommendation for future research is to use a more diverse and larger sample to allow generalizability of results. Samples may include athletes of different ages, sports, and levels of competition and both healthy and injured athletes.

Conclusion

The purpose of this study was to determine if there was a perceived sports performance benefit of using KT as compared to non-kinesiology tape or no tape in healthy collegiate athletes. Although sports is included in the *Occupational Therapy Practice Framework: Domain and Process* (AOTA, 2014a), occupational therapy is not commonly involved in the realm of sports but has the potential to be (Reed, 2011) through addressing both physical (Doucet, Woodson, Watford, 2014; Edwards, Baptiste, Stratford, & Law, 2014; Herbold, Boinstall, & Walsh, 2011; Heyde, 2011) and psychological (Kannenberg, Amini, & Hartmann, 2010) components of sports injuries. Occupational therapy practitioners may choose to explore intervention and prevention techniques, such as kinesiology taping, to promote occupational performance in sports. Other health care disciplines, who are currently more involved in sports rehabilitation, use various treatment interventions, one of which is KT. While KT is becoming increasingly popular, there is a lack of evidence supporting its effectiveness.

This research study aimed to address the following question: Is there a perceived sports performance benefit of using KT compared to non-kinesiology tape or no tape in healthy collegiate athletes? The null hypothesis was: There is no perceived sports performance difference between

using KT, non-kinesiology tape, and no tape. The alternative hypothesis was: There is a perceived sports performance difference between using KT, non-kinesiology tape, and no tape. Based on the findings, the null hypothesis was rejected, and the alternative hypothesis was accepted. However, while a perceived sports performance difference was found between the three trials, the difference was found in favor of the non-kinesiology tape. While this research study attempted to address gaps in the literature, there is still a need for future research to be conducted on the effects of other types of adhesive tapes.

Dr. Gregory Chown is an assistant professor in the undergraduate and graduate occupational therapy program at Alvernia University. He is a graduate of Laurentian University and McMaster University, and completed his doctoral studies at Rocky Mountain University. He has over 18 years of clinical experience working in Canada, Singapore and the United States with a focus on hand and burn injuries. Scholarly work includes publications in Burns, The Open Journal of Occupational Therapy, and Health and Interprofessional Practice. He has presented and provided lectures in Singapore, Canada, China, Australia, South Korea, England, Scotland, India and the United States.

Marlee McNerney graduated in 2015 with a master's degree in occupational therapy. She has since been working in an acute care hospital with a special interest in working with patients who have neurological deficits. Currently, she is pursuing certification as a brain injury specialist. Marlee plans on continuing to pursue certifications that will allow her to become more knowledgeable, and enhance her skills as a clinician. She would like to thank her family and friends who continue to help her along this journey.

Jennifer Petrilla, MS, OTR/L, PCBIS earned a master's degree in science in occupational therapy from Alvernia University located in Reading, PA. She currently works at the Reading Health Rehabilitation Hospital. She also has experience in long term care and home health settings. As a prior two sport collegiate athlete, Jennifer is interested in expanding the literature regarding sport as an occupation of daily living. In her spare time she enjoys coaching the women's tennis team at Alvernia University and spending time with her family. Questions about her research can be sent to Jennifer.petrilla02@gmail.com.

Hillary Prozzillo graduated in May 2015 from Alvernia University with a master's degree in occupational therapy. Upon graduation, she began working for a large health care system, with a focus in pediatrics. Hillary works with children from birth to 21, across a variety of settings such as school-based, inpatient, outpatient, and early intervention. Hillary has a strong interest in working with children with sensory processing disorder and neurodevelopmental disorders. She aspires to continue to seek out professional certifications and learning opportunities, in order to provide her patients with the most beneficial and current style of practice.

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