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Use of Attentional Focus in a Rehabilitation Setting: A Comparison of Theoretical Frameworks and Clinical Practice

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by

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Use of Attentional Focus in a Rehabilitation Setting: A Comparison of Theoretical Frameworks and Clinical Practice

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ABSTRACT

Information provided by a therapist is an important for motor learning. Instinctively, therapists refer to body positioning, creating an internal focus of attention (IFOA. Literature suggests, statements directing attention away from specific body movements, known as external focus of attention (EFOA), are most effective for motor learning. Little is known about how EFOA statements in a clinical setting compare to suggestions in literature, or whether therapists have an understanding of how to use it in rehabilitation programs. To determine this, appointments of 15 therapists were observed, and a therapist perception questionnaire was administered. Findings indicate, IFOA statements (262) are used more frequently than EFOA statements (70). When other factors are considered (i.e., task type) communications more closely reflect literature's suggestions. Therapist perception questionnaires highlight a discrepancy between therapists' perceptions and what was actually presented. The majority of therapists had limited understanding of attentional focus as a clinical motor learning tool.

Keywords: Attentional focus, clinical settings, therapists' perceptions

DEDICATION

This work is dedicated to my loving and supportive family. Mom, Dad, Nola, Naase and Allynah, I love you!

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I wish to thank, first and foremost my parents for their support and encouragement. I don’t know where I would be without everything you have done and continue to do for me. Nola, Naase and Allynah, you kept me laughing through the tough times, you don`t know how much that meant for my sanity!

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GLOSSARY

Attentional focus (AF): The process of focusing ones attention on particular cues.

Automatic processes or Automaticity: Act of performing a movement without attentional resources**.**

Cognitive or attentional resources: Capacity to "pay attention".

External focus of attention (EFOA): Directing ones' to movement effects.

Functional task: Tasks categorized as functional related to a specific real-life activity, (e.g., ambulation or balance training tasks).

Information: Either instruction or feedback presented to a patient.

Internal focus of attention (IFOA): Directing ones' attention to specific body movements.

Motor learning: Learning of a movement, characterized by a permanent change in movement accuracy.

Motor unit: Motor neuron and all muscle fibres innervated by it.

Movement efficiency: Production of a movement with the use of minimal muscle activity or performance of a movement with increased accuracy.

Movement smoothness: Measure of movement efficiency determined by the number of movement units involved.

Movement unit: One acceleration phase and one deceleration phase.

Non-informational Statements: Information that is typically motivational in nature. It does not direct attention either internally or externally.

Strengthening task: Tasks were tasks aimed at strengthening a particular muscle group.

CHAPTER I

INTRODUCTION

1.1 Motor Learning in a Rehabilitation Setting

After injury, many individuals rely on the assistance of a physical rehabilitation program and the guidance of a therapist in order to return to activity and restore function. Relearning correct movement patterns after injury is difficult and the specific goals of a given program vary with the injury and the individual patient's needs. Regardless of the specific goals of each program, in many cases, motor learning is the overall goal of a rehabilitation program and is characterized by a permanent change in the ability of an individual to perform a given task (Magill, 2001). Therapists overseeing rehabilitation programs have the option to implement a number of techniques and rehabilitation protocols to assist patients achieve their motor learning goals. Regardless of the protocol selected, information provided by the therapist is a common and integral part of the motor learning process (Swinnen, 1996). The information provided by a therapist to a patient can be placed into one of two categories based on when the information is provided. Instruction refers to information regarding elements a performer should focus on prior to commencing the task and feedback is information provided during, as well as upon completion of a task (McNevin, Wulf, & Carlson, 2000). For effective motor learning, a patient must first understand how to perform the task, and subsequently, they must be provided with information to help them establish the accuracy of the movement (Magill, 2001). As such, instruction and feedback are some of the most valuable tools used by therapists as they endeavour to facilitate motor learning of patients.

1.2 Instruction, Feedback and Attentional Focus

In an attempt to simplify tasks for patients, therapists typically make reference to a patient's body position or co-ordination when providing them with instruction and feedback. By directing a patient in this way, it draws their attention to the movements being performed, and causes them to pay more attention to those movements (McNevin et al., 2000). Contrary to intuition and what is commonly practiced in a rehabilitation setting, literature suggests that movements are optimized not when an individual is paying attention to the movements being performed, but when attention is directed elsewhere (McNevin et al., 2000; Magill, 2001).

An individual may direct their cognitive resources or attention in a variety of ways and may focus on any number of cues (McNevin & Wulf, 2002). Where attention is placed is referred to as the focus of attention or attentional focus (AF), and it can be defined in one of two ways (McNevin & Wulf, 2002). An internal focus of attention (IFOA) is created when attention is fixed on the movement itself, and an external focus of attention (EFOA) is created by directing attention on the effect of a movement rather than the movement (Wulf, Höß, & Prinz, 1998; Magill, 2001). For example, a therapist may provide either of the following statements: 1) "fully extend your elbow" or, 2) "reach forward and touch the wall in front of you". Each statement expresses the same goal but the first elicits an IFOA; a patient given these instructions would be focused on their arm. A patient given the second instructional statement would be under an EFOA, as that patient would be focused on the wall they were asked to touch.

Literature suggests that modifying instruction and feedback to elicit an EFOA rather than an IFOA not only improves quality of movement and accuracy, but ultimately leads to more effective retention (learning) of that task (Durham, VanVliet, Badger, &

Sackley, 2009; Wulf & Su, 2007). As alluded to earlier, in addition to outlining the goals of rehabilitation, verbal instruction and feedback provides a way to bring to a learner's attention relevant information for the execution of a task (McNevin et al., 2000; Al-Abood, Bennett, Moreno- Hernandez, Ashford, & Davids, 2002). The fact that instruction and feedback can be used to create a specific FOA make instruction and feedback very valuable tools for effective motor learning (McNevin, Shea, & Wulf, 2003; Marchant, Clough, & Crawshaw, 2007). Seemingly minor differences in the way information is presented can alter the attentional focus of a learner and have an impact on motor learning (Wulf & Su, 2007). This highlights the fact that it is not only the information provided to a patient that matters, but also the nature in which information is provided that drastically influences motor learning (McNevin et al., 2000).

1.3 Benefits of Attentional Focus

Performance improvements have been demonstrated as a result of an EFOA in a variety of situations: golf, volleyball, and soccer tasks to name a few (Wulf, Lauterbach, &Toole, 1999; Wulf, Gärtner, McConnel, & Schwartz, 2002; Beilock, & Carr, 2001). Along with its usefulness in sport situations, an EFOA has been investigated in a number of clinical situations, with its efficacy being demonstrated among older adult populations diagnosed with Parkinson's disease, as well as individuals with neurological impairments, making an EFOA universally beneficial (Chiviacowsky, Wulf, & Wally, 2010; Fasoli, Trombly, Tickle-Degnen, &Verfaellie, 2002).

1.4 Mechanism of EFOA

Researchers postulate the beneficial effect is due to the relative automaticity of movements as a result of an EFOA (Wulf, McNevin, & Shea, 2001). Movement automaticity indicates the production of a movement or skill without the involvement of attentional resources; a movement that is produced without thinking about it (Magill, 2001). While performing a movement under an IFOA, an individual may interfere with the automatic controls that generally produce the movement. Under an EFOA, the system can self-organize more naturally, creating a more efficient and effective movement (Wulf et al., 2001), and results in the performance and learning enhancements characteristic of an EFOA.

1.5 Attentional Focus in a Clinical Setting

Attentional focus as a motor learning tool can be quite useful to healthcare professionals if incorporated into rehabilitation sessions. With literature so favorably outlining the benefits of an EFOA, little is known about how therapists use AF in a clinical setting. Historically, there is an inconsistency in how therapists function in a clinical setting and what is suggested in literature. Many healthcare professionals take a fairly intuitive approach to rehabilitation or mimic techniques used by colleagues or instructors (McNevin et al., 2000). Generally, therapists make reference to spatiotemporal coordination, guiding a patient to consider their movements and focus internally while performing a given task (Durham et al., 2009).

Therapists report having positive attitudes towards evidence-based practices and understand its merit (Iles, & Davidson, 2006; Jette et al., 2003). However, in an attempt to help patients move more effectively, therapists tend to create an IFOA by drawing the learners' attention to their body and it's positioning or co-ordination when providing them with information about a task (Singer, Lidor, & Cauraugh, 1993; Wulf & Weigelt, 1997; McNevin et al., 2003). Use of attentional focus to provide feedback in a clinical setting was investigated by Durham and colleagues (2009) in a population of therapists treating stoke patients. In this population, a discrepancy between empirically based theory and clinical practice was apparent, with only 11 of 247 statements eliciting an EFOA. Outside of this very specific population, little is known about the use of attentional focus to aid motor learning in a rehabilitation setting or whether therapists even have an understanding of how it can be incorporated into their rehabilitation sessions.

1.6 Research Questions

There are three main research questions of the present study:

1) To determine how many IFOA and EFOA statements therapists provide to their patients.
2) To determine whether the uses of IFOA and EFOA statements are consistent with suggestions from motor learning literature.
3) Finally, to gain a better understanding of therapists' knowledge of attentional focus in a rehabilitation setting.

1.7 Hypothesis

It was expected that the use of attentional focus in a clinical setting would not reflect suggestions from motor learning literature. There will be a higher rate of IFOA statements presented by therapists during the observation. Moreover, there was the expectation that there would be a lack of knowledge of attentional focus and its uses in a clinical setting amongst therapists. Also, due to a fairly intuitive approach, therapists' perceptions of how they provide information would differ from what is actually observed.

CHAPTER II

REVIEW OF THE LITERATURE

2.1 Instruction and Attentional Focus

The impact of AF on motor learning and retention has been examined thoroughly in a number of situations; these studies will be discussed in this literature review and results are outlined in Table 1. Instruction is the initial communication used by therapists to convey information regarding a task. When used effectively, providing instruction can simplify a particularly difficult task by directing a patient's attention to cues that are pertinent to the task being performed. Singer and colleagues (1993) investigated the effect of 4 learning strategies: awareness, non-awareness, 5-step approach and a control condition on the learning and performance of a motor task. Participants were provided with specific instructions that varied depending on their strategy group assignment, for a ball throwing task. Participants in the 'awareness group' were instructed to pay attention to the way in which they threw the ball, focusing on contextual cues (e.g., feeling of the movement); these instructions in turn generated an IFOA. Members of the 'non-awareness' group were instructed to pre-plan their movements and focus on situational cues (e.g., centre of the target); generating an EFOA. The 5-step cohort was asked to execute the task by following a set of steps. This group was also instructed to focus on situational cues like the centre of the target, which also resulted in an EFOA. The final strategy control group was not provided with specific information regarding how to execute the task. Participants operating under the non-awareness and 5-step strategy, both

Table 1. Summary of research investing attentional focus effects in a variety of motor activities.

Study	Participants	Task	Performance Measurements	Performance
Beilock, Carr, MacMahon, & Starkes, 2002	N=21	Golf putting task	Putt accuracy (centimetres)	EF= 13.74cm IF= 19.44cm t (20) = 5.22, p <0.01
Fasoli, Trombly, Tickle-Degnen, & Verfaellie, 2002	N=33	1) Moving a can from a shelf to the table 2) Moving an apple from a shelf and putting it into a basket 3) Moving an empty coffee mug from the table onto a saucer	Movement units (acceleration and deceleration)	1) EF= 4.10 IF= 5.08 $F(1, 14)= 7.08$, $p= 0.019$ 2) EF= 2.99 IF= 3.20 $F(1, 14)= 0.32$, $p= 0.583$ 3) EF= 5.10 IF= 5.56 $F(1,14)= 2.49$, $p= 0.003$
Gray, 2004	N= 20	Batting task	Reaction time (milliseconds)	EF= 395ms IF= 419ms $F(1, 18)= 4.39$, $p= 0.03$
Landers, Wulf, Wallmann & Guadagnoli, 2005	N= 22	Balance on a rubber disk	Postural sway= RMSE(centimetres)	EF= 1.10cm IF= 1.40cm F 4, 36= 4.40, $p< 0.01$
Singer, Lidor, & Cauraugh, 1993	N=72	Ball throwing task	Throw accuracy=mean radial error (centimetres)	EF= 13cm IF= 20cm $F(3, 68) = 39.86$, $p< 0.05$

Shea, & Wulf, 1999	N= 32	Balance on a stabilometer	Postural sway= RMSE(degrees)	EF= 2.5^{o} IF= 3.8^{o} $F(1, 28) = 6.99$, $p < 0.001$
Vance, Wulf, Töllner, & NcNevin, 2004	N= 12	Biceps curl	Muscle activity (% of maximal effort isometric contraction)Biceps brachii	EF=310% IF=350% $F(1, 10) = 9.80$, $p <0.05$
			Triceps brachii	EF=240% IF=360% $F(1, 10) = 11.64$, $p <0.01$
Wulf, Höβ, & Prinz, 1998	Experiment 1: N=33	Ski simulator task	Amplitude (centimetres)	EF: 49cm IF: 41cm $F(2, 30) = 3.7$, $p <0.05$
	Experiment 2: N=16	Balancing on a stabilometer	Postural sway = Root mean square error (degrees)	EF: 4.20 IF: 50 $F(1, 110) = 8.5$, $p <0 .01$
Wulf, Landers, Lewthwaite, & Töllner, 2009	N=14 Older adults with Parkinson's disease	Balance on a stabilometer	Postural sway = RMSE(centimetres)	EF= 1.10cm IF= 1.40cm $F(2, 26)= 5.07$, $p< 0.05$
Wulf, McConnel, Gärtner, & Schwartz, 2002	Experiment 1: N= 48	Volleyball serve	Accuracy score	EF= 14 IF= 12.5 $F(1, 41) = 8.64$, $p< 0.01$
	Experiment 2: N=52	Soccer pass	Accuracy score	EF= 6 IF= 3.5 $F(1, 48)= 32.80$, $p < 0.01$
Wulf, McNevin, & Shea, 2001	N= 40	Balance on a stabilometer	Reaction time (milliseconds)	EF= 312ms IF= 341ms $F(1, 166)= 9.91$, $p< 0.01$

Wulf, & Weigelt, 1997	N= 18	Ski simulator task	Ampliude and Frequency= (centimetres /second)	No instr= 42 cm/s IF: 26 cm/s $F(1, 16) = 6.83$, $p = 0.0181$
Wulf, Zachry, Granados, & Dufek, 2007	N= 10	Vertical jump	Centre of mass displacement (centimetres)	EF= 6.08cm IF= 5.23cm * Measured from the lowest rung on the VertecTM (244cm) $F(2, 22) = 5.22$, $p < 0 .05$
Zachry, Wulf, Mercer, & Bezodis, 2005	N= 14	Basketball free throws	Accuracy score	EF= 2.5 IF= 2.1 $t(13) = 1.78$, $p < 0.05$

EF: External focus of attention condition

IF: Internal focus of attention condition

RMSE: Root mean square error

*Some data presented in the table are an approximation of values from graphs and tables.

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of which were externally focused, exhibited increased accuracy and throw variability during the task when compared to the other two experimental conditions.

In a ski simulator task (Figure 1), participants were instructed to produce the greatest horizontal amplitude possible (Wulf et al., 1998). Based on their experimental group, participants were presented with differing sets of instructions. The internal focus group was instructed to produce movements by focusing on the force exerted by their feet, and the external group was asked to focus on exerting force on the wheels of the platform they were standing on. A third group (control) was provided with no specific instructions other than to produce the greatest movement amplitude possible. Following a two day practice period, the external focus group exhibited the most significant performance improvement with amplitudes exceeding those of the internal group. A retention test on day three demonstrated that the performance improvements seen in the EFOA condition were not transient. Without additional instruction, participants who learned the task under an EFOA continued to exhibit improved performance (Wulf et al., 1998); this finding is of particular importance from a rehabilitation point of view. Therapists do not only want patients to perform effectively during their appointment, their aim is for patients to demonstrate permanent changes in performance after the treatment sessions have concluded. The ability of and EFOA to improve retention, is a strong representation of its beneficial use as a motor learning tool. An EFOA can improve performance, but more importantly, it allows an individual to more successfully learn a task (Wulf et al., 1998; Singer et al., 1993; Wulf & Weigelt, 1997).

In the same study (Wulf et al., 1998), the retention benefits of an EFOA were demonstrated in a second experiment. Participants were instructed to perform a balancing

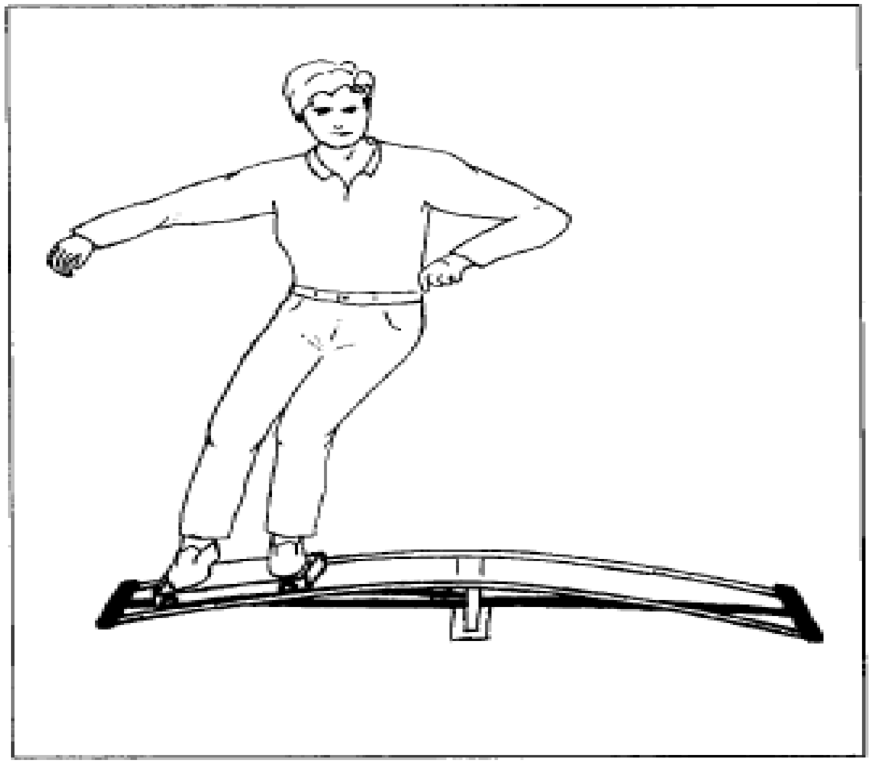

Figure 1. Illustration of the ski simulator apparatus. Adapted from Instructions for motor learning: Differential effects of IFOA versus EFOA by Wulf et al. (1998)

task while either focusing on their feet (IFOA) or on markers attached to the stabilometer platform on which they stood (EFOA). Performance of this task was determined by the variation in the platform from a horizontal position, measured by the root mean square error (RMSE) degrees. Individuals who learned the task under an EFOA had more success keeping the platform in a horizontal position. Error produced by those who learned the task under an EFOA was lower than error reported in the IFOA group (Wulf et al., 1998).

In addition to the observation that performance and retention is optimized when using an EFOA, an IFOA has been found to be detrimental for motor learning. This was demonstrated in a study by Wulf and Weigelt (1997), during which participants, provided with either IFOA instructions or no instructions at all were asked to perform a ski simulator task. Participants were asked to produce the greatest possible amplitude as well as velocity, and performance was measured by amplitude x frequency which would approximate the average velocity (cm/s). Participants performing the task under an IFOA were less successful when compared to participants who were not given any instructions. This finding suggested that an IFOA may actually hinder the motor learning process rather than help it.

2.2 Feedback and Attentional Focus

Feedback is an essential part of communication between therapist and patient. It is a way by which a therapist can correct a patient’s performance, and allows a patient to understand whether they are performing a movement accurately (Swinnen, 1996). Like instruction, the way a therapist provides feedback will direct a patient’s attentional focus. The extent to which attentional focus conditions influence motor learning was investigated by Shea and Wulf (1999). While performing a balancing task on a stabilometer, participants watched a monitor displaying the movements of the stabilometer, in effect mirroring the movements of the platform. One group of participants was informed that the images represented the movements of their own feet during the task, resulting in the development of an IFOA in those participants. A second group was informed that the movements on the monitor represented the movement of the platform on which they were balancing, thus inducing an EFOA. Participants who were given instructions resulting in an EFOA demonstrated an improvement in performance scores after two days of practice with the visual feedback. Again, performance in this task was determined by measuring the deviation of the platform from a horizontal position RMSE (degrees). Participants who learned under an EFOA had less movement from a horizontal position than those performing under an IFOA (Shea & Wulf, 1999). These results provided the preliminary evidence that, in addition to instruction, feedback presented to elicit an EFOA can also have a positive effect on the motor learning process (Shea & Wulf, 1999).

Shea & Wulf (1999) demonstrated the added benefit of providing externally focused feedback. However, there is a significant difference in the way feedback was presented in that study, and how feedback is traditionally presented in a rehabilitation setting. Typically, therapists do not constantly provide feedback to patients. To effectively assist with motor learning, feedback is presented after a group of repetitions rather than immediately following each attempt (Park, Shea, & Wright, 2000). Due to the differences in feedback delivery, all of the performance improvements could not automatically be attributed to EFOA. To identify the effect of externally focused feedback, Wulf and colleagues (2002) presented feedback to a group of volleyball players performing a “tennis serve”. The feedback that the participants were given either directed their attention internally (“shortly before hitting the ball, shift your weight from the back leg to the front leg”) or externally (“shortly before hitting the ball, shift your weight toward the target”). A feedback statement was provided to participants after every 5th trial. While being provided with EFOA feedback, there was a notable improvement in the serve accuracy of participants. During a retention test, the accuracy of the EFOA group continued to be superior to shot accuracy of the IFOA group. In another experiment, a group of participants were asked to execute a soccer pass while they received feedback directing their attention internally (“keep your knee bent as you swing your leg back, and straighten your knee before contact”), or externally (“use a long-lever action like the swing of a golf club before contact with the ball”). Again, in the retention tests, participants demonstrated increased shot accuracy when they received only feedback phrased to direct their attention externally (Wulf et al., 2002).

2.3 Attentional focus and Force Production

As an extension of previous studies, Wulf, Zachry, Granados, & Dufek (2007) turned their attention to determining whether or not EFOA significantly impacted force generation. Participants performed a vertical jump test, a task that is heavily reliant on maximum force production. Using a Vertec^{TM} measuring device, participants were asked to focus on the rung of the Vertec they were attempting to touch (EFOA) or focus on the finger with which they would touch the rung (IFOA). The first experiment had findings similar to prior studies. On average, the maximum height achieved by the participants under an EFOA was greater than that of the IFOA group (Wulf et al., 2007). The observed changes in vertical height could either be attributed to variations in the reaching mechanics of individuals, as a result of differing attentional focus instructions, or researchers suggested it could be indicative of force production improvements. To explain these improvements in performance, a second experiment measured total body centre of mass (COM) vertical displacement under the two attentional focus instructions. The COM displacement at the apex of the jump in the EFOA participants was found to be greater than their IFOA counterparts. This suggests that the force production under an EFOA was greater than the IFOA group, providing some insight into the extent of benefits that can be attributed to an EFOA (Wulf et al., 2007). This contribution from Wulf and colleagues enhances the understanding of how an EFOA can benefit motor learning, by expanding its benefits to include force production improvements (Wulf et al., 2007).

2.4 Attentional Focus and Expertise

In a clinical setting, patients perform tasks with various levels of experience. A program could be focused on relearning a previously familiar task, or could be aimed at developing a novel skill. Due to this, understanding how an EFOA affects different levels of expertise is relevant. The attentional demands of a given task evolve as the individual progresses through the stages of learning (Gray, 2004; Beilock & Carr, 2001). During the preliminary stages of skill acquisition, referred to as the cognitive or the declarative stage, individuals rely on a system working in a step-by-step fashion to execute the motion. The attentional demands of executing a task at this stage make it difficult to optimize speed or accuracy, providing an explanation for the decreased reaction times and increased error characteristic of novice performance (Gray, 2004). During the later stages of skill acquisition, an individual will attain a level of automatic movement control (the procedural or autonomous stage of learning). At this stage of learning, the attentional demands vary significantly from earlier stages, in that during the autonomous stage of learning, the movement is almost completely controlled by automatic processes. These automatic processes are considerably faster and more efficient than the step-by-step processes used by a novice (Gray, 2004). To ask an expert to revert to the cognitive stage of performance by asking them to attend to their body movement, often leads to a deterioration of the quality of movement (Gray, 2004). To confirm this theory, Beilock, Carr, MacMahon, & Starkes (2002) performed an experiment investigating the discrepancies in effects of attentional conditions when comparing novices and experts. The first experiment investigated the effect of skill-focused (IFOA) and dual-task conditions (EFOA) on the accuracy of a group of expert golfers. Under the IFOA condition, participants were asked to pay attention to their golf swing and say "stop" out loud when the swing “follow through” was complete. The EFOA condition involved participants performing the putting task while listening to a string of different tones, and to say “tone” when they heard a specific tone. Proximity of the putted golf ball to a target was used as the measure of performance (cm). While performing the EFOA task, participants had greater success and were on average closer to the target than when putting under an IFOA.

Gray (2004) determined direct effects of EFOA versus IFOA for a group of experienced baseball players. In the first experiment of the study, participants were asked to complete a simulated batting task, while simultaneously responding to auditory signals. Those in the extraneous condition group, also referred to as the external focus group, were asked to identify whether the tone provided was high or low. In the skill-focused condition, or IFOA, the individuals were required to identify whether the bat was moving up or down at the moment they heard the auditory signal. Participants produced faster reaction times when under an EFOA compared to the IFOA condition. These findings demonstrate the detrimental effect an IFOA can have on an experienced performer.

2.5 Clinical Populations

Although many studies have demonstrated the beneficial effects of an EFOA, the vast majority of these studies evaluated young and healthy groups of participants (Landers, Wulf, Wallmann, & Guadagnoli, 2005). In a clinical setting the population is more often than not unhealthy due to injury or disease, and includes older adults. It is for this reason that the generalizability of the results of many AF studies are limited (Fasoli et al., 2002). Landers et al. (2005) addressed this by investigating the effects of AF on a group of older adults (OA) who were diagnosed with Parkinson`s disease, and were prone to falls. Under an EFOA no falls were observed in a group of older adults with a previous history of falls, and as such were prone to falls. Conversely, three falls were recorded in their peers who were provided with either an IFOA or those who received no instruction at all (Landers et al., 2005). EFOA effects on balance where again tested in a group of participants with Parkinson's disease in a separate study (Wulf, Landers, Lewthwaite, & Töllner, 2009). Participants were asked to balance on an unsteady surface. While under an EFOA, participants reduced their postural sway, indicating an improvement in their ability to maintain postural control and balance. The clinical implications of this are evident, as this research demonstrates the breadth of EFOA in very different populations.

By simply altering a set of instructions, the stability of an at-risk population for falls was improved and the incidence of falls decreased (Landers et al., 2005; Wulf et al, 2009).

Fasoli and colleagues (2002) also investigated the effect of attentional focus with a group of individuals, some of whom had experienced a cerebrovascular accident (CVA). Individuals were asked to perform three functional reaching tasks: 1) removing a can from a shelf and placing it on the table, 2) taking an apple off a shelf and putting it into a basket, and 3) moving an empty coffee mug from the table onto a saucer. In a healthy individual, pre-planned movements, like the ones performed in this study, generally involve an acceleration phase and a deceleration phase (referred to as a movement unit), resulting in a relatively smooth movement. The smoothness of a movement is defined by the number of accelerations and decelerations (or, stops and starts) associated with producing a discrete movement, such as that used to reach for a target. Participants with CVA who were provided with EFOA instructions prior to performing a movement tended to produce smoother movements compared to the movements produced under an IFOA (Fasoli et al., 2002).

These results confirmed that EFOA is beneficial for populations other than a young and healthy population. Improved motor performance and motor learning have also been shown to be evident in a population of OA, those diagnosed with Parkinson’s disease, and in individuals with neurological disorders (Landers et al., 2005; Wulf et al., 2009; Fasoli et al., 2002).

2.6 Constrained Action Hypothesis

To explain how an EFOA tends to result in improved performance, researchers have suggested what is known as the “constrained action hypothesis” (CAH). The CAH proposed that when performing a task with an IFOA, an individual attempts to consciously control the movement. By doing so, the individual interferes with automatic motor control processes that would normally control movement. An EFOA draws attention away from the movement being performed and allows for automatic processes to take over, resulting in a more effective movement and improved learning (Wulf, McNevin, & Shea, 2001). This hypothesis was tested using a dual-task paradigm, and is described below.

When an individual is presented with two tasks to be completed simultaneously, performance of the secondary task is dependent on the attentional demands of the primary task. EFOA allows for more automatic processes to produce the movement, thus leaving more attentional resources available for the performance of a secondary task (Wulf et al., 2001). To validate the constrained action hypothesis, Wulf and colleagues introduced a secondary test to a basic attentional focus experimental design. Participants were asked to respond as quickly as possible to an auditory cue while performing the primary task of maintaining balance on a stabilometer. The group of participants was divided in half and randomly assigned to receive either IFOA or EFOA instructions. The IFOA group was asked to focus on keeping their feet horizontal during the trials, while the EFOA group was asked to think about keeping the markers (attached to the platform on which they were standing) horizontal. It was found that, although all participants seemed to improve their reaction time over the course of the trials, the participants who were given externally focused instructions had a significantly faster reaction time when compared to those who received IFOA instructions. This ability to respond to stimuli at a faster rate demonstrated that an EFOA required fewer attentional resources. Thus, a more automatic process was involved in the production of movement (Wulf et al., 2001). This study supports the hypothesis that the direction of attentional focus (internal or external) plays a role in determining whether or not a task is performed consciously or under automatic control.

To discover the underlying mechanisms by which EFOA enhances movement and motor learning, Vance, Wulf, Töllner, McNevin and Mercer (2004) conducted a series of experiments to assess the impact of attentional focus at the neuromuscular level. Raw electromyography (EMG) measurements were taken and subsequently converted into integrated EMG (iEMG) to provide information regarding the muscle activity associated with the production of particular movements (Vance et al., 2004). Studies were conducted under the assumption that an EFOA produces more automatically generated movements, which in turn would yield a more efficient movement. Efficiency of a particular movement in this context refers to motor unit recruitment specific to the task being performed. If this is true, decreased EMG activity should be observed, as only the motor units specifically needed for the movement would be recruited (Vance et al., 2004). To determine the differences between IFOA and EFOA at a neuromuscular level, participants performed biceps brachii curls while focusing on the movement of the bar (EFOA) or focusing on the movement of the arm (IFOA). It was found that, as a result of smoother, more fluid movements, the curl was executed more quickly under the EFOA condition than to the IFOA condition (Vance et al., 2004). Researchers also found a decrease in the iEMG activity of both the biceps brachii, and triceps brachii under an EFOA, which demonstrates the movement efficiency characteristic of an EFOA. Movement efficiency is achieved by the recruitment of muscle fibres needed to produce the movement or improving the co-ordination between agonist and antagonist muscle groups involved in the movement (Vance et al., 2004). The changes in muscle activity under an EFOA support the theory that under an EFOA, automatic processes are implemented, and in turn, an efficient movement process is implemented (Vance et al, 2004).

Vance and colleagues' research provided persuasive grounds for the belief that an EFOA results in a more efficient movement pattern. One limitation of the study is that iEMG activity was determined while participants performed a task that had no accuracy requirements, as had been the norm in the previous attentional focus literature (Wulf et al., 1999; Wulf & Weigelt, 1997; McNevin, 2003). To determine the EMG activity in IFOA and EFOA conditions while assessing performance measures, Zachry and colleagues (2005) asked participants to perform basketball free throws, with each participant performing the task under both attentional conditions. Each shot was given a score based on the shot's accuracy, and muscle activity was measured from the medial biceps brachii, long head of the medial triceps brachii, the medial deltoid, and the medial flexor carpi radialis on the shooting arm using electromyography (EMG). The findings of this study supported the results of prior studies (Wulf et al., 1999; Wulf et al., 1997; McNevin et al., 2000). When participants adopted an EFOA, performance scores were higher than the scores during the IFOA trials (Zachry et al., 2005). There was also a significant difference in the EMG activity observed in the biceps brachii and triceps brachii based on the AF condition utilized, with lower EMG activity recorded for both muscles under an EFOA. The decrease in EMG activity accompanied by improved motor performance is an indicator that the reduction in muscle activity is the result of improved movement accuracy as well as a higher level of efficiency while utilizing an EFOA (Zachry et al., 2005).

2.7 Knowledge Translation

For research findings to be useful, practitioners must be informed of best practices and be aware of clinical guidelines that may be developed based on these studies (Menon et al., 2009). Understanding when and how to incorporate research findings into clinical protocols is an important part of the evolution of clinical practice (MacDermid, & Graham, 2009). The translation of academic knowledge to a clinical setting is the crux of an effective rehabilitation program. Without the effective translation of knowledge, the allocation of resources to develop best practices or protocols would be in vain. To effectively develop useful evidence-based practice, knowledge of literature is necessary (Salbach, 2010).

2.8 Summary

As demonstrated, an extensive group of studies have been conducted regarding the efficacy of attentional focus instructions and feedback. These studies establish a substantial platform for the use of attentional focus to expedite more effective learning in a rehabilitation setting. However, the current literature does not show a commensurate increase in the use of attentional focus in a rehabilitation setting (Durham et al., 2009). It is important to understand how attentional focus is being incorporated into clinical settings and whether or not clinicians have a good understanding of how it could enhance their existing rehabilitation programs.

CHAPTER III

DESIGN AND METHODOLOGY

3.1 Participants

Using Cohen's power table with a power of 0.8 and an alpha level of 0.05, a convenient sample of 15 participants was recruited with cold calls to rehabilitation centres within the Windsor-Essex and Wellington counties. Thirteen participants were observed during three regularly scheduled appointments, and two were observed during two appointments, for a total of 43 observed appointments. The population of participants included twelve physiotherapists, two kinesiologists, and one physiotherapist assistant. In order to participate in the study, participants had to be an employee of the clinic; volunteers and individuals completing placement hours at clinics were ineligible to participate in the study. During the observed appointments, therapists treated patients with a wide range of injuries, from hamstring strains to complex regional pain syndrome. In addition to providing their own professional designation, participating therapists were asked to identify the stage of rehabilitation for each of the patients in the observed appointments. Stage of rehabilitation was divided into beginning, middle, end and chronic. These stages were determined by the therapist and were based on the patients' functional abilities at the time of the observation and the expected level of function upon completion of the program.

3.2 Procedures

To obtain permission for data collection at the rehabilitation locations, clinic owners/office managers were contacted and informed of the purpose and procedures of the study, which had been approved by the University of Windsor's Research Ethics Board. This information was relayed to therapists, who individually made the decision to participate in the study. Upon arrival at the clinic, the researcher met with participating therapists and reviewed the study procedures with them, and answered any questions the therapists had. The study involved some deception by way of omission, as therapists participating in the study were provided with an alternative purpose until observations were completed. Due to the nature of the study, if therapists were aware of the purpose, instruction and feedback provided during the observed rehabilitation sessions may not have been an accurate depiction of a typical rehabilitation session. To mitigate this, therapists were advised that the researcher was interested in observing therapist-patient communication. No specifics regarding what aspect of communication was given.

3.3 Informed Consent

Prior to commencing observations, participating therapists were provided with an informed consent letter (Appendix A) as well as a letter of information (Appendix B). The researcher verbally presented therapists with the purpose of the study as well as the procedure. Patients involved in the observed appointment were not required to provide signed consent. Instead, they were given a letter of information and were asked for verbal consent to having a researcher observe during their appointment. All involved in the appointment (therapists and patients) were made aware that they could choose to withdraw from the study without consequence at any point during or following the observation.

3.4 Design

Once all necessary consent was obtained, the therapist provided a location for the researcher to observe the appointment with minimal interference. For the first 5 minutes of the rehabilitation session, data were not collected in order to minimize the influence of the Hawthorne effect. During observation, the researcher generated a transcript of instruction and feedback statements provided by therapists to the patient during active tasks. Only communication pertaining to the task being performed was recorded and "small talk" was not included as part of the appointment transcript. Many of the statements did not convey information pertaining to the task being performed, or were motivational in nature. As such, they were categorized as non-informational statements. Although not included in the original hypothesis, the non-informational statements made up a large portion of statements presented to patients and as such, were included in the analysis of overall communication from therapists. Statements were categorized into one of the three categories: IFOA, EFOA or non-motivational (Table 2). In addition to transcribing each of the statements given by the therapists, the researcher categorized the statements as eliciting either an IFOA, EFOA, or non-informational.

The researcher also kept a record of the task, as well as the start and end times for the tasks. Due to the wide range in active time (5 minutes to 50 minutes), with a treatment time lasting on average (M)=14 min, it was necessary to standardize the number of EFOA instructional and feedback statements. To do so, the number of external statements were tallied and converted to a percentage of the total number of statements presented during each appointment.

Directly following their observed appointments, participating therapists were asked to complete the therapist perception questionnaire (Appendix C). Once data collection and the questionnaire were completed, a debriefing interview took place, at which time therapists were provided with the actual purpose of the study and were asked to read and sign the Debriefing Consent form (Appendix D). Therapists and patients were presented with a Human Kinetics research t-shirt for their participation in the study.

Table 2. Examples of internal focus of attention, external focus of attention and non-informational statements presented to patients during appointments.

Internal Focus of Attention	**External focus of Attention**	**Non-Informational**
“Squeeze your gluts.”	“Keep your bum against the wall.”	“Looks good.
“Bring your arm back.”	“Think of a dog at a hydrant.”	“Slowly”

Statements were selected from observed appointments.

3.5 Instruments

A. Documentation of Information

During rehabilitation sessions, the researcher utilized a data collection form in order to record the therapists’ instructions and feedback (Appendix E). This form is a modification of a form previously used to determine the feedback type and frequency in a rehabilitation setting (Carr, Zachariah, Weir, & McNevin, 2012). The format of the form allowed the researcher to record all statements of instruction and feedback from the therapist, a tally of these statements, as well as the length of time spent on each task.

Observations of the researcher have been shown to be reliable in a previous study by Carr and colleagues (2012). Excellent inter-rater reliability was determined for the two feedback variables measured in the study, knowledge or results (KR: r=0.962) and knowledge of performance (KP: r=0.988). As a result, it was determined that the observations made by a sole observer would consistently reflect the instruction and feedback presented during each appointment. However, having one researcher did increase the chance that a statement presented by a therapist could be missed during the transcription process. To establish that statements were consistently categorized as internal, external, or non-informational in nature, intra-rater reliability was determined by re-categorizing all statements recorded from observations. Spearman's Rho correlation demonstrated high agreeability between the categorization of statements. Intra-rater reliability for EFOA statements ($r=0.993$, $p< 0.01$), IFOA statements ($r=0.991$, $p< 0.01$), and non-informational statements ($r=0.994$, $p< 0.01$).

B. Therapist Perception Questionnaire

The therapist perception questionnaire was completed by each participating therapist and was used as a reflection of the therapists' perceived communications. This was used to compare actual and perceived use of attentional focus instructions or feedback. The questionnaire was a derivation of the "therapist self-report questionnaire" used by Carr and colleagues (2012), it uses eight items on a six-point Likert scale (1 = 0% of the time to 6 = 100% of the time) and one "yes or no" question to measure perceived use of instruction and feedback and identify the therapists' familiarity with attentional focus literature.

In order to determine the level of consistency between the actual and perceived use of informational (internally and externally focused) communication, a Wilcoxon signed ranks test was performed. The perception questionnaire was completed by therapists after the observations were completed and was used to assess the therapists' perceptions of attentional focus use. The actual communications were determined using the average of communications across the observed appointments for each therapist.

C. Attentional Focus and Task Type

The tasks therapists asked patients to complete were divided into one of two categories; strengthening or functional. This differentiation was made based on the goal of each individual task. Strengthening tasks were tasks aimed at strengthening a particular muscle group. Tasks categorized as functional related to a specific real-life activity, (e.g., ambulation or balance training tasks). Therapists who treated patients who performed both strengthening and functional tasks were the only therapists included in the analysis (N=9). To assess whether the type of AF changed across task type, a Wilcoxon signed ranks test was performed on the number of EFOA and IFOA statements delivered during each session.

D. Attentional Focus and Stage of Rehabilitation

The stage of rehabilitation of each patient (beginning, middle, end or chronic) was determined by the therapists overseeing their treatment, based on how long they had been enrolled in the current course of treatment and the predicted treatment timeline.

3.6 Statistical Analysis

The significance of differences between the three types of statements was determined using the Friedman's test. Originally, analysis of this data was to be performed using an analysis of variance (ANOVA). To satisfy strict assumptions associated with an ANOVA, specifically normal distribution of the data, a Kolmogorov-Smirnov test of normality was performed. The test established that the data set was not normally distributed for IFOA statements, [$D(339) = 0.305$, $p < 0.05$], EFOA [$D(339) =$

0.503, $p < 0.05$], or non-informational statements and [D(339) = 0.458, $p < 0.05$]. This finding rendered the ANOVA an inappropriate test for the data collected. The Friedman's test was selected as the alternative to the ANOVA. Post-hoc analysis of this data was performed using the Wilcoxon signed ranks test. The Wilcoxon signed ranks test was used to determine differences between perceived and observed use of EFOA and IFOA statements. Again a Wilcoxon signed ranks test was used to determine whether task type or stage of rehabilitation affected the use of EFOA statements.

CHAPTER IV

RESULTS

4.1 Attentional Focus Use in a Clinical Setting

The total percent of IFOA and EFOA statements presented by therapists over the course of all 43 appointments demonstrate an over representation of IFOA statements (Table 3 & Table 4). In addition to IFOA and EFOA statements, therapists used non-informational statements during their appointments. Of the 443 communication statements provided by therapists, 262 (59.1%) were internally focused, 70 (15.8%) were externally focused and 111 (25.1%) were non-informational in nature (Figure 2). As expected, the test identified a significant difference in the use of the three types of communication provided, [Q= 82.79, d.f=2 p = 0.000], indicating that there is a statistical difference in the use of the three types of communication. A series of three Wilcoxon signed ranks tests were conducted to identify which statement type (EFOA, IFOA, or non-informational) was provided more frequently.

To accurately conduct multiple post hoc tests without the effect of alpha inflation, Bonferroni's adjustments were implemented. Post hoc analysis of the data revealed that IFOA statements were presented at a significantly higher rate than EFOA statements [Z=-6.980, p= 0.000]. Similarly, IFOA statements were also more prevalent than non-informational statements during observed appointments [Z= -6.315, p = 0.000]. Although non-informational statements were presented at a higher rate than EFOA statements, this difference was not statistically significant [Z= -0.920, p = 0.357].

Table 3. Number and percent of IFOA and EFOA statements presented during instruction communication.

Therapist I.D	**IFOA**	**EFOA**
1	10 (76.9)	3 (23.1)
2	12 (92.3)	1 (7.7)
3	18 (78.3)	5 (21.7)
4	4 (100.0)	0 (0)
5	3 (75.0)	1 (25.0)
6	3 (75.0)	1 (25.0)
7	12 (80.0)	3 (20.0)
8	7 (70.0)	3 (30.0)
9	6 (66.7)	3 (33.3)
10	4 (66.7)	2 (33.3)
11	15 (60.0)	10 (40.0)
12	27 (96.4)	1 (3.57)
13	4 (66.7)	2 (33.3)
14	1 (11.1)	8 (88.9)
15	9 (100)	0 (0)

*Data are presented as number of statements (percent of total statements)

Table 4. Number and percent of IFOA and EFOA statements presented during feedback communication

Therapist I.D	**IFOA**	**EFOA**
1	29 (78.4)	8 (21.6)
2	8 (72.7)	3 (27.3)
3	8 (88.9)	1 (11.1)
4	4 (100)	0 (0.00)
5	3 (75.0)	1 (25.0)
6	7 (77.8)	2 (22.2)
7	6 (85.7)	1 (14.3)
8	8 (80.0)	2 (20.0)
9	2 (66.7)	1 (33.3)
10	4 (80.0)	1 (20.0)
11	2 (100)	0 (0.0)
12	16 (100)	0 (0.0)
13	12 (75.0)	4 (25.0)
14	7 (70.0)	3 (30.0)
15	11 (100)	0 (0.0)

*Data are presented as number of statements (percent of total statements)

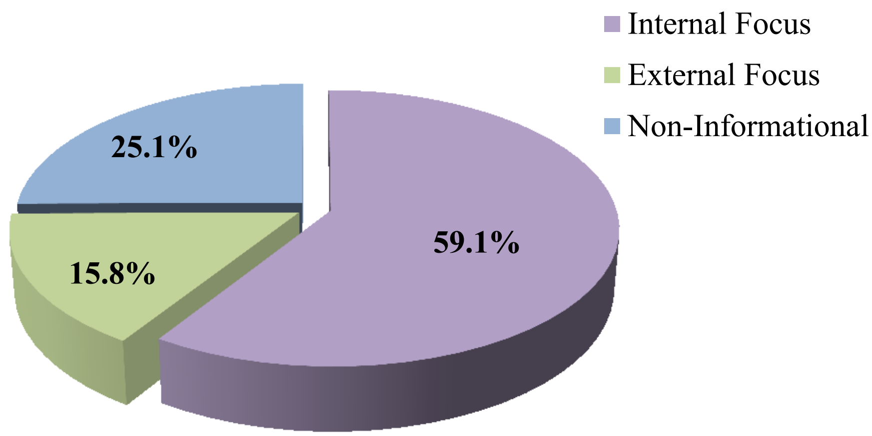

Figure 2. Distribution of all statements presented by therapists during observed appointments.

4.2 Therapist Perception Questionnaire

When comparing the way therapists perceive their communications with communications observed during appointments, the findings of the current study reveal that there was a discrepancy (Table 5). Analysis confirmed a significant underestimation of IFOA statements when instructing patients. Collectively, therapists believed that 42.7% of the statements they provided were internally focused, whereas based on observations of their interactions with patients, therapists actually presented 68.7% IFOA statements [Z= -2.443, *p*= 0.015]. Therapists were much more accurate in the way they perceived their use of internally focused statements when providing feedback (M=44.0%) compared to the observed number of feedback statements (M=48.7%) [Z=-0.341, *p*= 0.733]. With respect to the use of EFOA instructional statements, therapists also over-estimated their use. On average, therapists reported using 68.0% EFOA statements, a value considerably greater than the observed average of 26.7% during the appointments [Z=-3.354, *p*= 0.001]. Lastly, therapists overestimated EFOA feedback statements (M=53.3%) compared to (M=10.2%) observed during appointments.

Table 5. Comparison of observed (O) and perceived (P) use of statements.

	Internal	**p**	**External**	**p**
Instruction	O: 68.7% ± 22.6% P: 42.7% ± 34.5%	0.015 [C]	O: 26.7% ± 22.6% P: 68.0% ± 35.3%	0.002 [A]
Feedback	O:48.7% ± 21.0% P: 44.0% ± 27.5%	0.733 [B]	O: 10.2% ± 9.0% P: 53.3% ± 30.9%	0.001 [A]

*Data are presented as mean percent ± standard deviations.

[A] Significant over-estimation of the use of statements

[B] No significant difference in the observed and perceived use of statements.

[C] Significant under-estimation of the use of statements.

4.3 Attentional Focus and Task Type

On average, the amount of EFOA statements presented by therapists was 36.7% during functional tasks, and 15.4% during strengthening tasks [$Z=-1.014$, $p= 0.310$]. Although not a statistically significant difference, the trend suggests more external focus statements were provided during functional tasks (Figure 3).

4.4 Attentional Focus and Stage of Rehabilitation

The stage of rehabilitation that a patient is in determines which statements are more likely to be used to direct them. A comparison of the use of EFOA statements across the stages of rehabilitation (beginning, middle, end, and chronic) was not possible for each of the therapists, as none of the fifteen therapists observed treated patients in more than two of the stages of rehabilitation (Table 6). Descriptive analysis of the data, with respect to patient stage of rehabilitation and EFOA communications, demonstrate that overall, therapists treating patients in the beginning stage of rehabilitation delivered 40.5% EFOA statements, whereas only 21.6%, and 17.5%, were provided during the middle and end stages, respectively. When treating chronic patients, therapists used 37.7% EFOA statements.

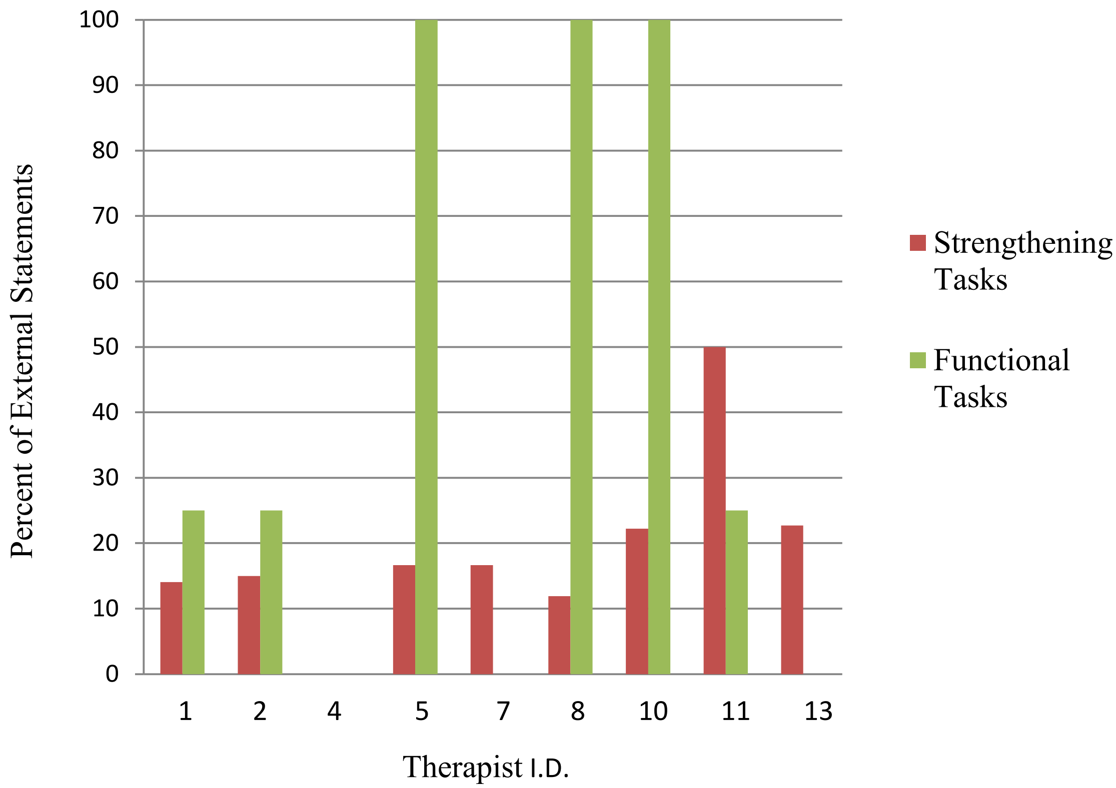

Figure 3. Percent of EFOA statements among therapists treating patients performing both strengthening and functional tasks (n=9). Non-Informational statements are excluded. Note: Therapist 4 treated patients performing strengthening and functional tasks, but they provided no informational statements during those appointments.

Table 6. Percent of externally focused statements based on stage of rehabilitation.

	Beginning	**Middle**	**End**	**Chronic**
1	25.0%	-	14.1%	-
2	-	-	17.9%	-
3	-	22.7%	22.2%	-
4	-	-	0.0%*	-
5	37.5%	-	-	-
6	-	20.0%	0.0%*	-
7	0.0%*	18.3 %	-	-
8	42.9%	-	27.8%	-
9	100.0%	0.0%*	-	66.7%
10	44.4%	-	25.0%	-
11	-	-	-	44.7%
12	-	-	-	1.7%
13	-	18.8%	33.3%	-
14	33.3%	71.2%	-	-
15	-	0.0%*	-	-
Overall	**40.5%**	**21.6%**	**17.5%**	**37.7%**

“*”= Represents cases where either no instruction or feedback was provided at all or of the instruction and feedback statements provided none were externally focused.

“-“= During observations therapists did not treat a patient in that stage of rehabilitation.

CHAPTER V

DISCUSSION

5.1 Attentional Focus Use in a Clinical Setting

This study sought to identify what type of attentional focus instructions (if any) are used by practicing clinicians in a rehabilitation setting. If practitioners follow a model predicated on motor learning research, one would expect to find that therapists are knowledgeable about feedback and instruction use. The results of the present study, however, suggest that there was a tendency for the participating therapists to use statements in a way that elicits an IFOA or provide non-informational statements more often than statements that would elicit an EFOA. These findings are in agreement with findings reported by Durham et al. (2009). In that study, researchers assessed the type of communication provided by therapists treating a population of stroke patients. The present study builds on the research by Durham et al. (2009) by including observed appointments with patients being treated with a variety of injuries. In doing so, the present study provides a wider view of rehabilitation practices across a range of injuries. When only considering informational statements, therapists communicated predominantly IFOA statements. Although EFOA statements were not used as frequently as IFOA statements during appointments, it became evident from observations and feedback from therapists that many factors affect the way in which they provide information to patients. In addition to academic sources, practitioners in this study reporting taking a number of other factors into account when communicating with patients, such as a patients' ability to interpret and integrate information presented to them, as well as the specific objectives of the task being performed. In a clinical setting, in order to assist a patient to perform a particular movement, the therapist provides instruction and feedback with the patients' body awareness and understanding in mind. A therapist provides information in a way that will most effectively produce the movement that is desired and, depending on the patient, this may involve IFOA, EFOA or a combination of the two types of statements. Very often in a clinical setting the decision of how to provide information to a patient is made on a case-by-case basis, which reflects the needs of each patient, as opposed to guidelines from academic literature.

5.2 Therapist Perception Questionnaire

Very much like the findings of Carr et al. (2012), the therapist perception questionnaire revealed a marked inconsistency between the way therapists believe they present information to patients and what was presented, based on the data that was collected. Therapists observed in the study consistently over-estimated their use of externally focused statements, with twelve of the fifteen therapists indicating that they believed they used more externally focused statements than were observed during instruction, and fourteen of fifteen therapists over-estimated the externally focused feedback statements used. One suggestion for this is the intuitive approach many therapists utilize when proving information to patients. On the questionnaire, therapists frequently identified that when presenting information to patients they focus more on presenting information in a way that is "second nature and intuitive" rather than on whether it draws attention internally or externally. Since many of the statements are provided based on what the therapist feels is appropriate, they may not have a clear recollection of how they provide information.

The intuitive way therapists give information to patients may be explained by the lack of knowledge of attentional focus. Of the fifteen therapists who participated in this study, eight indicated that they either had no understanding of attentional focus in a clinical setting or had no knowledge of it at all. The remaining therapists reported that they had an understanding of attentional focus and its significance in a clinical setting and all gained this information either from their formal education or directly from motor learning literature. This finding reveals a disconnect between the literature and clinical practice, suggesting a need for better collaboration between the academic and clinical aspects of rehabilitation. Practitioners should be made aware of attentional focus and its use in a clinical setting. Examples of how this can be accomplished include workshops at professional conferences, or continuing education credits

5.3 Attentional Focus and Task Type

Another factor with the ability to affect the way in which information is presented to an individual is the type of task being performed. As mentioned earlier, researchers have documented the benefits of an EFOA, however, many of the studies described, involved tasks that would be classified as functional. In a clinical setting, a large component of most rehabilitation programs is muscular strengthening (Bennell, Hunt, Wrigley, Hunter, & Hinman, 2007; Teixeira-Salmela, Nadeau, McBride, & Olney, 2001). Exercises performed as part of a muscle strengthening program, although an important part of rehabilitation, are rarely functional in nature (Weiss, Suzuki, Bean, & Fielding, 2000). To strengthen a muscle group, maximizing the number of motor units repeatedly under high resistance is the most effective method (Higbie, Cureton, Warren, & Prior, 1996). As such, an IFOA, which directs attention to the specific body part or muscle(s) being treated, may be more effective in bringing about improvements in strength. This suggestion is partly supported by the results of the study by Vance et al. (2004). In that study, healthy participants were asked to perform a number of biceps brachii curls and instructed to either focus on the weight of the bar they were curling, or on their arm. Electromyographic (EMG) recordings of the biceps brachii and triceps brachii muscles under each condition revealed that EFOA instructions resulted in fewer motor units being recruited compared to IFOA instructions. Although the researchers concluded that an external focus led to more efficient movement production, under normal strengthening conditions, the goal of the task would be to recruit as many motor units as possible. The higher EMG recordings made by participants who received IFOA instructions suggests this is exactly what they did. In a maximal voluntary contraction (MVC), a strength based task, Marchant, Greig and Scott (2009) demonstrated that an EFOA produced a more efficient muscular contraction. That is, under an EFOA, lower EMG activity was observed, suggesting fewer motor units were recruited to generate force equivalent to the force generated in the control MVC performed earlier. When comparing this effect of EFOA to the goals of muscle strengthening, there is an obvious conflict. While muscle strengthening requires the involvement of a large number of motor units, using an EFOA would result in the opposite outcome, adversely impacting strengthening goals. EFOA has been demonstrated to result in more effective movement patterns and improved retention when used to facilitate functional tasks. However, an EFOA may be detrimental when the goal is to improve muscle strength, as fewer motor units are involved. With this in mind, one might expect to see differences in the way therapists use external focus statements based on the type of task being completed and the goal of the task being performed.

Although the overall results did not indicate a significant difference in use of externally focused attention depending on the type of task being performed, five of the nine therapists included in this study provided a higher percent of EFOA statements to their patients while they (patients) performed functional tasks. Furthermore, three of those therapists increased their use of EFOA statements to 100% while guiding patients through their functional tasks. Since only nine of the therapists could be included in this analysis, the data set is not large enough to conclusively determine whether task type contributes to how therapists present EFOA statements.

5.4 Attentional Focus and Stage of Rehabilitation

The investigation into factors affecting the use of EFOA statements extended to include injury stage of the patient. As an individual advances through a rehabilitation program, the characteristics and short-term goals of their program develop along with their injury recovery. After injury, rehabilitation should ideally be focused on regaining range of motion and then, strengthening and function (Mattacola, & Dwyer, 2002). Accordingly, the beginning stages of rehabilitation should be dedicated to improving range of motion and strength of the injured area. Once these goals have been achieved, functional training which progressively becomes more advanced, should be introduced into the treatment protocol. Based on this progression through rehabilitation and the distribution of strengthening and functional tasks across rehabilitation stages, it was expected that there would be observable patterns of EFOA use with respect to patient stage.

The collection of appointments observed did not make it possible for a comparative analysis for each therapist of the use of externally focused statements in each stage of rehabilitation. Instead, therapists' use of externally focused statements was considered collectively. The findings did not exhibit the expected changes in EFOA use. Contrary to expectations, therapists provided the most EFOA communication during the beginning stages of rehabilitation with fewer EFOA statements delivered during the middle and end stages of rehabilitation. There are a few possible reasons for the discrepancy in the expected findings and those of the present study. Most notably, because all therapists did not have patients in each of the stages of rehabilitation, an accurate comparison on an individual basis could not be completed. Each therapist has their own way of providing information; when searching for trends in the use of attentional focus in a group of therapists, this individuality is not accounted for. As a result detecting trends with this method is more challenging. In addition, therapists do not always incorporate more functional tasks into the advanced stages of rehabilitation. As a result, the expected changes in the use of EFOA statements, corresponding with increased use of functional tasks, was not demonstrated in the data collected.

Overall, significant changes in attentional focus use as a function of task type and stage of rehabilitation were not seen, but some individual patterns were evident. One therapist in particular identified that she used externally focused statements largely to "teach movement patterns" (functional), and relied on IFOA statements primarily "for cueing muscle activation" (strengthening purposes); an approach to attentional focus that is consistent with motor learning literature (Vance et al., 2004; Marchant et al., 2009). When investigating this therapist's communications with her patients, it was evident that she did provide instruction and feedback that reflected the motor learning literature. All functional tasks performed by her patients were facilitated by EFOA instructions and feedback, demonstrating that some clinicians successfully use EFOA statements in the way the literature recommends.

CHAPTER VI

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

Conclusions

The present study was not intended to be a complete representation of the use of attentional focus in all rehabilitation situations. However, it is intended to be a snapshot and provide some insight into how it is incorporated. As expected, the present study suggests that, in general, IFOA statements tend to dominate communications from therapists observed in the study. The therapist perception questionnaire and debriefing period provided some insight into why therapists provide information to patients in the way that they do. Each rehabilitation program is unique and varies considerably based on the patient being treated and the specific goals of their program. As a result, the use of IFOA or EFOA statements is made on a case by case basis. To investigate whether attentional focus use is consistent with motor learning literature, all parts of the program must be taken into consideration, including stage of rehabilitation and the goal of tasks being performed in each appointment.

By considering these aspects of a rehabilitation program, the present study offers a different perspective on attentional focus in a clinical setting. Previous attempts to understand the use of attentional focus in a clinical setting considered communication as a whole, without taking into consideration trends in attentional focus use relative to factors of the appointment, such as the stage of rehabilitation, the task type, goal of rehabilitation program, etc. All of these factors have the ability to impact what attentional focus condition would be most beneficial in that instance, and should be considered when evaluating attentional focus use. Although failing to reach significance, there was a trend towards the use of EFOA to facilitate functional tasks. This indicates that although there may be a large portion of IFOA communications, in specific situations therapists use EFOA statements in a way that mirrors what literature suggests. During the post-observation debriefing period, when asked to identify how they typically present information to patients, a participant indicated that it was reliant on what they were trying to get the patient to accomplish. To activate a specific muscle group for strengthening purposes, an IFOA is most effective, however, functional tasks are best facilitated with EFOA information.

As expected, there was a discrepancy in the way that the therapists in the current study perceived they used attentional focus in a clinical setting and what is observed. This could be indicative of the intuitive approach employed by many clinicians when presenting information to patients, rather than a more calculated approach considering how to most effectively achieve their goals. In addition there also seems to be a gap in knowledge translation from literature to clinicians, as eight of the observed therapists did not have an understanding of attentional focus research or its practical uses. The first step in increasing the prevalence of evidence based rehabilitation practices should be to ensure that therapists are aware of the benefits associated with the use of different attentional focus conditions in clinical practice, so that patients receive optimal care.

Limitations and Recommendations

As a result of the appointments observed and the data that were collected, the sample sizes for the secondary analyses (task type and stage of rehabilitation) were decreased, detrimentally impacting the validity of those tests. In that same vein, the findings of the current study were limited by the amount of demographic information collected. Other than the stage of rehabilitation, very little patient information was collected, limiting the amount of investigation possible into the types of factors that may impact the use of EFOA.

Another limitation of the present study is the number of researchers involved in data collection. One researcher observed interaction between therapists and patients, recording instructions and feedback statements presented during the appointment. Due to a high level of inter-rater reliability in a previous study, it was decided that the observations of one researcher accurately reflected the appointment and the categorization of statements. However, by only including one observer, the chance that a statement provided by the therapist could be missed was increased.

To address the limitations presented, recommendations for future research include:

1) Inclusion criteria should be adjusted to ensure that patients in each of the stages of rehabilitation, and performing both functional and strengthening tasks are observed.
2) Collecting more information regarding the type of injury and primary goals of each program would provide more insight into EFOA trends, and changes in use of attentional focus communications based on the specifics of the program.
3) Inclusion of a second observer to reduce the likelihood of missing statements provided during the appointment.

Despite these limitations, the present study does provide insight into how attentional focus is currently incorporated into clinical settings. It also provides some perspective to understand what factors and how these factors influence the use of EFOA in motor learning. The final contribution of the present study is to identify a potential gap in the translation of knowledge from literature to clinical use. With this knowledge, resources can be directed towards understanding and bridging this gap.

REFERENCES

Al Abood, S. A., Bennett, S. J., Moreno, H., Ashford, D., & Davids, K. (2002). Effect of verbal instructions and image size on visual search strategies in basketball free throw shooting. *Journal of Sports Sciences, 20*(3), 271-278.

Beilock, S. L., & Carr, T. H. (2001). On the fragility of skilled performance: What governs choking under pressure? *Journal of Experimental Psychology.General, 130*(4), 701- 725.

Beilock, S. L., Carr, T. H., MacMahon, C., & Starkes, J. L. (2002). When paying attention becomes counterproductive: Impact of divided versus skill-focused attention on novice and experienced performance of sensorimotor skills. *Journal of Experimental Psychology.Applied, 8*(1), 6- 16.

Bennell, K. L., Hunt, M. A., Wrigley, T. V., Hunter, D. J., & Hinman, R. S. (2007). The effects of hip muscle strengthening on knee load, pain, and function in people with knee osteoarthritis: a protocol for a randomised, single-blind controlled trial. *BMC Musculoskeletal Disorders, 8,*121- 130.

Carr, K., Zachariah, N., Weir, P., & McNevin, N. (2012). An examination of feedback use in rehabilitation. *Physical and Rehabilitation Medicine, 23(1),* 1-14.

Chiviacowsky, S., Wulf, G., & Wally, R. (2010). An external focus of attention enhances balance learning in older adults. *Gait & Posture, 32*(4), 572-575.

Durham, K. Van Vliet, P. M., Badger, F., & Sackley, C. (2009). Use of information feedback and attentional focus of feedback in treating the person with a hemiplegic arm. *Physiotherapy Research International, 14*(2), 77-90.

Fasoli, S. E., Trombly, C. A., Tickle-Degnen, L., Verfaellie, M. H. (2002). Effect of instructions on functional reach in persons with and without cerebrovascular accident. *American Journal of Occupational Therapy*, *66*(4), 380-390.

Gray, R. (2004). Attending to the execution of a complex sensorimotor skill: Expertise differences, choking, and slumps. *Journal of Experimental Psychology:Applied, 10*(1), 42- 54.

Higbie, E. J., Cureton, K. J., Warren, G. L., & Prior, B. M. (1996). Effects of concentric and eccentric training on muscle strength, cross-sectional area, and neural activation. *Journal of Applied* Physiology, *81(5),* 2173-2181.

Iles, R., & Davidson, M. (2006). Evidence based practice: A survey of physiotherapists' current practice. *Physiotherapy Research International*, *11*(2), 93- 103.

Jette, D. U., Bacon, K., Batty, C., Carlson, M., Ferland, A., Hemingway, R., Hill, J. C., Ogilvie, L., & Volk, D. (2003). Evidence-based practice: Beliefs, attitudes, knowledge, and behaviors of physical therapists. *Physical Therapy*, *83*(9), 786- 805.

Landers, M., Wulf, G., Wallmann, H., & Guadagnoli, M. (2005). An external focus of attention attenuates balance impairment in patients with parkinson's disease who have a fall history. *Physiotherapy*, *91*(3), 152- 158.

MacDermid, J. C., & Graham, I. D. (2009). Knowledge translation: Putting the "Practice" in evidence-based practice. *Hand Clinics*, *25*(1), 125-143.

Magill, R. A. (2001). *Motor Learning: Concepts and Application- Sixth Edition*. New York, NY: McGraw-Hill.

Mattacola, C. G., & Dwyer, M. K. (2002). Rehabilitation of the ankle after acute sprain or chronic instability. *Journal of Athletic Training,37*(4), 413- 429.

Marchant, D. C., Clough, P. J., & Crawshaw, M. (2007). The effects of attentional focusing strategies on novice dart throwing performance and their task experiences. *International Journal of Sport and Exercise Psychology, 5*(3), 291- 303.

Marchant, D. C., Greig, M., & Scott, C. (2009). Attentional focusing instructions influence force production and muscular activity during isokinetic elbow flexions. *Journal of Strength and Conditioning Research, 23*(8), 2358-2366

McNevin, N. H., Shea, C. H., & Wulf, G. (2003). Increasing the distance of an external focus of attention enhances learning. *Psychological Research, 67*(1), 22- 29.

McNevin, N. H., & Wulf, G. (2002). Attentional focus on supra-postural tasks affects postural control. *Human Movement Science, 21*(2), 187-202.

McNevin, N. H., Wulf, G., Carlson, C. (2000). Effects of attentional focus, self-control, and dyad training on motor learning: Implications for physical rehabilitation. *Physical Therapy*, *80*(4), 373- 385.

Menon, A., Korner-Bitensky, N., Kastner, M., McKibbon, A. K., & Straus, S. (2009). Strategies for rehabilitation professionals to move evidence-based knowledge into practice: A systematic review. *Journal of Rehabilitation Medicine*, *41*(13), 1024-1032.

Park, J., Shea, C., Wright, D. (2000). Reduced-frequency concurrent and terminal feedback: a test of the guidance hypothesis. *Journal of Motor Behaviour, 32*(3), 287-296.

Salbach, N. M. (2010). Knowledge translation, evidence-based practice, and you. *Physiotherapy Canada*, *62*(4), 293- 294.

Shea, C. H., & Wulf, G. (1999). Enhancing motor learning through external-focus instructions and feedback. *Human Movement Science, 18*(4), 553- 571.

Singer, R. N., Lidor, R., & Cauraugh, J. H. (1993). To be aware or not aware? What to think about while learning and performing a motor skill. *Sport Psychologist, 7*(1), 19-30.

Swinnen, S. P. Information feedback for motor skill learning: a review. In: Zelaznik HN, ed. *Advances in Motor Learning and Control*. Champaign, Ill: Human Kinetics; 1996:36–66.

Teixeira-Salmela, L. F., Nadeau, S., Mcbride, I., Olney, S. J. (2001). Effects of muscle strengthening and physical conditioning training on temporal, kinematic and kinetic variables during gait in chronic stroke survivors. *Journal of Rehabilitation Medicine, 33*(2), 53-60.

Vance, J., Wulf, G., Töllner, T., McNevin, N., & Mercer, J. (2004). EMG activity as a function of the performer's focus of attention. *Journal of Motor Behavior, 36*(4), 450-459.

Weiss, A., Suzuki, T., Bean, J., & Fielding, R. A. (2000). High intensity strength training improves strength and functional performance after stroke. *American Journal of Physical Medicine & Rehabilitation, 79*(4), 369-376.

Wulf, G., & Weigelt, C. (1997). Instructions about physical principles in learning a complex motor skill: To tell or not to tell. *Research Quarterly for Exercise and Sport, 68*, 362- 367.

Wulf, G. G., Lauterbach, B. B., & Toole, T. T. (1999). The learning advantages of an external focus of attention in golf. *Research Quarterly for Exercise and Sport, 70*(2), 120-126.

Wulf, G., & Su, J. (2007). An external focus of attention enhances golf shot accuracy in beginners and experts. *Research Quarterly for Exercise and Sport, 78*(4), 384- 389.

Wulf, G., Zachry, T., Granados, C., & Dufek, J. S. (2009). Increases in jump-and-reach height through an external focus of attention. *International Journal of Sports Science Coaching, 2*(3), 275- 288.

Wulf, G., Gärtner, M., McConnel, N., & Schwarz, A. (2002). Enhancing the learning of sport skills through external-focus feedback. *Journal of Motor Behavior, 34*(2), 171-182.

Wulf, G., Höβ, M., & Prinz, W. (1998). Instructions for motor learning: Differential effects of internal versus external focus of attention. *Journal of Motor Behavior, 30*(2), 169-179.

Wulf, G., Shea, C. H., & Matschiner, S. (1998). Frequent feedback enhances complex motor skill learning. *Journal of Motor Behavior, 30*(2), 180-192.

Wulf, G., McNevin, N., & Shea, C. H. (2001). The automaticity of complex motor skill learning as a function of attentional focus. *Quarterly Journal of Experimental Psychology: Section A, 54*(4), 1143-1154.

Zachry, T., Wulf, G., Mercer, J., & Bezodis, N. (2005). Increased movement accuracy and reduced EMG activity as the result of adopting an external focus of attention. *Brain Research Bulletin, 67*(4), 304- 309.

APPENDICES

Appendix A: Initial Informed Consent

CONSENT TO PARTICIPATE IN RESEARCH

Title of the Study: An Examination of Communication in an Active Rehabilitation Setting.

You are asked to participate in a research study conducted by **Neb Zachariah** under the supervision of **Dr. Nancy McNevin,** from the **Department of Kinesiology** at the University of Windsor, **the results of which will contribute to Neb Zachariah's master's thesis.**

If you have any questions or concerns about the research, please feel free to contact **primary investigator, Neb Zachariah, e-mail: zacharin@uwindsor.ca or Dr. McNevin, e-mail: nmcnevin@uwindsor.ca (519) 253-3000 ext. 4276.**

PURPOSE OF THE STUDY
Examine the communications of therapists to patients during active physiotherapy sessions.

PROCEDURES
If you volunteer to participate in this study, you will be asked to:
- administer normal treatment to patients who agree to participate in this study while being observed by a researcher
- complete a short follow-up survey three weeks after being observed by a researcher

Length of commitment:
- three appointments to be observed/shadowed by two researchers
- 20 minutes to complete a follow-up survey

Frequency of procedures:
- Three appointments will be observed within a single day
- One time completion of a follow-up survey

Location of procedures:
- Within private clinic therapist is currently practicing

POTENTIAL RISKS AND DISCOMFORTS
May experience discomfort from being observed when providing treatment.
- This will be managed by determining a pre-arranged area of the treatment room that is most suitable for the researcher to stand as to not interfere with treatment.
- If discomfort begins to interfere with treatment of patient, therapist may exercise the right to ask the researcher to leave.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

Results will benefit therapists as it will lead to a better understanding of the various communications styles used by therapists during active rehabilitation sessions. This will increase therapists' awareness of their current practices and provide a basis for therapists to understand other communication styles.

COMPENSATION FOR PARTICIPATION

Participants will receive a Human Kinetics research t-shirt.

CONFIDENTIALITY

Information obtained in connection with this study will not be identified with you as personal information will not be collected. All data will be stored in the secure data storage facility in the Department of Kinesiology. Only the primary and co-investigators will be able to access the data.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to participate in some aspect of the study and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Participants will be informed of the results through two channels. A presentation will be made to the participating therapists to provide an opportunity to ask questions. Patient participants will be provided with a written copy of feedback on the overall study. This will be provided through the therapy clinics that they attend.
Date when results are available: August 2013

SUBSEQUENT USE OF DATA

This data will not be used in subsequent studies.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario N9B 3P4; Telephone: 519-253-3000, ext. 3948; e-mail: ethics@uwindsor.ca

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study ***An Examination of Communication in an Active Rehabilitation Setting*** as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

____
Name of Subject

______________________________ ____________________
Signature of Subject Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

______________________________ ____________________
Signature of Investigator Date

Appendix B: Letter of Information

LETTER OF INFORMATION

Title of the Study: An Examination of Communication in an Active Rehabilitation Setting.

You are asked to participate in a research study conducted by **Neb Zachariah** under the supervision of **Dr. Nancy McNevin,** from the **Department of Kinesiology** at the University of Windsor, **the results of which will contribute to Neb Zachariah's master's thesis.**

If you have any questions or concerns about the research, please feel free to contact **primary investigator, Neb Zachariah, e-mail: zacharin@uwindsor.ca or Dr. McNevin, e-mail: nmcnevin@uwindsor.ca (519) 253-3000 ext. 4276.**

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Examine the communications of therapists to patients during active physiotherapy sessions.

PROCEDURES
If you volunteer to participate in this study, you will be asked to:

- administer normal treatment to patients who agree to participate in this study while being observed by a researcher
- complete a short follow-up survey three weeks after being observed by a researcher

Length of commitment:

- three appointments to be observed/shadowed by two researchers
- 20 minutes to complete a follow-up survey

Frequency of procedures:

- Three appointments will be observed within a single day
- One time completion of a follow-up survey

Location of procedures:

- Within private clinic therapist is currently practicing

POTENTIAL RISKS AND DISCOMFORTS
May experience discomfort from being observed when providing treatment.

- This will be managed by determining a pre-arranged area of the treatment room that is most suitable for the researcher to stand as to not interfere with treatment.
- If discomfort begins to interfere with treatment of patient, therapist may exercise the right to ask the researcher to leave.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY
Results will benefit therapists as it will lead to a better understanding of the various communications styles used by therapists during active rehabilitation sessions. This will increase therapists' awareness of their current practices and provide a basis for therapists to understand other communication styles.

COMPENSATION FOR PARTICIPATION
Participants will receive a Human Kinetics research t-shirt.

CONFIDENTIALITY
Information obtained in connection with this study will not be identified with you as personal information will not be collected. All data will be stored in the secure data storage facility in the Department of Kinesiology. Only the primary and co-investigators will be able to access the data.

PARTICIPATION AND WITHDRAWAL
You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to participate in some aspect of the study and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS
Participants will be informed of the results through two channels. A presentation will be made to the participating therapists to provide an opportunity to ask questions. Patient participants will be provided with a written copy of feedback on the overall study. This will be provided through the therapy clinics that they attend.
Date when results are available: August 2013

SUBSEQUENT USE OF DATA
This data will not be used in subsequent studies.

RIGHTS OF RESEARCH SUBJECTS
You may withdraw your consent at any time and discontinue participation without penalty. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario N9B 3P4; Telephone: 519-253-3000, ext. 3948; e-mail: ethics@uwindsor.ca

SIGNATURE OF INVESTIGATOR
These are the terms under which I will conduct research.

_________________________________ __________________

Appendix C: Therapist Perception Questionnaire

As perhaps you already know, therapists can differ from each other in the type of feedback they give in response to their patients' performances.

This questionnaire is designed to find out what type of instruction and feedback therapists provide their patients.

Therapist's Response to Patient's Error

Listed below are three examples of feedback you might give your patient after he/she has made an error while completing a reaching task (arm extension) toward a target.

PLEASE RATE EACH STATEMENT IN TERMS OF HOW OFTEN (% OF THE TIME) YOU GIVE THIS KIND OF FEEDBACK TO YOUR PATIENT AFTER HE/SHE HAS MADE AN ERROR DURING PERFORMANCE BY CIRCLING THE CORRESPONDING NUMBER.

Percentages should add up to 100%.

	0% of the time	20% of the time	40% of the time	60% of the time	80% of the time	100% of the time
1. Ignore patient's error	1	2	3	4	5	6
2. "Focus on reaching the target."	1	2	3	4	5	6
3. "Focus on fully extending your elbow".	1	2	3	4	5	6

Therapist's Instructions to Patients

Listed below are two examples of how you might instruct your patient to perform a task (arm extension).PLEASE RATE EACH STATEMENT IN TERMS OF HOW OFTEN (% OF THE TIME) YOU PROVIDE THIS TYPE OF INSTRUCTION TO A PATIENT BY CIRCLING THE CORRESPONDING NUMBER.

Percentages should add up to 100%.

	0% of the time	20% of the time	40% of the time	60% of the time	80% of the time	100% of the time

"Try to fully extend your arm"	1	2	3	4	5	6
"Reach forward and try to touch the wall in front of you"	1	2	3	4	5	6

Indicate how the following statements affect the way you provide instruction and feedback to a patient during a rehabilitation session.

	0% of the time	20% of the time	40% of the time	60% of the time	80% of the time	100% of the time
Instructions and feedback that direct the patients' attention to their movements and coordination.	1	2	3	4	5	6
Instructions and feedback that direct the patients' attention to external cues.	1	2	3	4	5	6
Instructions and feedback are provided in a way that is second nature and intuitive.	1	2	3	4	5	6

Prior knowledge of Attentional Focus

Do you have an understanding of attentional focus and its uses in a clinical setting?
Yes / No

If yes, please indicate where you acquired this knowledge (eg: school, professional conference, motor learning literature etc):

___

Modified from Stein, J. (2009). Influence of perceived coach feedback on athletes perception of team's motivational climate. (Doctoral dissertation). Retrieved from http://proquest.umi.com (AAT MR61678).

Appendix D: Debriefed Informed Consent

CONSENT TO PARTICIPATE IN RESEARCH

Title of Study: **Use of Attentional Focus in a Rehabilitation Setting: A Comparison of Theoretical Frameworks and Clinical Practice**

You are asked to participate in a research study conducted by **Neb Zachariah** under the supervision of **Dr. Nancy McNevin,** from the **Department of Kinesiology** at the University of Windsor, **the results of which will contribute to Neb Zachariah's master's thesis.**

If you have any questions or concerns about the research, please feel free to contact **primary investigator, Neb Zachariah, e-mail: zacharin@uwindsor.ca or Dr. McNevin, e-mail: nmcnevin@uwindsor.ca (519) 253-3000 ext. 4276.**

PURPOSE OF THE STUDY

(1) determine the type of instruction and feedback patients received from therapists
(2) determine if the type of instruction and feedback used by therapists is consistent with motor learning literature
(3) determine if therapists' have a working knowledge of attentional focus literature.

PROCEDURES

If you volunteer to participate in this study, you will be asked to:

- administer normal treatment to patients who agree to participate in this study while being observed by a researcher
- complete a short follow-up survey after being observed by a researcher

Length of commitment:

- three appointments to be observed/shadowed by two researchers
- 20 minutes to complete a follow-up survey

Frequency of procedures:

- three appointments will be observed within a single day
- One time completion of a follow-up survey

Location of procedures:

- Within private clinic therapist is currently practicing

POTENTIAL RISKS AND DISCOMFORTS

May experience discomfort from being observed when providing treatment.

- This will be managed by determining a pre-arranged area of the treatment room that is most suitable for the researchers to stand as to not interfere with treatment.
- If discomfort begins to interfere with treatment of patient, therapist may exercise the right to ask the researcher to leave.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

Results will benefit therapists as it will provide some insight into the use of attentional focus in clinical settings. In addition it will increase therapists' awareness of their current practices.

COMPENSATION FOR PARTICIPATION

Participants will receive a Human Kinetics research t-shirt.

CONFIDENTIALITY

Information obtained in connection with this study will not be identified with you as personal information will not be collected. All data will be stored in the secure data storage facility in the Department of Kinesiology. Only the primary and co-investigators will be able to access the data.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to participate in some aspect of the study and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. Following debriefing if you wish to remove data from the study collected during the treatment session you were part of, this will be done so without any consequences.

FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Participants will be informed of the results through two channels. A presentation will be made to the participating therapists to provide an opportunity to ask questions. Patient participants will be provided with a written copy of feedback on the overall study. This will be provided through the therapy clinics that they attend.
Date when results are available: August 2013

SUBSEQUENT USE OF DATA

This data will not be used in subsequent studies.

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario, N9B 3P4; Telephone: 519-253-3000, ext. 3948; e-mail: ethics@uwindsor.ca

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study **Use of Attentional Focus in a Rehabilitation Setting: A Comparison of Theoretical Frameworks and Clinical Practice** as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

____
Name of Subject

____________________________________ __________________
Signature of Subject Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

____________________________________ __________________
Signature of Investigator Date

Appendix E: Data Collection Form

DATA SHEET ____ OF ____	**TASK:** ______________ Time:________ ACTIVE TIME: _________	Comments	**Task**:- ______________ Time:__________ ACTIVE TIME: ___________	Comments
INTERNAL		**INSTRUCTION**	**INTERNAL**	**INSTRUCTION**
EXTERNAL			**EXTERNAL**	
INTERNAL		**FEEDBACK**	**INTERNAL**	**FEEDBACK**
EXTERNAL			**EXTERNAL**	

Session Length: ___ to ___ **Total Active Time:** _____ **Patient Level:** BEG MID END

Therapist ID: ____________

VITA AUCTORIS

Neb Zachariah was born in Guelph, Ontario in 1987. She completed her B.Sc. in Human Kinetics at the University of Guelph in 2008. Neb plans to conclude her graduate studies at the University of Windsor in Kinesiology in the fall of 2013.