THE DEVELOPMENT AND TRANSFER OF SELF-REGULATION DURING MOTOR SKILL ACQUISITION: A SOCIAL COGNITIVE PERSPECTIVE

by

Jordan David Goffena

A Dissertation
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by

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Dedication

I dedicate this dissertation to my late brother, P. Marcus Goffena.

Acknowledgements

I would like to acknowledge the tremendous role my brother, Marcus, has played in my personal, professional, and emotional development. Completing a doctoral program is not an easy task in the first place, but trying to maintain the level of rigor needed to complete a doctoral program after your unexpected death was the toughest barrier I have ever had to overcome. I am grateful for all the fun times we had together, but above all I am thankful for how you have continued to push me to become a better person even after your passing. The hard work it took to write this dissertation is only a small reflection of how you showed me to work hard for what I believe in. For that, this dissertation is dedicated to your memory, brother.

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I would like to thank all of the friends that I've made along the way. Moving from Ohio, I came to the DC metro area with no friends and limited knowledge of how a big city functioned. Now, I feel like I have an amazing extended family that has forever changed my life! This acknowledgment is for all of the friends made through Mason's doctoral program who helped me *start green and finish gold*; for all the friends I have made through the various sport leagues who have helped keep me sane when work got too overwhelming; and especially for the friends who I will forever call my DC fam (Jeremy, Damareus, and Jamere to name a few). A special thank you to Samantha Ives for sitting next to me in every single class we've taken together and being the best office buddy I could ever ask for – I'm not sure if I could have gotten through this program without you! Finally, a special thank you to Johnathan Kwak – you have shown me that life is so much more than just the pursuit of a professional goal.

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List of Abbreviations and Symbols

Self-regulated Learning ..... SRL
Psychological Skills Training ..... PST
Counts Per Attempt ..... CPA
Visual-Gaze ..... VG
Catch-and-Release Patterning ..... CRP
Stance for Control ..... SC
Personal Record ..... PR
Quantitative ..... Quan
Qualitative ..... Qual
Sequential ..... →
Analysis of Variance ..... ANOVA

Abstract

THE DEVELOPMENT AND TRANSFER OF SELF-REGULATION DURING MOTOR SKILL ACQUISITION: A SOCIAL COGNITIVE PERSPECTIVE

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George Mason University, 2020

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The purpose of the present study was to assess the development and transfer of self-regulation for college-aged novice learners as they acquired a novel motor skill. A three-phase sequential mixed method design consisted of a qualitative cross-case analysis that assessed commonalities among instructional videos (phase one) that informed the development of an experimental, laboratory-based learning intervention (phase two) which was followed by a post-intervention qualitative interview (phase three). Once the experimental protocol was established, novice-level learners (N = 29) were randomly assigned to one of two conditions: a control condition that received physical skill practice (n = 15) or an experimental condition that received self-regulation coaching with physical skill practice (n = 14). The experimental protocol contained a physical skill performance assessment (both conditions) and a self-regulation microanalytic interview protocol (experimental condition only). In order to better judge the novice-level learner's motor

proficiency and their development of self-regulation, microanalytic data were also collected from high proficiency performers (n = 4). A 2 x 4 repeated measures ANOVA was conducted between the two conditions over pre-, mid-, post-, and transfer test time points. Results yielded non-significant differences between conditions in their skill proficiency, though the experimental group's mean performance scored higher than the control for both post-test and transfer test evaluations. Chi-square analyses showed that the experimental group used significantly more strategies to aid their performance. On both post-test and transfer test evaluations the experimental group consistently used outcome goals, strategically planned and monitored performance using more mental-skill oriented strategies and used outcome-oriented standards of performance to judge how well they performed. These quantitative findings provide initial support that self-regulatory skills learned through self-regulation coaching can adaptively transfer across performance environments. Qualitative findings showed that goals were important for the learning process and goal setting was the self-regulation component most connected to transfer (as taught through self-regulation coaching). Emergent findings suggest important distinctions between physical-skill oriented transfer and self-regulation transfer across different levels of motor proficiency. A discussion of the findings, future directions for research, and educational implications for the development and transfer of self-regulation are advanced.

Chapter One: Introduction

Among the many social institutions that influence people's interests (e.g., politics, education, family), a popular and established institute that draws much of our time, energy, capital, and advocacy is sport. Whether it is your Thursday evening volleyball league with friends, Friday night gaming with NBA 2K18, attending your niece's or nephew's soccer game on Saturday morning, or watching Sunday NFL football with family, sport is often an activity people in society will schedule their free time around. Further, sport is a hot topic that brings people together for friendly discussion (e.g., discussing ESPN's ranking of the top-10 plays of the week) or heated debate (i.e., who's the best athlete of all-time). For example, people can have the sport-specific debate on who the all-time best basketball player is between Michael Jordan and Lebron James; compare Usain Bolt's current world records in the 100 and 200 meter dash to the records Jesse Owens held from in the 1930s; or, by generalizing across all sports, try to determine who holds the all-time best performance in high-stakes competitions from athletes such as swimmer Michael Phelps, tennis player Rodger Federer, or boxer Muhammad Ali.

Though the examination of these sport phenomena is thought-provoking and entertaining, the arguments are subjective. The acquisition of sport skills for elite performance is based on years of training and in order to develop task-specific strengths, tactics, and strategies for goal-directed, performance-oriented behavior (e.g., shooting

skills for Lebron James, running mechanics for Usain Bolt). Researchers interested in expertise in sport call this deliberate practice. Athletes who put high effort into the practice of sport-specific tasks are deliberately practicing, as long as the practice activities are relevant for performance in highly competitive environments (Ericsson, Krampe, & Tesch-Römer, 1993). Expert performers undoubtedly have the physical attributes to demonstrate the task-specific skills needed for their sport, but how are these skills developed and refined over time? Research has identified that it takes 10 years (Simon & Chase, 1973), or 10,000 hours (Ericsson, Krampe, & Tesch-Römer, 1993), of deliberate practice to reach a level of mastery for the performance of the learned motor or cognitive skills.

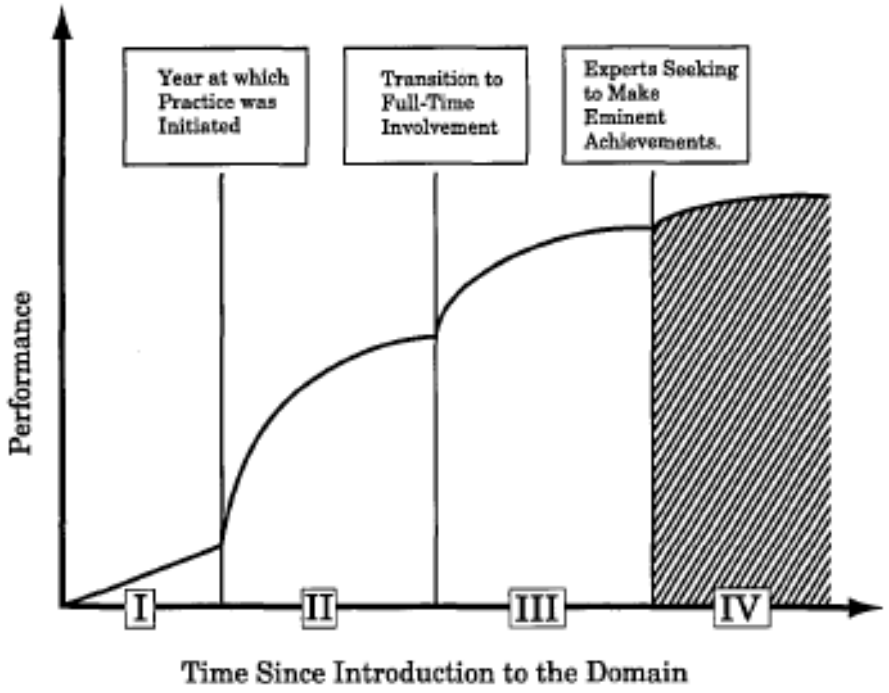

Figure 1. Phases of acquisition for expert performance. Reproduced from Ericsson, 1998, p. 87.

Figure 1 represents a sequence for skill development from the initial learning trials to elite performance. The professional athletes mentioned above are well within the grey area to the right (i.e., phase IV) which is indicative of high achievement and performance excellence in their respective sports. Returning to the question of interest (i.e., how do these skills develop over time?), we must look toward the left of the time sequence (i.e., phase I) for an assessment of skill development. For example, a critical consumer of research could then ask, "what skills and drills did the young Lebron James take part in?" or "what was the type of instruction the young Usain Bolt was receiving in the early stages of his running career?" Though the assessment of highly skilled

performance is interesting, the current study will assess how skills are initially trained and developed for novice-level performers.

Theoretical Framework

The primary theoretical framework for this dissertation research is social cognitive theory (Bandura, 1986, 1989). Social cognitive theory is an expansion from Bandura's (1977b) earlier work on social-learning theory. There are three key assumptions of social cognitive theory: enactive and vicarious learning, reciprocal interactions, and self-regulatory processing (Schunk, 2012; Schunk & Usher, 2013). The first assumption of social cognitive theory incorporates modeling and observational learning (e.g., attention, retention, production, and motivation) into the process of learning (Bandura, 1986; Schunk, 2012), which illustrates that learning can occur vicariously through the observation of a model's task demonstration. The onset of social cognitive theory and the incorporation of modeling and observational learning can be seen in the evolution of research within the sport and exercise psychology literature. Specifically, within a span of 75 years of research published by *Research Quarterly for Exercise and Sport*, modeling and observational learning for motor skill acquisition and sport coaching has been recognized as a consistent and re-emerging theme (Weiss & Gill, 2005). The second assumption outlines that learning experiences interact reciprocally between a person's cognitions, their behavior, and the environment they are within, which has been identified as reciprocal causation (Bandura, 1986, 1989). The final assumption is that self-regulatory processing, personal agency, and an individual's desire

to have control over their actions and thinking within a learning environment are intrinsically important.

There is substantial evidence from the social cognitive literature in sport that self-regulatory performance (e.g., cognitive/ metacognitive skills, mental skills) can be learned alongside the training of physical skills in sport and physical education (Goudas, Kolovelonis, & Dermitzaki, 2013; Kitsantas & Kavussanu, 2011). Training for self-regulation in sport is linked to the 10,000-hour rule as research has indicated that the self-regulation of sport learning and performance becomes increasingly more likely with higher expertise (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). In other words, expert performers are self-regulating their thoughts, cognitions, behavior, motivation, and use strategies to enhance their performance. The self-regulation of learning in sport refers to how athletes and individuals learning motor skills are interacting with motivational, behavioral, or cognitive regulatory processes (e.g., self-talk, imagery, attentional focus) relative to their sport-specific performance goals (Kitsantas & Kavussanu, 2011). This definition of self-regulation is an adaption of Zimmerman's (2000, 1986) cyclical model of self-regulated learning (SRL) which identifies a feedback loop between the three phases before, during, and after task-specific, goal-directed performance.

Alignment between social cognitive theory and SRL. Zimmerman's theory of SRL, a perspective heavily influenced by social cognitive theory, has three major themes for the self-regulation of learning and performance: dimensions, phases, and levels (Schunk & Usher, 2013). The dimensions of self-regulation consist of motives (e.g., self-

efficacy, goals), methods (e.g., routines, strategies), timing (e.g., choice in task or duration), behavior (e.g., self-observation, self-reactions), the physical environment (e.g., choice in study location), and the social environment (e.g., help-seeking). The broader picture of the dimensions is congruent with the one of the key assumptions of social cognitive theory: reciprocal causation. The alignment between self-regulation and social cognitive theory can be found in Table 1.

Table 1
Alignment between Social Cognitive Theory and Self-Regulation: Dimensions

Reciprocal Causation	Dimensions of Self-Regulation
Environment	Physical Environment
	Social Environment
Behavior	Behavior
Person	Motives
	Methods

Note. The dimension *timing* was intentionally left out due to the holistic nature and complexity of time.

The second main component of Zimmerman's theory of self-regulation is the cyclical nature of SRL. The cycle of self-regulation refers to the phases within the process of learning. The three phases of the cycle are forethought, performance, and reflection, and they represent what happens prior to the performance of a task, what

occurs during the performance process, and the reflection after the task has been performed. Zimmerman's conceptualization of the phases is in alignment with social cognitive theory (see Figure 2 for an illustration). However, Zimmerman's conceptualization of self-regulation expands social cognitive theory by adding the temporal component to the cycle. That is, the phases occur before, during, and after performance, and the processes within each phase occur within its respective time relative to the performance of the task. Similarly, the two are distinct as Zimmerman's model incorporates the significant role of self-monitoring within the performance phase, whereas self-monitoring is a more ubiquitous element for social cognitive theory.

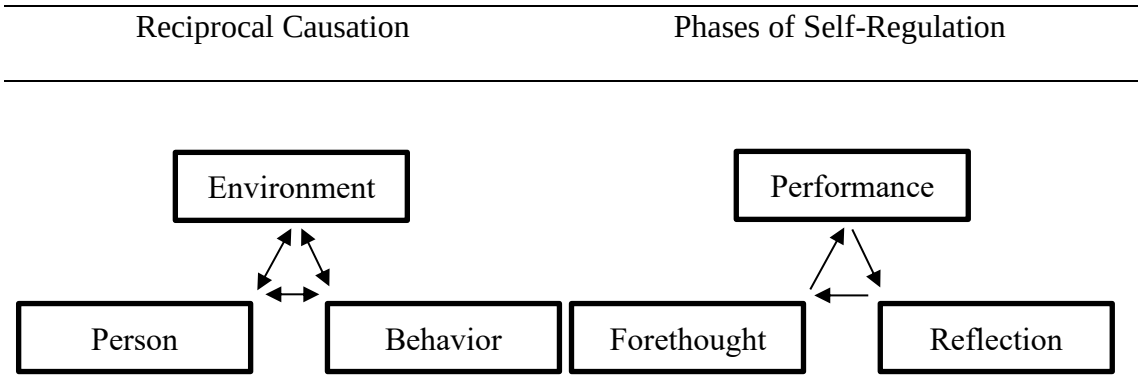

Figure 2. Alignment between social cognitive theory and self-regulation: Phases

The final component of Zimmerman's conceptualization of self-regulation refers to how self-regulation is developed over time. The levels involved with learning how to self-regulate one's learning are observation, emulation, self-control, and self-regulation

(Zimmerman, 2000). Learners can develop their ability to self-regulate by observing and emulating a model's demonstrations, instructions, and using their feedback as a resource. As the learner identifies individualized self-monitoring strategies for task performance, the learner will transition to more self-controlled behaviors. The interaction between the self and the social environment is important for internalizing performance information, especially for the transition to more self-controlled and self-regulated behaviors (Schunk, 1999; Schunk & Zimmerman, 1997). See Table 2 for alignment between the levels of self-regulation and the social and environmental factors affecting the development of self-regulation during skill acquisition.

Table 2
Alignment between Social Cognitive Theory and Self-Regulation: Levels

Levels of Self-Regulation	Social-to-Self Factors	Environmental Factors
Observation	Modeling	The presence of a model
Emulation	Social feedback and performance	Communication with the model
Self-Control	Process-oriented standards of performance	Structured self-learning
Self-Regulation	Outcome-oriented standards of performance	Dynamic self-learning

Future directions in the theoretical framework. The two frameworks at the core of this research is social cognitive theory and the theory of SRL. Social cognitive self-regulation contains dimensions, phases, and levels of self-regulation within learning and performance environments. Novice learners can develop self-regulatory behavior by progressing through the levels (i.e., observation, emulation, self-control, and self-regulation), which will strengthen the use of sub-processes within the phases of the SRL cycle. Though there are multiple publications that show evidence and provide support for the multi-level model of SRL for sport and physical activity (Goudas, Kolovelonis, & Dermitzaki, 2013; Kitsantas & Kavussanu, 2011; Kolovelonis & Goudas, 2013), there is little research identifying what happens for those individuals after self-regulation has been developed and learned.

One such phenomenon to study at the conclusion of self-regulation development is transfer. Schunk and Zimmerman (1997) identified transfer as a direction for future self-regulation researchers to consider. Specifically, they said, "we recommend [future research should be] on factors affecting transfer of self-regulatory skills. Transfer includes maintenance of skills over time and generalization across contexts and subject domains. Transfer is important because self-regulation is involved in the academic, social, and motor skill domains" (Schunk & Zimmerman, 1997, p. 205). However, the phenomenon of transfer is multifaceted and multidimensional. Anecdotally, it has been suggested that self-regulation can broadly transfer across academic disciplines (Baum, Owen, & Oreck, 1997). Empirically, research has found associations between training for self-regulation and SRL processes with cognitive transfer (Barak, Hussein-Farraj, &

Dori, 2016), problem-solving (Fuchs et al., 2003b), and decision-making (Llorens, Vidal-Abarca, & Cerdán, 2016). Though the research between self-regulation and transfer has been recommended and some evidence collected, much more is needed to determine what the role of transfer is relative to the development of self-regulation for novice learners. Therefore, this dissertation research was created to assess how novice learners develop self-regulation during motor skill acquisition, and how learned self-regulation subsequently transfers across performance environments.

Statement of the Problem

Transfer is not a new topic of interest for research in psychology and the learning sciences. In fact, it has been one of the leading topics that span the 20th century of educational research (Barnett & Ceci, 2002; Marton, 2006). Early research on transfer was developed from a behaviorist perspective. This viewpoint focused on identical elements (Thorndike, 1913; Thorndike & Woodworth, 1901), which explains how a response to a stimulus will occur between environments if the basic elements of a new stimuli is similar to that of the original within the stimulus-response situation. Similarly, Skinner (1953) would call this generalization, by way of operant conditioning. The issue with both early perspectives is that they disregard components of transfer that are cognitive in nature (Schunk, 2012). Years later, Royer (1979) developed a model of transfer from the cognitive perspective called schema theory. Schema theory offers a different outlook as transfer occurs after learning, and learning is based upon the development of cognitive structures (i.e., schemata) for the learning task instead of the reinforcement of a response to a stimulus. Other theories of transfer beyond Royer's early

cognitive view have been influenced by perspectives such as information processing theory and situated learning (Ormrod, 2012).

Now, however, there has been a contemporary resurgence of transfer in the educational literature that is focusing on new conceptualizations toward what transfer embodies (Engle, 2012; Goldstone & Day, 2012). Evidence for the modern-day resurgence comes from the academic journals in the domains of educational psychology and the learning sciences. Specifically, in 2012, the *Educational Psychologist* and *The Journal of the Learning Sciences* both published special editions focused on the phenomenon of transfer. Further, the journal *Educational Research Review* published six more articles focused on new theoretical conceptualizations of training transfer from multiple viewpoints (Segers & Gegenfurtner, 2013). This new era of transfer research is concerned questions such as *how* and *how much* of transfer is occurring, *what* is being transferred, *when* is it being transferred, and *where* is it occurring (Barnett & Ceci, 2002; Marton, 2006; Nokes, 2009; Nokes-Malach & Mestre, 2013; Salomon & Perkins, 1989)?

This is important as we now know transfer is much more than being positive or negative, near or far, literal or figural, vertical or lateral, and specific or general (Ormrod, 2012; Schunk, 2012). These contemporary perspectives on transfer range from taking a multiple mechanism approach (Nokes, 2009) that better aid learners to "make sense" of the topic at hand (Nokes-Malach & Mestre, 2013) from a cognitive perspective, to a more socio-cultural perspective which helps learners "notice" as a way to effectively focus (Lobato, Rhodehamel, & Hohensee, 2012). Though there are a variety of conceptualizations of transfer based on many different paradigmatic viewpoints, the

problem between transfer and self-regulation is that there has not been a model developed to better understand the transfer of SRL from a social cognitive perspective.

Context of the Research

Motor learning is both a field of study and learning perspective that broadly assesses the internal and external contextual factors that affect how individuals acquire motor skills. When learning motor skills, individuals often develop physical and cognitive processes derived from consistent repetition and practice of motor tasks, which forms relatively permanent changes in one's ability to perform a motor task or skill (Schmidt & Lee, 2011, 2014). Motor skill acquisition, in regard to acquiring complex sport-oriented skills, can be viewed as the development and refinement of kinesthetic control through using whole-body manipulations of actions (and variations of locomotion) and posture relative to the constraints of motor task being learned (Newell, 1991). This definition is important as performance environments in sport require athletes to adapt to the constraints relative the standards of performance for the physical task (Davids, Button, & Bennett, 2007; Furley & Memmert, 2011).

This dissertation research was conceptualized using an interdisciplinary perspective. The primary learning task (i.e., outcome variable) within this research is based on the acquisition of motor skills. Though the aim of this dissertation was to observe motoric proficiency (i.e., in the field of applied motor learning), the design of this research was based on theories and methodologies from educational psychology and sport psychology literature. The field of educational psychology, specifically the literature on SRL, strongly influenced the methodological framework. Further, SRL

theory has strong implications for coaches effectively instructing their athletes (i.e., self-regulation coaching). Though this dissertation was developed to highlight the role of social cognitive learning in the sport domain, sport-oriented motor tasks (e.g., long jump, the butterfly swim, or softball batting) are difficult to empirically assess due to (a) the complexity of the motor task, (b) the differential levels to which athletes can perform a complex motor task, and (c) the difficulty with systematically measuring sport-oriented performance within a laboratory setting. The assessment of many sport-oriented skills have been successfully measured within the context of its own environment (i.e., applied empirical research) such as basketball shooting (Cleary & Zimmerman, 2001), basketball dribbling (Kolovelonis, Goudas, Dermitzaki, & Kitsantas, 2013; Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012), and volleyball serving (Kitsantas & Zimmerman, 2002), and other skills such as dart throwing have been assessed within the physical education classroom (Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary, 2000; Kolovelonis, Goudas, & Dermitzaki, 2011a; Zimmerman & Kitsantas, 1996, 1997). For the purpose of decreasing possible effects from social-facilitation (Rajecki, Ickes, Corcoran, & Lenerz, 1977; Zajonc, 1965), this dissertation research assessed motor skill acquisition within a laboratory setting. The complex motor skill selected for this research was the three-ball cascade juggling task.

Among the first to empirically use the motor skill of juggling in a research study, Trussell (1965) assessed college women to determine and predict their proficiency of motor learning. However, Bebko, Demark, Osborn, Majumder, Ricciuti, and Rhee (2003), while specifically using a three-phase motor learning sequence (e.g., Fitts &

Posner, 1967), taught novice learners the art of juggling and investigated how automaticity was developed for the complex motor skill. More recently, going beyond just acquisition and automatization of juggling capabilities, Laughlin, Fairbrother, Wrisberg, Alami, Fisher, and Huck (2015) investigated the retention and transfer of juggling performance as well as assessed the degree to which self-controlled behaviors influence learning the three-ball cascade juggling task. As motor skill acquisition is oftentimes broadly applied, the research conducted in this area is specific to the context of acquiring juggling proficiency. The studies outlined above have systematically assessed how juggling skills are acquired (Bebko et al., 2003), and most notably, understood through a social cognitive perspective (Laughlin et al., 2015). The purpose of this dissertation was to add to this body of literature and assess the acquisition and transfer of juggling performance through the theoretical lens of social cognitive theory and SRL.

Though research has assessed the degree to which juggling proficiency is acquired (Laughlin et al., 2015; Bebko et al., 2003), other applied motor learning studies have found that juggling skills can be transferred to similar (e.g., near transfer; Bebko, Denmark, Im-Bolter, & MacKewn, 2005) and dissimilar (e.g., far transfer; Lammfromm & Gopher, 2011) performance environments. Building upon these studies, this dissertation research assessed the development and transfer of not only juggling performance but also the development and transfer of self-regulation when performing the juggling task. Highly acclaimed self-regulation scholars have identified self-regulation transfer as a direction for future research (Schunk & Zimmerman, 1997).

Though the phenomenon of transfer is regularly debated by educators and academics (Barnett & Ceci, 2002), the transfer of self-regulation is still an area of little emphasis in educational research (Schunk, 2012).

Research Questions

The following questions are the focus of this dissertation research. First, are there group differences in motor performance for post-intervention testing (i.e., post-test and transfer task) between the control and experimental conditions? Second, are there group differences in self-regulatory strategic planning between the control and experimental conditions? The third research question focuses in on the role of self-regulation coaching and is broken down in two parts. From a quantitative perspective, how do the experimental group members transfer their self-regulation skills (i.e., self-judgements, goals, and strategic self-monitoring) from the post-test to the transfer test? From a qualitative perspective, what findings emerged from the participant's verbal responses that further illustrate adaptive self-regulation transfer?

Key Terms

Key terms in the study include *novice*, *motor skill acquisition, self-regulated learning, social cognitive theory, self-regulation coaching,* and *self-regulation transfer*.

For the study, a **novice** is an individual who has little to no prior experience with the motor skill of juggling. The novice jugglers participated in a learning intervention focused on **motor skill acquisition**. Motor skill acquisition for complex skill learning is the development and refinement of kinesthetic control through using body manipulations

and movement constraints for a specific motor task (Newell, 1991). Once a motor skill is learned, the hope is that the skill can transfer across performance environments.

Self-regulated learning (SRL) is a metacognitive, behavioral, and motivational strategic process that supports task-specific, goal-directed learning (Zimmerman, 2000, 2008). As a theoretical perspective highly influenced by **social cognitive theory** (Bandura, 1986, 1989), SRL is represented by the context of the learning task and the social environment (e.g., a coach or teacher) surrounding the task (Pintrich, 2000).

Self-regulation coaching refers to the teaching of task-specific goals and strategic cues to facilitate learning during the acquisition of motor proficiency. Built upon the tenants of Zimmerman's (2000) developmental model of self-regulation (i.e., observation, emulation, self-control, and self-regulation), the purpose of self-regulation coaching is to explicitly guide learners out of the emulation phase into the self-control and self-regulation phases. Primary features of self-regulation coaching within the intervention include shifting goals, strategic self-monitoring and self-evaluation.

Self-regulation transfer, relative to coaching for self-regulation with novice learners, is the transfer of SRL processes between performance environments for similar but distinct motor tasks. Specifically, the self-regulation transfer represents the transfer of the primary features of self-regulation coaching (i.e., goals, self-monitoring strategies, and self-evaluation) across performance environments.

Chapter Two: Literature Review

Optimal learning for sport-specific skill development is linked to highly structured learning environments and often depends on a coach's commitment to teaching deliberate practice strategies (Ericsson, 1998; Ericsson, Krampe, & Tesch-Römer, 1993). In sport, the use of deliberate practice techniques is, to a large degree, connected to the use of self-regulation strategies for athletic performance (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). Coaches and physical education teachers can use motor learning theories to help guide the learners whom they instruct. In particular, a sequential, three-phase model is often used to help novices develop motor skills (Fitts & Posner, 1967). This model consists of cognitive, associative, and autonomous phases and is regularly used as a guiding framework for coaching, skill acquisition, and performance in sport (Coker, 2015, 2018). Though the cognitive, associative, and autonomous phases are not fixed in sequence (Anson, Elliott, & Davids, 2005; Christina & Corcos, 1988), the framework (a) compliments research designs that assess learning from a self-regulation perspective (Zimmerman, 2000), and (b) resembles other theoretical frameworks that have been used to develop automaticity during motor skill acquisition for the three-ball cascade juggling task (Bebko et al., 2003; Laughlin et al., 2015).

The following literature review will introduce the theory of self-regulated learning and provide empirical evidence and applications relative to motor learning, skill

acquisition, and literature from the field of sport psychology. Then, five theoretical models of learning and performance are identified, which focus on the development and maintenance of self-regulation and the development of motor proficiency. Next, a section identifying literature that involves how knowledge and skills transfer across learning and performance environments. In this section, differences between cognitive transfer, perceptual-motor transfer, training transfer, and strategy transfer are advanced which inform the operationalization of self-regulation transfer. Finally, a section will elaborate on the connection between the aforementioned research and outline the specific questions guiding this dissertation research.

Self-Regulated Learning and the Acquisition of Sport and Motor Skills

The self-regulation of one's learning is often connected to how learners are proactive with incorporating motivational, metacognitive, and behavioral strategies when participating in the process of learning (Zimmerman, 2000, 2006, 2008). Self-regulatory processes account for task analysis, self-monitoring, and self-evaluation among others that cycle through forethought, performance, and self-reflection phases (Zimmerman, 1986, 2000). In the context of education, setting task-specific learning goals help students regulate their time and energy through creating individualized strategies for the successful completion of the learning task. Therefore, self-regulated learning (SRL) is a goal-directed, constructive process that learners demonstrate effortful considerations to monitor and control their regulatory behavior, cognition, and motivational beliefs that are influenced by the social environment and the contextual features of the learning task (Pintrich, 2000).

Sport learning is often associated with long periods of extensive practice with the constant repetition of physical tasks and skills (e.g., 10,000-hour rule, deliberate practice; Ericsson, Krampe, & Tesch-Römer, 1993). In the context of sport learning and the performance of learned motor skills, self-regulation has been regarded as "a set of cognitive, behavioral, and motivational processes that interact cyclically to enhance performance" (Kitsantas & Kavussanu, 2011, p. 217). This definition of self-regulation, which is based on Zimmerman's (2000) SRL model, offers a valuable perspective to assess how individuals acquiring motor skills are self-regulating their learning and performance. Using this perspective, a learning intervention for motor skill acquisition was designed to help facilitate the development of SRL. The learning intervention incorporated (a) a theoretical model for motor learning (Fitts & Posner, 1967), and (b) an SRL model for motor and sport performance (Kitsantas & Kavussanu, 2011; Zimmerman, 2000) for the purpose of teaching a novice learner a new motor skill.

Zimmerman (1986, 2000) described how students regulate their learning by cycling through forethought, performance, and self-reflection phases. The forethought phase pertains to aspects of learning that occur before performing a task and is represented by two categories: task analysis and motivational beliefs. Further, the sub-processes within the categories are goal setting and strategic planning (task analysis), and self-efficacy beliefs, goal orientation, perceived instrumentality, and intrinsic interest (motivational beliefs). These constructs interact holistically to help individuals think about the learning task prior to their engagement in the task. The next phase in the cycle focuses on what occurs during the performance of the task. The two categories for

performance are self-control and self-observation. The sub-processes involved in the self-control category are represented by task strategies, attentional focus, self-instruction, and imagery, and the processes for self-observation being metacognitive monitoring and self-recording. The way in which learners manipulate the learning environment can aid in their ability to effectively learn the task at hand, and self-regulators frequently use the performance strategies to persist when engaged in the process of learning. The third and final phase of the cycle is self-reflection and is represented by the categories of self-judgments and self-reactions. The sub-processes within the two categories are self-evaluations and attributions, as well as self-satisfaction and adaptability respectively. This reflection on performance assists learners in thinking about what just happened to better prepare for the next attempt. In other words, this phase helps the learner solidify the knowledge by reflecting on their specific experience learning the new skill. See Figure 3 for an illustration of the cyclical model of SRL.

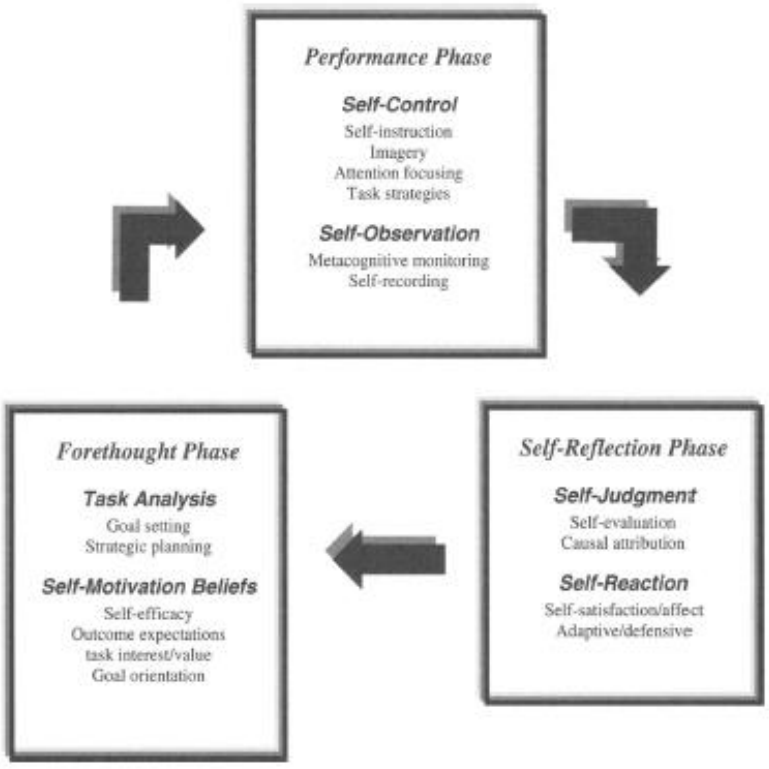

Figure 3. The cyclical model of self-regulated learning. Reproduced from Zimmerman, 2008, p. 178.

SRL and sport learning and performance. Studies using the cyclical model of SRL have been primarily conducted in the educational context, but some important studies have been conducted in the context of sport and motor performance. Among the leading studies, Cleary and Zimmerman (2001) conducted a study with high school basketballers that assessed their self-regulation skills. The purpose of this research was to test the cyclic model of SRL by comparing expert, non-expert and novice players free-throw shooting skills during self-directed practices. Forty-three players were assessed on their general shooting skill and then on their individual perception of goal setting, self-

efficacy, strategy choice, self-satisfaction, and attributions. The results indicate that expert shooters show stronger levels of self-regulation than non-experts, and the non-experts showed stronger levels of self-regulation than novices. More specifically, it was found that as expertise with basketball shooting increases, self-regulatory skills increase (Cleary & Zimmerman, 2001). Therefore, as athletes become more experienced in their sport, they will, in turn, be more likely to effectively use the forethought (goal setting, self-efficacy, strategy choice) and self-reflective (self-satisfaction and attributions) phases in the self-regulation cycle which enhances their performance. The results were among the first to show empirical evidence that more experienced athletes utilize self-regulatory processes as outlined by Zimmerman (2000), and a succeeding study in the college setting yielded analogous results (Cleary, Zimmerman, & Keating, 2006).

A similar study in a different performance environment was conducted to assess the applicability of the SRL cycle in volleyball serving. The purpose of this study was to evaluate expert, non-expert and novice college athletes on their self-regulatory skills when learning and performing serving tasks. This study extended Cleary and Zimmerman's (2001) study by including planning, adaptation, self-evaluation, and self-monitoring to the study variables, which are additional components of the SRL cycle. Statistically significant differences between novice, non-experts, and expert volleyball players were found in their serving skills and self-regulatory processes (Kitsantas & Zimmerman, 2002). A staggering result revealed that 90% of the variance in volleyball serving performance was attributable to the self-regulation processes assessed in the study.

Mechanisms of self-regulation in sport learning and performance. Crews, Lochbaum, and Karoly (2001) gathered and synthesized 34 published articles on self-regulation spanning over a decade of research in sport and exercise psychology. The findings yielded seven mechanisms of self-regulation from four context areas in kinesiology: physical activity, exercise, skill acquisition, and sport. The hypothesized mechanisms from the analysis include awareness, cognitive-imaginal, goal-centered, instrumental competence, intrinsic motivation, planning and problem-solving, and self-reactions. See Table 3 for a list of the mechanisms and the components attached to the mechanism.

Table 3
List of Mechanisms and Mechanism Components for Self-Regulation in Physical Activity, Exercise, Skill Acquisition, and Sport

Mechanisms	Components of the mechanism
Awareness	1. Self-monitoring
	2. Self-observation
	3. Task/ situation awareness
Cognitive-imaginal	1. Attentional focus
	2. Visualization/ imagery
	3. Self-talk
	4. Cueing
Goal-centered	1. Formation

	2. Alignment
	3. Value
	4. Commitment
Instrumental competence	1. Physical capabilities
	2. Sensory capabilities
	3. Discomfort tolerance
Intrinsic motivation	1. Goal-directed autonomy
	2. Goal-directed competence
	3. Goal-directed relatedness
Planning/ problem-solving	1. Solution-making
	2. Problem-identification
	3. Planning
Self-reactions	1. Social comparison
	2. Attributions
Self-efficacy	1. Performance accomplishments
	2. Vicarious experience
	3. Verbal persuasion
	4. Physiological states

The majority of the studies focused on awareness, which include self-monitoring, self-observation, and keeping deliberate awareness toward variables relative to the task at

hand or situational variables. Consistent with the self-control processes within the performance phase of the Zimmerman (2000) cyclical model, cognitive-imaginal mechanisms encompass attentional focus, visualization/ imagery, and self-talk. The competencies identified that were goal-centered consisted of the formation, alignment, value, and commitment to sport-oriented goals. The mechanism of instrumental competence includes athletes' physical and sensory abilities for performance. Intrinsic motivation, as outlined by self-determination theory (Deci & Ryan, 1985; Ryan & Deci, 2000, 2002), is a mechanism that uses the basic psychological needs of autonomy, competence, and relatedness relative to their goals and effort for self-regulating performances. The mechanism of planning and problem-solving are focused on developing solutions, identifying problems, and planning accordingly based on the problem and solution to the problem. A primary component of the self-reaction mechanism is social comparison and attributions. Holistically, when using Zimmerman's (2000) cyclical model of SRL, the mechanisms of goal-centered, intrinsic motivation, and planning and problem-solving represent the forethought phase; awareness, cognitive-imaginal, and instrumental competence represent the performance phase; and the mechanisms highlighting self-reactions represent the reflection phase.

In addition to the seven mechanisms outlined above, self-efficacy has been added as a mechanism of self-regulation. Crews, Lochbaum, and Karoly (2001) combined self-reward with self-reactions and the majority of the literature regarding the self-reward component was self-efficacy. As self-efficacy is a theory of motivation, self-reward and self-reactions were separated due to Zimmerman's (2000) cyclical model identifying self-

efficacy as a motivational belief in the forethought phase. Self-efficacy refers individual's self-beliefs regarding their perception of ability when developing and implementing a plan of action for task-specific performance (Bandura, 1977a, 1986, 1997). The literature has indicated there are four primary sources of self-efficacy: performance accomplishments, vicarious experience, verbal persuasion, and physiological states (Bandura, 1977a, 1986; Feltz & Lirgg, 2001). As a primary component of social cognitive theory, and that SRL is heavily influenced by social cognitive theory, self-efficacy as a mechanism for self-regulation is an important addition to Crews, Lochbaum, and Karoly's (2001) list of mechanisms from the sport psychology literature.

SRL and motor learning and performance. The above studies were among the first to use the SRL cyclical model to assess sport performance. Holding a similar social cognitive perspective, many studies have assessed the positive role self-control plays in the acquisition of motor skills and subsequent motor performance (Janelle, Barba, Frehlich, Tennant, & Cauraugh, 1997; Janelle, Kim, & Singer, 1995; Wulf & Toole, 1999). Further, studies have found significant differences on motor learning transfer between groups who were given the opportunity to request self-controlled feedback compared to a yoked control group (Chiviacowsky & Wulf, 2002; Fairbrother, Laughlin, & Nguyen, 2012).

A more recent study that assessed motor skill acquisition (e.g., juggling performance) using social cognitive perspectives established a learning environment where participants were able to self-control the type of feedback they received throughout the learning process (Laughlin et al., 2015). This design allowed for participants to ask

for four different types of instructional feedback throughout their acquisition of juggling skills. The four types of feedback were (a) the reiteration of instruction on the basic juggling movement pattern, (b) a video demonstration of the juggling movement pattern, (c) feedback on knowledge of performance (i.e., technique and strategies), and (d) feedback on knowledge of results (i.e., duration and catches per attempt). The self-controlled environment provided the learners the autonomy to choose the type of feedback they desired throughout the acquisition of juggling proficiency. Laughlin et al. (2015) found that in the second half of the acquisition phase learners more regularly asked for knowledge of results and chose knowledge of results to confirm success or improvement, connect their technique to their performance, and to set new outcome goals/ support their confidence. Learners asked for instruction, video demonstration, and knowledge of performance when they are interested in understanding the general concept, desire visual information, and wanted to highlight undetected errors respectively, as well as obtain unique or specific information regarding all three forms of feedback. As for the participant's perception of good and bad trials, learners requested feedback regarding knowledge of performance after bad trails as compared to good trials and feedback regarding knowledge of results after good trails as compared to bad trails. Overall, the study provided evidence that it may be more effective to use knowledge of performance in earlier stages of acquisition and knowledge of results after the basic motor patterns for the skill have been developed.

A particularly interesting finding from Laughlin et al. (2015) was that they recorded participants' self-reported strategies for self-controlled behavior were their

ability to manage their attention during skill acquisition (e.g., attentional focus) and emulating the model during demonstration. These strategies are consistent with Zimmerman (2000) in that attentional focusing is a self-control sub-process within the performance phase of the SRL cyclical model, and that emulating a model is a necessary step in becoming more self-controlled during the acquisition of motor skills (Kitsantas, Zimmerman, & Cleary, 2000; Kolovelonis, Goudas, & Dermitzaki, 2010; Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012). Further, as discussed by Laughlin et al. (2015), an important implication from the study pertains to the role of feedback and its inherent relationship with self-regulation throughout the study. Self-controlled behaviors described in the study suggested that the study participants deliberately organized their learning relative to the goals and evaluation for future performance (Laughlin et al., 2015). This finding is consistent with the cyclical model of SRL. Therefore, providing learners the autonomy to self-control the type of feedback they receive improves the learning environment and facilitates the self-regulation of learning and performance.

Zimmerman (2000) specified that learners progress through sequential levels to attain self-regulatory performance consist of observation, emulation, self-control and self-regulation, and are developed through a dynamic interaction between the learner and the social environment (Schunk, 1999). From this perspective (Schunk & Zimmerman, 1997; Zimmerman & Schunk, 2004), as novices learn new skills they rely heavily on social interactions as they observe a model's demonstration of the skill and then emulate their behavior. Through the emulation process, a learner's skill improvement is influenced by social guidance and feedback. The transition from social-to-self occurs

when learners transition from observing and emulating to self-controlling and self-regulating their skill learning and performance. The effectiveness of the transition from observation and emulation to self-control and self-regulation is influenced by how the learner internalizes information from the social environment (Schunk, 1999). Once the feedback from the social environment is internalized, the learner can turn to internal sources of regulation influenced by personal standards of performance, self-reinforcement, and self-efficacy beliefs (Schunk & Zimmerman, 1997). In other words, as self-regulatory competence increases when self-regulation skills become internalized, the social feedback for self-regulation training can decrease in frequency as the learner more regularly engages in self-regulation. This inverse relationship mimics a style of feedback often used in sport called bandwidth feedback. Bandwidth feedback refers to when a coach monitors and tracks his or her athlete's motor performance to identify their likelihood of error, and more proficient athletes require less feedback as their skills are more developed as compared to an athlete who would otherwise be more prone to performance errors (Coker, 2015, 2018; Smith, Taylor, & Withers, 1997). For example, Chambers and Vickers (2006) conducted a study that assessed bandwidth feedback for swimming performance and found that a group of athletes who received bandwidth coaching saw greater improvement in swimming time as compared to a control group. Interestingly, among the first studies to assess the bandwidth style of feedback found that amplified error tolerance increased performance on a transfer test (Sherwood, 1988), therefore providing preliminary evidence that social-to-self training can be advantageous for transfer of self-regulation.

Self-regulation coaching for motor learning and performance. The aforementioned studies have outlined self-regulation and self-control strategies for both sport and motor learning and performance. The three primary components of self-regulation used to represent self-regulation coaching in the present study were goal setting, self-monitoring, and self-evaluation. These three SRL processes were selected because these components strongly represent the forethought, performance and self-reflection phases (Zimmerman, 2000).

First, representing the forethought phase, goal setting is consistently cited in definitions of self-regulation (Crews, Lochbaum, & Karoly, 2001; Kitsantas & Kavussanu, 2011; Pintrich, 2000; Zimmerman, 2000). Simply put, social cognitive self-regulation is a goal-directed strategic process. Kitsantas and Zimmerman (1997) found that novice learners perform best when they start their learning setting process goals that gradually shift to outcome goals. Shifting goals, goals that shift from process to outcome, was the goal setting format incorporated into the present study.

Second, and perhaps most importantly, self-monitoring represents the performance phase. Self-monitoring has roots linked back to the earlier behaviorist perspective of operant conditioning (Mace, Belfiore, & Hutchinson, 2001; Schunk, 2012), but has maintained its role in contemporary social cognitive perspectives in the SRL cyclical model (e.g., metacognitive self-monitoring). Building on prior motor learning studies, the use knowledge of performance and knowledge of results has been used for self-controlled behavior (Janelle et al., 1997; Laughlin et al., 2015). Research shows that novice learners tend to shift from requesting knowledge of performance to

knowledge of results as expertise increases throughout the process of acquiring juggling skills (Laughlin et al., 2015). Emulating Kitsantas and Zimmerman's (1997) shifting goals framework, self-regulation coaching in the present study supported self-monitoring by having participants monitor their goal attainment based on process goals taught in the study and monitor their performance based on outcome goals.

The third step of the three-phase cyclical model is self-reflection. The component for self-reflection in the proposed study is self-evaluation. Research has found that self-evaluations can increase the likelihood of achievement alongside goal setting and self-monitoring (Schunk & Ertmer, 1999). As goal setting and self-monitoring are important components of the SRL cycle for the forethought and performance phases, self-evaluation is a critical component for the reflection phase as participants will be self-reflecting on (a) process goals and knowledge of performance, and (b) outcome goals and knowledge of results. Self-evaluation was the final aspect of each practice episode throughout the process of learning, which led into the forethought phase of the next practice episode.

Theoretical Models of Skill Acquisition

The evaluation of novice learning and performance cannot be complete without an understanding of how motor and sport skills are acquired. Though we have peered into the literature on how sport and motor skills are acquired and how those components are connected with self-regulation, there is a large body of research that specifically outline fundamental learning progressions needed to acquire both mental and physical skills within the context of motor learning. The following sections identify five exemplar

models of learning that highlight the way motor and self-regulatory skills are acquired. See Table 4 for an overview of the five models.

Table 4
Multi-level Models of Skill Acquisition

Author(s)	Field of Study	Theoretical Model Phases				
		Level 1	Level 2	Level 3	Level 4	Level 5
Bernstein, 1967	Biomechanics	Freeze	Release & Reorganize	Optimization		
Fitts, 1964; Fitts & Posner, 1967	Motor Learning	Cognitive	Association	Autonomous		
Kirschenbaum, 1984	Clinical Psychology, Applied Sport Psychology	Problem Identification	Commitment	Execution	Management	Generalization
Singer, 1986	Applied Sport Psychology	Readying	Imaging	Focusing	Executing	Evaluating
Zimmerman, 2000	Educational Psychology	Observation	Emulation	Self-Control	Self-Regulation	

The first section outlines two models from the fields of biomechanics (Bernstein, 1967) and motor learning (Fitts & Posner, 1967), which are geared toward acquiring basic and applied motor skills respectively. The next section focuses on how self-regulation skills are developed, and this model was conceptualized from an educational psychology perspective (Zimmerman, 2000). The final section is primarily concerned with maintaining self-regulation skills for expert performers from the field of applied sport psychology. Considerations are made for Singer's (1986) mental skills approach model and Kirschenbaum's (1984) problem-solution model of self-regulation.

Acquiring basic motoric skills. From a biomechanical perspective, Bernstein (1967) conceptualized a three-level model outlining the ways in which researchers can solve the problem of motor acquisition by assessing the co-ordination and regulation of the *degrees of freedom* associated with the skilled movement. The first step is to *freeze* the degrees of freedom. In this stage, learners attempt to use as few movement patterns as possible so that task-related movements can be identified and then reduced. This leads into *releasing* and *reorganizing* the degrees of freedom. This stage of learning consists of the loosening up the motoric constraints used to freeze the degrees of freedom, which in turn increases the range for independent movement. In other words, after awareness for the skilled movement increases, the learner is more capable of releasing the degrees of freedom which are then reorganized into a new motor pattern. Finally, once motor control is achieved, learners can more readily exploit the motor system to explore more options for skilled movement. Skills are *optimized* and autonomous movement has been achieved.

Though this model is widely received by motor control theorists and biomechanists, well structured, and connected to research which maintains a high degree of internal validity for basic, laboratory type research designs, Bernstein's perspective does not incorporate the fundamental social factors that are associated with the complexity of human learning. Social cognitive theory (Bandura, 1986) indicates that knowledge can be acquired through both observing and interacting with others in social situations and through self-reflection on one's prior experiences. In particular, individual learners hold a degree of personal agency over their learning (Bandura, 2006) and their learning can be enhanced or diminished based on their perception of the social environment. However, the guidance from a proper model (e.g., teacher or coach) can considerably facilitate the learning process (Bandura, 1977b, 1986). Because of these fundamental tenants of social cognitive theory, alternative models of skill acquisition are needed to assess how self-regulation can be developed in a social environment.

Slightly more in line with social cognitive theory, Fitts and Posner (1967) identified a three-level model, however this model was conceptualized within the motor learning literature via information processing theories (i.e., cognitivism) rather biomechanics. This model of motor learning starts with a cognitive phase of learning that transitions to an associative phase which then progresses toward the individual being autonomous in the task or skill (Fitts & Posner, 1967). The cognitive phase of motor learning includes a detailed description of the activity/ task to be learned, as well as the initial acts of learning the movements linked to the motoric skill. The associative phase represents the largest duration of athletic practice and is focused on skill reinforcement

through the enhancement of one's proprioception. Finally, the autonomous phase represents a phase of learning where the athletic skill has been developed but the level of automaticity is reinforced by the athletes own awareness of the kinesthetic task being practiced. Generally speaking, a small amount of time is dedicated to the cognitive phase whereas the majority of the time learners will be in the associative or autonomous phases, however individuals can fluctuate back and forth between phases as needed for the process of learning (Anson, Elliott, & Davids, 2005). This model of skill acquisition is very useful to identify aspects of physical skills learning. The present study used Fitts and Posner's (1967) model of motor learning alongside Zimmerman's (2000) models of self-regulation as the theoretical basis for participants to learn the physical skill of juggling and how they can concurrently develop self-regulatory skills (See Figure 3 for a visual representation).

Developing self-regulation skills. The cyclical model of SRL is best characterized by a feedback loop between forethought, performance, and reflection. However, research using the cyclical model often make distinctions between novices, non-experts, and experts relative to their learning and performance of self-regulatory skills (Cleary & Zimmerman, 2001; Cleary, Zimmerman, & Keating, 2006; Kitsantas & Zimmerman, 2002). Is it that those athletes are inherently better self-regulators, or is self-regulation a skill that can be learned over time and enhanced through social interaction? Addressing this question, Zimmerman and Kitsantas (1996; 1997; Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary, 2000) conceptualized a sequence of phases that lead to the development of self-regulation. The multi-level model of self-

regulation illustrates a set of phases that help learners engage in self-regulatory skills which are learned alongside the practice of a task-specific motor skill. Specifically, the collective research on the multi-level model provides evidence toward self-regulation being a metacognitive skill that can be developed and learned when taught appropriately.

The four phases of the developmental model (i.e., multi-level model; Zimmerman, 2000) consists of (a) observation, (b) emulation, (c) self-control and (d) self-regulation. In the context of sport, these phases represent how athletes and coaches can engage in the process of learning together, and showcase that athletes observe and emulate their coach's instruction and demonstration of athletic skills during practice. Over time, as awareness and knowledge about the athletic task increases, the athlete will transition into a phase of relative kinesthetic control. This self-control phase represents how athletes independently build and strengthen their understanding/ ability to perform the athletic task. As an athlete persists in his or her sport learning, they then can develop an ability to regulate their thoughts, actions, motivation and behavior regarding the athletic task. As such, the final self-regulation phase is representative of when an athlete has learned how to properly regulate their learning (i.e., adaptively use forethought, performance, and reflection processes), which is more connected to the automatic performance of the specified sport task.

The studies produced by Zimmerman and Kitsantas (1996; 1997; Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary, 2000) on the multi-level model were conducted in the physical education classroom. The first of a series of four studies was designed to determine the role of goal setting and self-recording procedures in the

acquisition of dart throwing skills (Zimmerman & Kitsantas, 1996). It was hypothesized that using process goals will be associated with greater dart throwing performances and an increase in self-efficacy beliefs and intrinsic interest as components of the forethought phase. Further, it was thought that the use of self-recording procedures (a performance phase process) would not only enhance dart throwing performance and self-efficacy beliefs, but also increase self-reactive beliefs as a component of the reflection phase.

A sample of 50 high school girls participated in the study during physical education. A quasi-experimental design was used, and study participants were randomly assigned to one of five conditions: (a) use of a product goal and no self-recording; (b) use of a product goal and self-recording; (c) use of a process goal and no self-recording; (d) use of a process goal and self-recording; and (e) practice-only control group. Four measures were used in the study which consisted of one measure assessing dart-throwing performance, a self-efficacy scale, a self-reaction scale, and an intrinsic interest scale. Participants in the process-oriented goal conditions showed greater success in dart throwing abilities compared to the product goal conditions. Further, self-recording strategies directly enhanced throwing abilities more so than the non-recording conditions. A path analysis yielded a model with indirect effects between goal setting, dart throwing skills, and self-efficacy, as well as goal setting, dart throwing skills, and self-reactions. The model also found indirect effects between self-recording, dart throwing skills, and self-efficacy, and self-recording, dart throwing skills, and self-reactions. A direct effect was found between self-recording and both self-efficacy and self-reactions.

The second study assessed the role of process and outcome goals during dart throwing learning and performance in the physical education classroom (Zimmerman & Kitsantas, 1997). Specifically, the purpose of this study was to home in on the role of goal setting, therefore this study added two new goal setting groups: shifting goals and transformed goals. A shifting goal is a goal that *shifted* from a process goal to an outcome goal through the learning process, and a transformed goal refers to a goal that is *transformed* from an outcome goal to process goals. Relative to performance, process goals yielded significant differences in dart throwing ability as compared to outcome goals. Further, shifting goals provided significant differences in throwing performance as compared to both the process goals and transformed goals (Zimmerman & Kitsantas, 1997). Due to the impact of shifting goals in this study, the present dissertation research adopted shifting goals and incorporated these goals into the experimental framework of the study.

The third study in the series directly applied the three phase SRL cycle to the acquisition of dart throwing skills with high school girls (Kitsantas & Zimmerman, 1998). The emphasis of the experiment was on the acquisition of motor skills as it pertains to key self-regulatory processes guided by both the cyclical model and multi-level model of SRL. Specifically, the researchers assessed the acquisition and performance of dart throwing skills based on the implementation of a strategic cycle using goal setting (fixed vs. shifting), strategy use (analytic vs. imaginal), and self-evaluation (recording vs. no recording). Results indicated self-efficacy beliefs, self-satisfaction, and intrinsic interest enhanced the skill acquisition process for dart throwing,

and that self-evaluative recording procedures were associated with significant increases in self-efficacy beliefs, self-satisfaction, and intrinsic interest (Kitsantas & Zimmerman, 1998).

The final study in the series assessed dart throwing learning and performance at the transition between the observation and emulation phases of the multi-level model (Kitsantas, Zimmerman, & Cleary, 2000). Specifically, researchers assessed the degree to which a coping model or a mastery model would help facilitate the learning of motoric skills. It was hypothesized that girls learning from a coping model would surpass girls who learned from a mastery model, and the girls learning from a mastery model would surpass girls learning from basic practice only. Results confirmed that the group with a mastery model performed statistically better than the control group. Moreover, the difference in dart throwing skill found as the coping model group was statistically different than the mastery model group (Kitsantas, Zimmerman, & Cleary, 2000). The result of Kitsantas, Zimmerman, and Cleary's (2000) study supported the over-arching theme that self-regulatory skills can be developed as learners' transition between observation, emulation, self-control, and self-regulation phases by specifically assessing goals in the observation and emulation phases.

The studies by Zimmerman and Kitsantas (1996; 1997; Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary, 2000) generally assessed the development of the self-regulation during motor skill acquisition. Since then, a group of researchers in Greece have strived to advance the research on the acquisition of self-regulatory skills in the physical education classroom and have emphasized its effectiveness as a self-

regulation intervention for motor learning (Goudas, Kolovelonis, & Dermitzaki, 2013; Kolovelonis & Goudas, 2013). Taking after a similar framework as Kitsantas, Zimmerman, and Cleary (2000), these studies found evidence for the transition between emulation to self-control levels of self-regulation (Kolovelonis, Goudas, & Dermitzaki, 2010; Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012). Another study incorporated the importance of instructional and motivational self-talk (Kolovelonis, Goudas, & Dermitzaki, 2011b). But most recently, their research has focused on the role of performance calibration and its connection between process goal setting with underestimation and performance goal setting with overestimation (Kolovelonis, Goudas, Dermitzaki, & Kitsantas, 2013).

As a key facet of the social cognitive perspective, the aforementioned research supports the important role of modeling (Bandura, 1977b, 1986) during the initial stages of motor learning and the subsequent development of self-regulation. Together, these studies highlight the role of coaching and instruction during the early stages of motor skill acquisition and the subsequent practice of athletic tasks from a social cognitive perspective. The general consensus is that as long as proper modeling is provided to help set specific goals and make a strategic plan, learners not only develop the motor skill being trained but also learns how to self-regulate their learning and performance during the evaluation of their motor proficiency.

The studies on the development of self-regulation impacted the conceptualization of this dissertation research. The studies provided initial evidence for a multi-level model of self-regulation (Kitsantas & Zimmerman, 1998; Zimmerman & Kitsantas, 1996, 1997),

and the findings have been reaffirmed using the same research design (Kolovelonis, Goudas, & Dermitzaki, 2010; Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012). Building upon the social cognitive nature of the developmental model, the general aim of this dissertation was to better understand what happens *after* an individual learns how to self-regulate (i.e., after the transition from observation, emulation, self-control and self-regulation). In other words, how does learned self-regulation transfer across performance environments?

Maintaining self-regulation skills. Though the above studies (guided by Zimmerman's perspective) have accumulated evidence toward the development of self-regulation skills, alternative models have been identified within the sport psychology literature. Two specific models have been created which use mental strategies to focus on self-paced tasks during learning and performance (Singer, 1986; Singer & Cauraugh, 1985) and the maintenance of self-regulation and evaluation of self-regulatory failure (Kirschenbaum, 1984).

First, Singer (1986) created what is now known as his global learning strategy for sport. This model of sport learning specifies that learners can formulate and organize effective mental strategies to help with the performance and execution of self-paced skills. Self-paced skills are skills that should be practiced as it would be in a competition (e.g., volleyball serve, golf swing). Singer's model consists of (a) readying, (b) imaging, (c) focusing, (d) executing, and ends with (e) evaluating. Research has indicated that using this learning strategy enhances the acquisition of motor skills (Singer, Flora, & Abourezk, 1989), and that five-step procedure would be favorable for a novice learner to

use (Singer, Lidor, & Cauraugh, 1993). In contrast, arguments have been made that Singer's five-level model discourages the role of self-monitoring and self-evaluation during the learning and performance of athletic tasks (Kitsantas & Zimmerman, 1998), as the model relies heavily on attentional focus strategies which augment a *non-awareness* viewpoint (Singer, Lidor, & Cauraugh, 1993). Further, though Singer uses language that is in line with mental skills training vocabulary (e.g., readying, imagining, focusing) from the field of sport psychology, this model does not specifically identify itself as a model for how athletes can learn to be more self-regulatory.

Second, Kirschenbaum (1984) created a problem-solution model for self-regulation in context of sport and emphasized the inherent synergy between self-regulation and sport psychology. This model consists of (a) identifying that problem exists, (b) becoming committed to changing the problem, (c) executing the actions needed for the change, (d) managing environmental factors associated with the change, and then (e) generalizing the changes across multiple settings. These phases of self-regulation in sport are modeled off how researchers in clinical psychology have attempted to broadly reduce complex relationships into a sequential process for self-controlled behavior (Kanfer & Karoly, 1972). After evaluating applied research in golf (Kirschenbaum & Bale, 1980) and bowling (Kirschenbaum, Ordman, Tomarken, & Holtzbauer, 1982), Kirschenbaum's framework represents a noteworthy addition to the sport psychology literature and since has been regularly cited as an effective model for applied sport psychologists to apply to their psychological skills training plans to help

athletes self-regulate during their athletic performances (Weinberg & Gould, 2015; Weinberg & Williams, 2015).

Though Kirschenbaum's (1984) model was informative for Zimmerman's (2000) model of SRL within physical education, Kirschenbaum's model appears to be designed as a model to maintain self-regulation for more experienced athletes rather than develop self-regulation for novices. Specifically, Zimmerman's model was conceptualized as a developmental model for how coaches and physical educators can teach athletes self-regulatory skills concurrent with acquiring task-specific physical skills. Kirschenbaum's model assumes that an athlete is already self-regulatory enough to know when a problem is impeding performance (phase one), understand how to persist to attain his or her self-directed goal (phase two), possesses the cognitive skills to execute the intended action (phase three), and manage their environment well enough to take consideration of the factors that could influence performance (phase four). Though both Zimmerman and Kirschenbaum models are theorized from different academic perspectives (e.g., educational psychology vs. clinical psychology), both models are consistent with self-regulation perspectives used in sport psychology research (Crews, Lochbaum, & Karoly, 2001).

Kirschenbaum (1984) supported his five-level model with four general principles for the relationship between sport psychology and self-regulation. Consistent with Kitsantas and Zimmerman's (1998) argument against Singer's model, Kirschenbaum's first principle states that self-monitoring is needed for self-regulation. After citing his own research (Kirschenbaum, 1976; Kirschenbaum & Tomarken, 1982), Kirschenbaum

(1984) said, “self-monitoring appears necessary, but not sufficient, to maintain effective self-regulation” (p. 163). This is a central point as self-monitoring is an important aspect to both the phases and levels of SRL (Zimmerman, 2000; Schunk & Usher, 2013), but is distinct from Zimmerman’s perspective as the statement inherently advocates a maintenance of self-regulation for athletes as compared to the development of SRL.

Similarly, Kirschenbaum’s second principle is relatively congruent with Zimmerman’s perspective, with the exception of one component. The second principle from Kirschenbaum indicates how individual differences and dispositions can influence how an athlete self-regulates by assuming there are salient personality traits associated with being a self-regulator. Coming from an interactional viewpoint, Kirschenbaum indicated how this principle is not exempt from the collaboration between the person and situation. However, Zimmerman’s perspective is built upon tenants of Bandura’s (1986) social cognitive theory (e.g., reciprocal causation). Reciprocal causation attends to how learning and development are contingent upon the interaction between the environment, person, and behavior (Bandura, 1989; Zimmerman & Schunk, 2003), which is important when a learner is observing and emulating demonstrations from a model to learn and perform a certain skill.

The third principle outlined by Kirschenbaum refers to the how self-regulation is influenced by how self-monitoring and expectations interact with task mastery. That is, the effectiveness of self-regulatory processes will vary based on the degree to which the physical skill being trained can be performed autonomously. For example, a novice tee-ball player – one with little mastery – will have a harder time self-regulating his or her

learning and performance as their experience with self-monitoring or awareness for outcome expectations is limited. This, in turn, would make it very difficult for the novice learner to self-identity whether there are problems that exist in either their throwing mechanics (e.g., pitching) or batting ability (e.g., hitting). On the other hand, a professional baseball or softball player – one who has reached a level of mastery – is likely to be more in tune with their learned way to self-monitor and self-regulate their performance relative to their ability to properly assess external cues. Identifying mastery as an important component that can enhance or diminish one's ability to properly self-regulate is an issue of skill development and skill acquisition. That is, the skill that is being performed has not been practiced enough for one to have autonomy over their physical actions. To that end, the novice learner will likely to be able to develop self-regulatory skill through Zimmerman's model rather Kirschenbaum's model.

The fourth principle of self-regulation from Kirschenbaum outlines that affective state (e.g., emotion, anxiety, attention) influence self-regulated performance relatively independently from outcomes associated with cognitive factors. Though Zimmerman perceived self-efficacy as a better predictor of performance as compared to a direct regulation of emotion (Panadero, 2017), he identified self-evaluation and self-reflection as strategies to regulate emotions for performance enhancement (Zimmerman, 2000). There is a degree similarity between Zimmerman and Kirschenbaum's perspectives on the fourth principle as it pertains to self-regulation in sport, however more research would be needed in order to further assess the role of affective states from Zimmerman's viewpoint for self-regulation in sport. Altogether, though the Zimmerman and

Kirschenbaum models are complimentary in many ways, three distinctions indicate that (a) Kirschenbaum's model is more associated with maintaining self-regulation, (b) does not incorporate reciprocal causation, and (c) the lack of mastery in Kirschenbaum's model will inhibit one's ability to self-regulate effectively. These discrepancies describe unfavorable tenants for a holistic development of self-regulatory skills.

Though we have discussed aspects of the first four phases and principles of Kirschenbaum's model, there is an essential aspect to the five-level that has value yet to be explored: generalizability. Generalization refers to the reoccurrence of a practiced behavior under various conditions where the trained behavior has not been performed (Stokes & Baer, 1977). Generalization requires resilience regarding both internal and external competition demands with highly sustained effort across long periods of time (Kirschenbaum, 1984), with noting that individual's often cannot maintain self-regulatory behavior change within the high demands of the setting and time frame (Kirschenbaum & Tomarken, 1982). The majority of research assessing generalization from this perspective has focused on the ways in which self-regulation has failed, therefore inhibiting generalized behavior change (Kirschenbaum, 1987). This is known as self-regulatory failure (Kirschenbaum, 1976; Kirschenbaum, & Karoly, 1977), and is "the process by which individuals fail to generalize desired behavior changes over time and across settings in the relative absence of immediate external constraints" (Kirschenbaum & Tomarken, 1982, p. 137). Kirschenbaum (1987) then highlighted the role of obsessive-compulsive self-regulation (Kirschenbaum & Tomarken, 1982) as the counter to self-

regulatory failure, a behavioral mechanism which allows for athletes to persist with generalizing their self-regulatory behaviors.

To sum up, Kirschenbaum's model of self-regulation is regularly sited in the sport psychology literature as self-regulation is an important goal for athletes (Weinberg & Gould, 2015; Weinberg & Williams, 2015). Kirschenbaum's model, however, functions under the premise that the mental skills for sport performance have been taught and the athlete has effectively learned the skills, thus able to use the cognitive strategies during performance. In merging Zimmerman's (2000) social cognitive developmental model of self-regulation with Kirschenbaum's (1984) cognitive model of self-regulation, a working model of self-regulation was created to represent the lifespan of skill acquisition from the early stages of learning to the later stages of automatic performance.

The working model of self-regulation for motor learning and sport performance. Holistically, the aforementioned literature on developing and maintaining self-regulation has been conceptualized into a holistic model that represents self-regulation for motor learning and sport performance. The working model of self-regulation for motor learning and sport performance can be viewed in Figure 4.

The working model represents the combination between Zimmerman's (i.e., observation, emulation, self-control, and self-regulation) and Kirschenbaum's (i.e., problem identification, commitment, execution, environmental management, and generalization) model of self-regulation. The model is split between the developmental aspects of Zimmerman's model as compared to Kirschenbaum's model which emphasizes how competitive athletes maintain their self-regulation before progressing to

self-regulatory failure. The figure indicates that self-regulation skills gradually increase over time and practice, and then start to plateau once the self-regulation and motor skills become automatized. The important addition to the working model outside of Zimmerman and Kirschenbaum's sequence is the addition of self-regulation transfer. Assessing the role of self-regulation transfer is the purpose of this dissertation research, and the study assessed how novices learn a complex motor task and the degree to which learned self-regulation transfers across performance environments. Even though Kirschenbaum's model fits well within the application of mental skills training and maintaining self-regulation, Zimmerman's model provides a better theoretical model that accounts for development of self-regulation alongside physical skill acquisition.

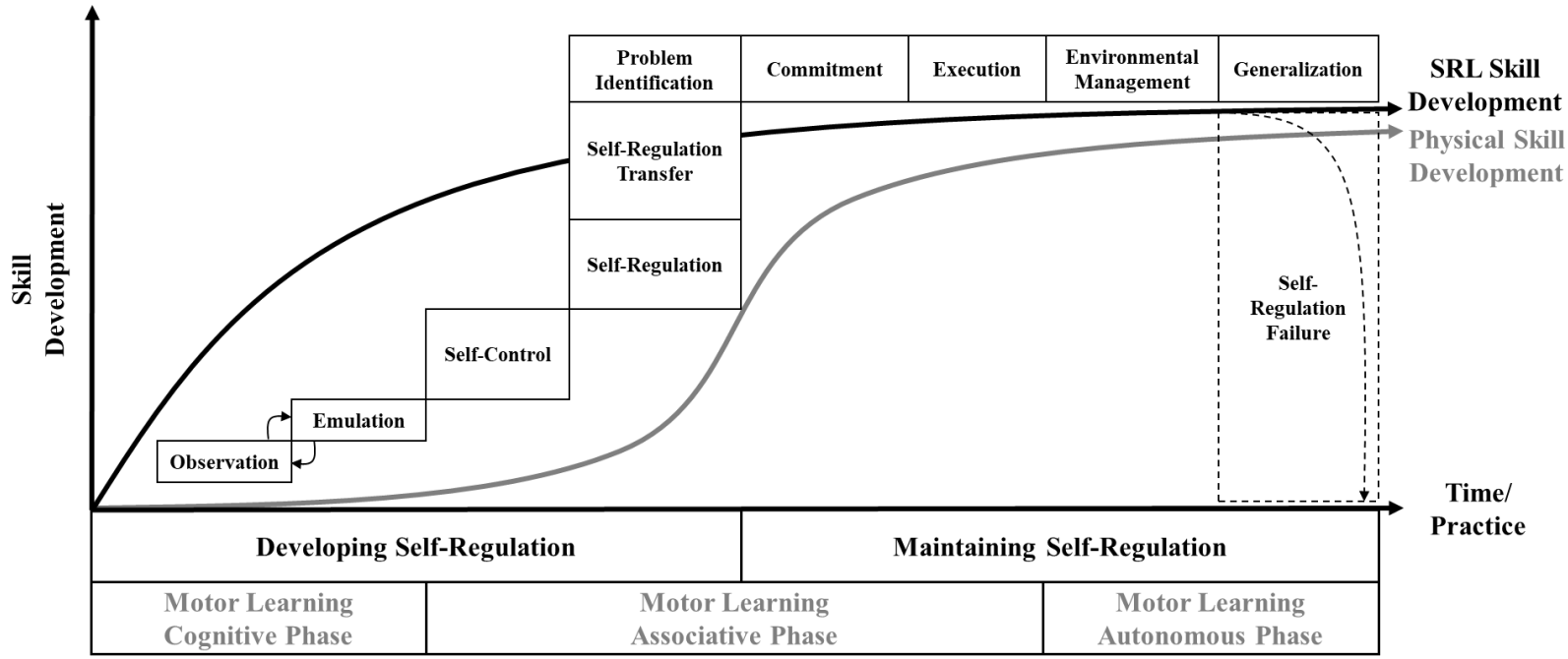

Figure 4. The working model of self-regulation for motor learning and performance.

Sport psychology professionals often use Kirschenbaum's phases as an exemplar model for self-regulation. Self-regulation has been identified as a key component for effective mental training (Weinberg & Williams, 2015) and has been noted as the *ultimate goal* for psychological skills training (PST; Weinberg & Gould, 2015). Specifically, Weinberg and Gould (2015) said:

> The ultimate goal of PST is to have athletes effectively function on their own without needing constant direction from a coach or sport psychologist. Thus, after PST an athlete should be able to self-regulate her internal functioning in the desired manner, and successfully adapt to changes in the world around her (p. 257).

This statement implies that Kirschenbaum's model is effective in helping athletes achieve self-regulation, however it is also acknowledged as a model to use *after* the athlete has been trained to use psychological skills such as goal setting, imagery, self-talk, attentional focus, and anxiety management. This point provides further evidence of Kirschenbaum's model as a maintenance of self-regulation rather development of self-regulation. When teaching self-regulatory skills through physical skills training, going through the observation, emulation, self-control to self-regulation phases is more interrelated with the learning of motor skills as these phases are analogous to the cognitive, associative, and autonomous phases of motor learning (Fitts & Posner, 1967).

The transfer of self-regulation should not be confused with Kirschenbaum's fifth phase of generalization. Generalization pertains to a broader transfer of self-regulation outside the common structure of the practiced skill; this viewpoint comes from the study

of self-regulation failure, and is synonymous to a far, negative transfer. The present study distinguishes transfer as narrower to the learned skill which then transfers to similar but different motor performance environments (i.e., transfer as near and positive). Further, this conceptualization of transfer is assumed to be associated with the development of self-regulation, whereas generalization is interrelated with maintaining self-regulation after has already been developed.

Types of Transfer

One of the most consistent problems with assessing, evaluating, and empirically studying of the transfer of knowledge is that the phenomenon is too broad to generalize across topics, subjects, and skills. Subsequently, research is often focused on specific tasks relative to the topic of interest of researchers and policy makers. This section first identifies aspects of cognitive transfer that build the foundation for why transfer is important to empirically study. The next three sections delve deeper into perceptual-motor transfer, training transfer, and strategy transfer. These sections highlight pertinent literature that lead to the assessment of transfer and self-regulatory processes. The following section offers an operational definition of self-regulation transfer for the present study. Finally, transfer studies regarding the acquisition of juggling skills are explored.

Cognitive transfer. The debate on what transfer is and how learning and skills can transfer across contexts is a long-standing discussion that spans many fields of psychology (e.g., cognitive, developmental, educational, experimental) and a century of research (Barnett & Ceci, 2002; Marton, 2006). This conversation between professionals

in the field primarily concerns the transfer of cognitive learning, knowledge, skills, or conceptual understandings of academic material. Cognitive transfer refers to how knowledge and conceptual understandings acquired from a process of learning can be applied other tasks and situations different from the original learning context (Barnett & Ceci, 2002; Nokes, 2009; Salomon & Perkins, 1989). Transfer is most often classified as either near or far. Near transfer is identified as a transfer of cognitive skills and/or knowledge to a similar task or context, whereas far transfer is when transfer occurs to tasks and contexts dissimilar to that of where the skills or knowledge was learned (Nokes-Malach & Mestre, 2013). More emphasis is often put toward research on far transfer as it is of more interest for educational practitioners and policymakers (Barnett & Ceci, 2002).

An early model of cognitive transfer is known as the schema theory of transfer (Royer, 1979). This conceptualization of transfer describes two main components of transfer: general vs. specific. The first step is to develop general schema during learning for the content being learned. The theory holds a hierarchical structure where a general schema is the foundation for more specific schemata to build upon. Specific schemata are subsequently the procedures and strategies that are influenced by the already known general schema. Royer (1979) highlighted:

> Schema theory suggests that during the learning process a particular schema (or schemata; one could have both a data structure and a procedural schema activated at the same time) is activated and serves as a structure for representing information and as a source of hypotheses about what kind of information to

> expect. One way to think of a schema is as a structure with a series of slots waiting to be filled by the incoming information. As long as the incoming information matches up to one of the slots in the schema, learning proceeds smoothly and easily. However, in the event that a bit of information is encountered which does not match up to a slot, or even worse, when information is encountered which does not match up to any of the available schema, learning becomes difficult and arduous (p.30).

Generally speaking, Royer's (1979) schema theory outlines how the learning process works and can lead to have general and specific knowledge that can help individuals transfer their learning across skills, concepts, and contexts. Since then, research has progressed to looking at the mechanisms influencing cognitive transfer.

Many transfer researchers use the term mechanisms to assess what is happening with the learning prior to and during the transfer process. Mechanisms are often viewed on a macro scale, therefore integrates not only cognitive processes, but also aspects of behavior, emotion, motivation, and social processing (Engle, 2012). In other words, transfer mechanisms contain different sets of illustrations (i.e., representations) and processes that assess how knowledge transfers from one context to the next (Nokes-Malach & Mestre, 2013). See Table 5 for how mechanisms fit into the overall structure of transfer research.

Table 5
Structure of Transfer Research

	Guiding Questions for Research	Citations
Mechanisms	*How* is transfer occurring?	Salomon & Perkins, 1989
	How much transfer?	Nokes, 2009
		Nokes-Malach & Mestre, 2013
Content	*What* is being transferred?	Salomon & Perkins, 1989
		Barnett & Ceci, 2002
Context	*When* is transfer happening?	Barnett & Ceci, 2002
	Where did/ does transfer happen?	Marton, 2006

In this way, mechanisms are treated as the underlying reasons for why transfer was able to occur for the individual. Contemporary cognitive transfer research has placed a new emphasis on learner's idiosyncratic learning perspectives (Goldstone & Day, 2012), which may change the role of the underpinnings of transfer for that particular individual.

Two mechanisms of transfer are associative and interpretive in nature (Bransford & Schwartz, 1999). As these are mechanisms found within an individual's own learning perspective, learners will interpret new learning situations based on their past knowledge and experience. That is, a learner's *preparation for future learning* is based on their way of knowing and how they *know with* the processes associated with how they know how to

build knowledge (Bransford & Schwartz, 1999; Broudy, 1977). The first mechanism refers to how learners associate their learning from already learned information. The second mechanism then refers to how learners have different ways to interpret new knowledge and know how to organize information in congruence with their knowledge base. To simplify, Nokes-Malach and Mestre (2013) said, "The classical approach is typically described as the transportation of knowledge elements or components that are learned from on situation or task and applied to another" (p. 185). See Table 6 to find a list of mechanisms and the components attached to the mechanism.

Table 6
List of Mechanisms and Mechanism Components for Cognitive Transfer

Mechanisms	Components of the mechanism
Association	1. Construction from prior knowledge
Interpretation	1. Categorization from prior knowledge
Low-road transfer	1. Varied practice
	2. Automization
High-road transfer	1. Mindful abstraction
	2. Forward-reaching abstraction
	3. Backward-reaching abstraction
Analogical transfer	1. Retrieval
	2. Mapping
	3. Inference

Knowledge compilation	1. Social feedback
	2. Declarative knowledge
Constraint violation	1. Generate
	2. Evaluate
	3. Revise
Identical rules	1. Production rules
	2. Use-specificity principle

The next set of mechanisms also work under the framework evaluating the *how* and *what* of transfer. In this evaluation, Salomon and Perkins (1989) distinguish low-road and high-road mechanisms of transfer. Low-road transfer contain aspects of varied practice and automization in that this type of transfer involves the transfer of knowledge and skills that have been deliberately practiced over time. In other words, the information is regularly available for transfer as the information does not require conscious attention to what information is needed for the transfer process. On the other hand, high-road transfer contains mindful abstractions which lead to conscious attention, reflective thinking, and a decontextualizing of the information needed for transfer. Further, high-road transfer involves two abstraction components: forward-reaching and backward-reaching. Forward-reaching high-road transfer uses a type of abstraction set up for the application of the information in the future. That is, a general conceptualization develops, and the application of the newly learned material is primed for a spontaneous use of the

knowledge later. Backward-reaching high-road transfer uses abstractions already committed to memory. The learner can therefore actively reach back to his or her prior knowledge and experience to initiate the transfer process.

Research from Nokes (2009; Nokes-Malach & Mestre, 2013) has assessed the integration of multiple mechanisms in the study of transfer. The multiple mechanism approach has been conceptually discussed by Day and Goldstone (2012), however Nokes (2009) elaborated, "If people have multiple transfer mechanisms then it is likely that they apply or engage those mechanisms adaptively, in response to the transfer conditions, i.e., what relevant knowledge they possess, how it is encoded, and the relation between the training and transfer problems" (p. 2). In other words, there are multiple mechanisms that can be assessed during the transfer process, and the combined evaluation of these mechanisms lends a new paradigmatic viewpoint to assessing the multifaceted study of cognitive transfer. The multiple mechanisms approach has been incorporated into specific research designs by using analogical transfer, knowledge compilation, and constraint validation (Nokes, 2009), and more recently added the component of identical rules to set the stage for sense-making during the process of transfer (Nokes-Malach & Mestre, 2013).

As seen in Nokes (2009), the three primary components of the multiple mechanisms approach are analogical transfer, knowledge compilation, and constraint validation. Analogical transfer is the transfer of declarative or procedural knowledge through (a) retrieving prior knowledge/ exemplars, (b) determining alignment (i.e., mapping) between the prior knowledge/ exemplars and problem that needs to be solved,

and (c) making a justifiable inference for the problem at hand (Chen, 2002; Gentner, 1983; Gentner, Holyoak, & Kokinov, 2001; Gick & Holyoak, 1980, 1983). Analogical transfer is a classic example of what has been researched in the transfer of cognitive knowledge, but also is connected to problem-solving transfer. Knowledge compilation is a mechanism that takes already learned declarative knowledge and transforms the prior information into procedural knowledge called production rules (Anderson, 1982, 1987), and is otherwise known as declarative-to-procedural transfer (Nokes-Malach & Mestre, 2013). In this sense, a learner will actively retrieve prior information connected to the problem at hand (i.e., compiling all the necessary features of what has been already learned) and then convert the information into useful pieces that can be used in a different situation. Constraint violation (Ohlsson, 1996; Ohlsson & Rees, 1991) is also known as a form of declarative-to-procedural transfer, but unlike knowledge compilation, this mechanism utilizes a generation-evaluation-revision cycle when reflecting on declarative knowledge and applying said knowledge to the problem at hand. All three mechanisms generally operate under the same premise of reflecting on prior learning, knowledge, and experience relative to the new situation, but differ in the way the information is processed and subsequently applied to the problem at hand. In a way, the multiple mechanisms approach indicates that for transfer to occur, knowledge and procedures must be deliberately practiced within the training phase of learning.

In testing the role of analogical transfer, knowledge compilation, and constraint violation as multiple mechanisms affecting the transfer process, Nokes (2009) conducted two laboratory-based experiments with one hundred and twenty-five (experiment one)

and forty-eight (experiment two) undergraduate students. The first experiment was constructed to determine between-group differences with the three experimental conditions using exemplars, tactics, and constraints, whereas the second experiment found within-group differences for participants who were trained for analogical transfer, knowledge compilation and constraint violation. Both experiments were compared to a control group with no training on the mechanisms. For both experiments, participants were trained and then tested on three transfer tasks.

Results were discussed based on accuracy performance and the time that it took to complete the tasks. Relative to accuracy performance, experiment one yielded group differences where the three experimental groups (i.e., trained in the three mechanisms separately) significantly outperformed the control group for the transfer problem one. These results provide evidence that transfer has occurred, however no significant differences in accuracy was found in problem two and three. Experiment two yielded an overall statistically significant group difference between the one experimental group (i.e., trained in the three mechanisms together) and the control group. More specifically, the experimental group significantly outperformed the control group across transfer problems one, two, and three. Time to complete the task did not reveal as many significant results as accuracy performance, however differences in timing was strong enough to show evidence that procedural knowledge was transferring from exemplars to the transfer tasks. For experiment one, the group trained to recognize analogical transfer with exemplars were significantly quicker in solving problems than the control group and the groups trained for tactics and constraints for transfer problem one. Further, the same

exemplar group outperformed the control group for transfer problems one and two with participants who scored 100% accuracy. Results for experiment two were consistent with experiment one, where the experimental group was significantly faster than the control group overall and for participants who scored 100% accuracy for transfer problem one.

Overall, Nokes (2009) provided empirical evidence that a general theory of transfer, by way of assessing multiple transfer mechanisms, is sustainable. More recently a model for transfer has indicated that sense-making is a processing tool which allows the learner to persist in the multiple mechanisms transfer cycle (Nokes-Malach & Mestre, 2013). Adding to the three mechanisms of analogical transfer, knowledge compilation, and constraint validation, the conceptualization of sense-making also uses identical rules as a mechanism of transfer. Identical rules consist of production rules (i.e., procedural knowledge) and the use-specificity principle when learners go from the learning process to transferring their learning across tasks and activities (Singley & Anderson, 1989). In other words, procedural knowledge from the production rules is distinct from declarative knowledge as used in analogical transfer and knowledge compilation.

Building upon the framework of the four multiple mechanisms, Nokes-Malach and Mestre's (2013) model of transfer incorporates evaluative and cognitive processes for transfer identified as sense-making and satisficing. This model integrates the multiple mechanisms into a hierarchical structure, going from more simplistic to complex in nature. Specifically, the hierarchy builds on the base of identical rules, and the learner sequentially transitions to analogizing, compiling knowledge, and then assessing the violations of constraints. An important aspect to the sense-making model of transfer is

that it incorporates goal-directed behavior into the transfer process. That is, different learners will employ the appropriate mechanism of transfer within the hierarchy based on their goals and experience with the new learning material. The role of goals is found within the operational definition of sense-making, where "sense-making [is] the act of determining whether the task goals have been accomplished to the satisfaction of the solver based on coordination of prior knowledge with information from the environment and the framing of the task" (Nokes-Malach & Mestre, 2013, p.185). Holistically, the process of sense-making is weaved throughout the process of transfer as learners situate themselves within the hierarchy of transfer mechanisms and use sense-making as a tool to recognize where they are at relative to their learning goals. Sense-making interacts reciprocally with satisficing (Simon, 1993). Consistent with the idea of the principle of parsimony (Epstein, 1984), satisficing is a decision-making process that identifies solutions to the problem that best confirms the learning goal for the individual. Worded differently, as a learner situates his or herself within the hierarchy of transfer mechanisms, the learner will persist in the transfer process via sense-making and become aware of the discrepancies of their prior knowledge by assessing the constraints within the learning environment through satisficing. This multiple mechanisms model of transfer uses sense-making and satisficing as the inherent cognitive processing tools that take into consideration the leaner's goals when pinpointing the specific mechanism or set of mechanisms to guide the transfer process.

To summarize, cognitive transfer is topic of study that has been intently discussed, studied, and researched throughout the 20th century. However, there has been a

contemporary resurgence of research on transfer (Engle, 2012; Goldstone & Day, 2012), and these new conceptualizations provide a bedrock of knowledge for the incorporation of transfer mechanisms within the proposed dissertation. Though this collective research is informative on the *how, what*, *when*, and *where* of transfer, the transfer of self-regulation for motor skill acquisition goes beyond the transfer of cognitive knowledge and skills and can be further informed by research conducted on the transfer of perceptual-motor skills.

Perceptual-motor transfer. Though many definitions of motor skill transfer exist, a series of papers (Allen, Fioratou, & McGeorge, 2011; Furley & Memmert, 2010, 2011) highlighted the role of cognitive adaptation, spatial working memory, and expertise within the sport domain to shed light on a few specific transfer hypotheses relative to motor performance. Furley and Memmert (2011) acknowledged research assessing perceptual-motor transfer as either being narrow or broad in nature. The narrow transfer hypothesis (Chabris & Simons, 2010) suggests that athletes with many years of experiences possess strong cognitive abilities, and the cognitive skills individuals' hold can transfer within the context of their sporting environment. That is, the specific processing abilities can transfer through different aspects of their specific sport, but do not enhance basic cognitive abilities across different contexts outside of their sport.

The broad transfer hypothesis (Furley & Memmert, 2011), on the other hand, functions under the premise that persistent practice in an activity simulating the environmental tasks develops basic cognitive abilities that can later transfer across broader contexts. The field of applied sport psychology operates strongly under the broad

transfer hypothesis in that the mental skills learned through PST and can transfer across numerous aspects of athlete's lives (e.g., life-skill transfer). Regarding life-skills transfer, Pierce, Gould, and Camiré (2016) developed a model which identified contextual factors for transfer (e.g., support, rewards, and opportunities for transfer, similarity between transfer contexts) and psychological processes (e.g., basic psychological needs satisfaction, engagement, confidence, automatic processing during skill learning) that can be enhanced from using the model. Recently, this model was used to develop strategies to help coaches enhance life-skills transfer for the athletes which they coach (Pierce, Kendellen, Camiré, & Gould, 2018).

A major critique on these hypothesis (broad and narrow) is that the collective research addressing the transfer hypotheses are assessing athletes with the highest degree of sport experience (i.e., expert athletes), and the classification schemes which characterizes what and who experts are is used differently among researchers in various fields (Furley & Memmert, 2011). Specifically, the transfer hypotheses are assessing athletes who have already had a significant amount of time invested for gaining experience in learning the specific sport skills. Though the broad and narrow hypotheses are helpful in understanding transfer in the sporting context, the current study is focused on how novices learn a new motor skill and the development and transfer of self-regulatory strategic thinking.

A motor transfer perspective consistent with the transfer of self-regulation is perceptual-motor skill transfer. Perceptual-motor skill transfer refers to how individuals learning motor skills can adapt their previously acquired perceptual-motor knowledge

and experiences to similar or dissimilar learning and performance contexts (Collard, Oboeuf, & Ahmaidi, 2007). The transfer of perceptual-motor skills generally functions under the premise that (a) human behavior is goal-directed and motivated by performance demands; (b) behavior evolves over time to improve the probably of success; (c) transfer occurs within performance and contributes to learning; (d) transfer depends on anticipatory mechanisms; and (e) transfer occurs across a continuum and may depend on several variables (Rosalie & Müller, 2012). Motor skill acquisition and the perceptual-motor transfer of skills is a main objective of this research regarding the experimental design and training of motor skills. However, more is needed to assess the transfer of self-regulation. Another body of literature regarding transfer is concerned with how training transfers across performance environments.

Training transfer. The transfer of physical and cognitive skills come in many shapes and sizes. As discussed, the transfer of learning and knowledge can be near or far, literal or figural, vertical or lateral, low or high road, and forward or backward reaching (Barnett & Ceci, 2002; Gagné, 1985; Royer, 1986; Salomon & Perkins, 1989; Schunk, 2012). Moving beyond the *what, where, when* and *how* of cognitive transfer, factors that are known to facilitate transfer are (a) having the acquired skill needed for transfer, (b) knowing when the transfer skill would be useful, (c) having the self-belief that the transfer skill is useful, (d) knowing how to apply the transfer skill to different contexts, and (e) having opportunities to practice the transfer skill (Schunk & Zimmerman, 1997). Schunk and Zimmerman (1997) identified these factors as important factors for transfer,

and they strongly urged self-regulation researchers to evaluate the role of transfer in the development and assessment of self-regulated learning.

One area of research that has assessed both transfer and self-regulation is the literature of training transfer. The early career work from an influential educational psychologist, Robert Mills Gagné, focused on aspects of teaching perceptual-motor tasks to soldiers and subsequently assessed how the training transferred across military performance environments when he served as the Director of Research in a laboratory for the Air Force (Ertmer, Driscoll, & Wager, 2003). The research conducted in the Air Force lab focused on how learning complex motor skills can be optimally learned and performed, as well as how the learned skills can be successfully transferred to successful performances on a transfer task. Though Gagné didn't explicitly study the relationship between transfer and self-regulation, he was among the first to set the stage for proper research designs that assess learning, performance, and transfer.

From a management training perspective, research has assessed the transfer of training and its association with self-regulation and self-control variables (Kehr, Bles, & Rosenstiel, 1999). Specifically, they were interested in finding the influence that self-regulation and self-control had on the transfer of training within a professional development geared toward low- and mid-level management within an insurance company. The four dependent variables (i.e., intention memory, emotion, intention realization, and criteria fulfillment) were assessed three months after the training. Three hypotheses were advanced relative to the four dependent variables: (a) self-regulation will be strongly related with intention memory as compared to self-control, (b) self-

regulation will be more associated with positive emotions and self-control will be more associated with negative emotions, and (c) self-regulation will be connected to increased success in the training transfer and self-control will inhibit successful training transfer. Hypothesis one separated participants into groups based on their self-report of self-regulation and self-control items on the Volitional Components Inventory (Kuhl & Fuhrmann, 1998). Hypothesis two and three used self-regulation and self-control as variables rather than a classification scheme for participants; that is, participants were not separated into different groups based on them being identified as self-regulators or self-controllers.

Support for hypothesis one and two was clear, and partial support for hypothesis three was found. Kehr, Bles, and Rosenstiel (1999) found that self-regulators used intentional memory significantly more times than the self-control group to determine hypothesis one. The results for hypothesis two yielded positive main effects for both self-regulation and self-control for emotions, however indicated that self-regulation had a larger and positive effect on emotions. Hypothesis three used intention realization and criteria fulfillment as indicators for success of training transfer. Partial support was found for this as significant for both self-regulation and self-control were found for intention realization, but only one significant finding for self-regulation and not self-control for criteria fulfillment. There was a positive association between intentional realization and self-regulation, and a negative association between intentional realization and self-control. Relative to criteria fulfillment, a significant and positive relationship was found

for self-regulators, but a negative and non-significant relationship was found for self-control.

A major critique of this study is that their theoretical framework of self-regulation is based on Kuhl's conceptualization of volitional control (Kuhl & Fuhrmann, 1998; Kuhl & Goschke, 1994). In this view, self-regulation and self-control are two different components of volitional control. Kehr, Bles, and Rosenstiel (1999) identified self-regulation as self-integrated volition, and these individuals tend to set work goals relative to their self-motivational beliefs and self-maintenance. Self-control, on the other hand, was identified as having self-disciplined volitional control, and the self-controllers are able to maintain their work goals while suppressing their needs when completing a task. This is in stark contrast to Zimmerman's (2000) conceptualization of self-regulation, as this perspective does not treat self-control and self-regulation as separate entities. Specifically, self-regulation is a learned, sequential process and develops from observation and emulation levels, to self-control, and subsequently self-regulation (Zimmerman, 2000).

Another primary limitation to the Kehr, Bles, and Rosenstiel (1999) study is how the authors identified successful and unsuccessful training transfer. They assessed the difference between self-regulation and self-control among intention memory, emotion, intention realization, and criteria fulfillment, and suggested that the combination between these five dependent variables is representative of training transfer. Though this is an interesting quantitative technique, transfer pertains to more than just five criteria. For example, having sufficient time with practicing a skill is needed to facilitate the

development of the skill as well as knowing when it will be useful as a transferable skill (Schunk & Zimmerman, 1997). The two-day training intervention used in the study, presumably, did not provide sufficient time for training and retention, let alone the transfer of this knowledge across different contexts in the workplace.

Strategy transfer. The transfer literature is not simply limited to transferring physical skills or conceptual knowledge (i.e., training), but can also be applied to strategy usage when acquiring academic knowledge (Phye, 1992). Going above and beyond content based knowledge, cognitive transfer, and perceptual-motor transfer, research has been conducted to assess the degree to which problem-solving skills can transfer across learning and performance environments (Phye, 1989, 1990).

In his first study assessing immediate and delayed transfer, Phye (1989) conducted two sequential experiments to determine the effect of advice prior to and feedback during the training of problem-solving skills for verbal analogies and syllogisms. Between the analogy, syllogism, and control conditions, analogy and syllogism contained a group of participants who received advice before training, a group who received feedback during training, and another group who received both advice before and feedback during training. One hundred and sixty nine student participated across the seven conditions. The results yielded a significant main effect, and both analogy training and syllogism training held significantly higher performances compared to the control group when they used their new problem-solving knowledge on the transfer task. There were no significant differences between practice conditions (e.g., advice, feedback, both advice and feedback). A replication study was conducted (i.e., experiment

two) to assess the non-significant findings between practice conditions, and another non-significant result was found between the conditions and their transfer performance scores. Results were assessed relative to the theoretical foundations of schema transfer (Royer, 1979).

Building on the findings and interpretation of immediate transfer (Phye, 1989; Royer, 1979), Phye (1990) utilized general and procedural schema approaches for the assessment of training transfer (analogical and syllogistic) for memory-based processing. Phye (1990) used the same methodological framework as Phye (1989) but changed the transfer task to be performed two days after the training process. One hundred and eighty-one subjects participated in the study. Extending the findings from Phye (1989), it was found that transfer performances for the analogical condition significantly outperformed both the syllogism and control conditions (Phye, 1990). Altogether, Phye's (1989, 1990) early research on problem-solving transfer provides transfer researchers evidence that the training conditions and training design facilitates the transfer of strategic problem-solving. In particular, it called for a push toward a training-for-transfer perspective to guide learners' transfer of strategic awareness (Phye, 1992).

During the early 90's, as empirical evidence for strategic transfer (i.e., problem-solving transfer) grew larger and was more commonly cited, strategy transfer became to be known as a variable to be assessed in a study as well as a tool that could be used to assess competence (Phye, 1992). More importantly, Phye (1992) offer a methodological suggestion for assessing transfer in the academic classroom. Specifically, he identifies research (i.e., Phye, 1989, 1990) which has integrated a training-for-transfer paradigm.

Fitting the structure of a classroom schedule, early in the week (e.g., Monday) should start the training process, and then performance should be tested in the middle of the week (e.g., Wednesday). As the retention test would be on a Wednesday, this provides adequate time to assess delayed transfer on Friday. This was found to be a successful mechanism within a research design to study strategic transfer (Phye, 1990, 1991; Phye & Sanders, 1992). The first implication from this collective research is that a research design geared toward assessing transfer should consist of three phases: (a) a phase dedicated to teaching, training, and skill acquisition, (b) a phase dedicated to assessing performance, retention, memory, or what was learned during the acquisition phase, and (c) a final phase that assesses transfer of learning or performance on a transfer task. The second implication from this research is that more successful transfer occurs when researchers are explicitly teaching toward transfer (Phye, 1992).

With the aim to assess elementary aged students on their mathematics problem-solving, Fuchs et al. (2003a) explicitly taught students strategic transfer strategies. The research design employed one control group using teacher-designed instruction and three experimental conditions using only solution instruction, partial solution plus transfer, and a full solution plus transfer. Solution focused instruction consists of consistent practice with practical examples, peer support/ involvement, and explicit instruction. In this district wide study (six schools), twenty-four teachers and 375 students took part in the study. Performance was recorded relative to students' conceptual underpinnings, computational application, problem-solving strategies, and communicative value.

Transfer was assessed relative to immediate transfer (e.g., Phye, 1989), near transfer, and far transfer.

Regarding immediate transfer, Fuchs et al. (2003a) found substantial group differences and improved performance for all three experimental conditions as compared to the control group. Group differences were found within the solution focused instruction conditions, where the solution focused group and full solution plus transfer group both significantly outperformed partial solution plus transfer group. Further, similar results were found for the near transfer measure. All experimental conditions outperformed the control group on the near transfer task. Within the experimental condition, significant differences were found where the full solution plus transfer group outperformed the solution focused group and partial solution plus transfer group, but a non-significant relationship was found between the partial solution group plus transfer and the solution focused group.

Some variability was found in the group differences between control and experimental conditions when it came to far transfer. Non-significant relationships were found between the control and solution focused group, solution focused group and partial solution plus transfer group, and partial solution plus transfer and full solution plus transfer. Significant group differences were found where both the partial solution plus transfer and full solution plus transfer outperformed the control group, and the full solution plus transfer group outperformed the solution focused group regarding far transfer. Overall, these results provide considerable empirical evidence that explicitly

teaching for transfer enhances immediate, near, and far transfer of mathematic problem solving (Fuchs et al., 2003a).

In a similarly designed study, Fuchs et al. (2003b) conducted a study that assessed elementary level students' SRL strategies and mathematics problem solving abilities while providing problem-solving transfer instruction. Six schools, twenty-four teachers, and 395 third grade students took participated in the study. Eight teachers were randomly assigned to a teacher designed instruction (i.e., control group), an experimental condition focused on solution plus transfer (i.e., full solution plus transfer; Fuchs et al., 2003a), and a final experimental condition focused on transfer plus SRL. The SRL processes incorporated in the transfer plus SRL condition were goal setting and self-assessment (i.e., self-monitoring), and the SRL processes assessed in the study were self-efficacy, goal orientation, self-monitoring, and effort.

The results of Fuchs et al. (2003b) found significant group differences in student performance for both transfer and SRL processes. The results showed group differences between high, average, and low achieving students for their performance on immediate, near, and far transfer tasks. The conditional main effect was significant for all measures of immediate, near, and far transfer. Across all achievement groups, the transfer plus SRL condition outperformed the solution plus transfer and control groups, and the solution plus transfer condition outperformed the control group on immediate transfer. Regarding near transfer, high achieving students showed significant differences the control, solution plus transfer, and transfer plus SRL group, where both transfer plus SRL and solution plus transfer more successfully transferred than the control group and the transfer plus

SRL more successfully transferred compared to the solution plus transfer group. For average and low achievers, both experimental conditions were statistically more significant than the control groups, but no statistical differences were found between transfer plus SRL and solution plus transfer. Far transfer found a significant group difference between the transfer plus SRL and control conditions, but no statistical significance between the control group and the solution plus transfer group as well as between the solution plus transfer group and transfer plus SRL group.

Results of Fuchs et al. (2003b) also found group differences between the conditions for SRL processes. Self-efficacy for learning, effort, goal-orientation and self-monitoring yielded similar results between the control group and the solution plus transfer group, and students in the transfer plus SRL were more likely to respond positively to the SRL questions as compared the both control and the solution plus transfer groups. The transfer plus SRL and solution plus transfer both reported strongly about their self-efficacy for transfer, especially as compared to the control group. Further, high and average achieving students were equally more likely to respond positively to the SRL prompts as compared to the control group.

Overall, the results provide evidence that adding SRL into the experimental design for teaching for transfer elicits higher performance on transfer tasks (i.e., immediate, near, and far) and SRL processes of self-efficacy for learning, self-efficacy for transferring learned knowledge, goal-orientation, self-monitoring, and effort. The study provided sufficient evidence that SRL makes a difference when assessing problem-solving transfer, however it is still unknown how teaching toward self-regulation and

teaching SRL processes can be connected with the transfer of self-regulation across performance environments.

Self-regulation transfer. It is not uncommon to see a research study assessing the degree to which perceptual-motor skills can transfer through performance environments, or how cognitive skills and knowledge transfers within and across learning environments. However, it is more uncommon to find research assessing the degree to which self-regulation skills transfer across differential tasks and contexts. Schunk and Zimmerman (1997) urged self-regulation theorists to advance research assessing how self-regulation skills can be transferred across learning and performance contexts. Attempts have been made to simultaneously examine the effectiveness of problem-solving transfer while assessing self-regulatory skills (Fuchs et al., 2003a; Fuchs et al., 2003b), and these studies are among the few that imply teaching SRL skills can assist in the transfer process (Schunk, 2012). Specifically, Fuchs et al. (2003b) identified how problem-solving transfer can be used when teaching SRL processes of goal setting and self-evaluation. The authors found that teaching toward problem-solving transfer positively influenced student learning, and that SRL enhanced students' overall performance. These findings showed support for how teaching for transfer can enhance SRL processing. However, these findings did not show how teaching for SRL can enhance the transfer of SRL across learning or performance environments.

First, Baum, Owen, and Oreck (1997) outlined how self-regulation processes developed in the performing arts learning environment can be subsequently transferred over to other academic domains. The authors assume instructional methods within well-

structured performing arts environments inherently support their students' development of self-regulation, and the learned self-regulation skills can be broadly applied to other academic areas of study (i.e., science, social-studies, mathematics). In particular, for the broad transfer of performing arts to academics to occur, relative similarity of the instructional condition must be established in order to facilitate the transfer of self-regulatory skills, but these two aspects of transfer work together synergistically (Baum, Owen, & Oreck, 1997). Though this conceptual article uses many unique anecdotal examples for convey the application of self-regulation transfer, a research study was not described. Further, the article identified many teaching components that relate to transfer and the development of self-regulation skills, but empirical evidence is needed to further assess the degree to which learned self-regulation can transfer across learning and performance environments.

Second, Barak, Hussein-Farraj, and Dori (2016) examined transfer and self-regulation skill training with undergraduate students who were provided differential learning opportunities (e.g., online vs. in-class settings) in an educational psychology course. The mixed methods study assumed that higher levels of self-regulation will be attained if the student holds more SRL processes, and self-regulatory students would then have the ability to demonstration both near and far transfer. To that end, the study did not focus as much on self-regulation transfer, but more so how cognitive transfer accompanies self-regulatory learners.

The self-regulatory strategies the online condition identified for meaningful learning that included planning, self-control, and evaluation. On the other hand, the on-

campus students identified barriers to meaningful learning for online students as they are more likely to have limited communication skills and decreased self-discipline. Relative to transfer, the study identified near transfer as knowledge learned and applications proximal to psychological principles, whereas far transfer was exemplified when course content was applied to contexts outside the psychology classroom; far transfer was coded into three applications representing personal aspects, family situation, and professional career. Between both online and on-campus groups, 34% of the transfer responses represented near transfer and 66% of the responses were relative to the students' own life, family, or anticipated career. Interestingly, the on-campus group was more likely to talk about acquiring knowledge (i.e., learning psychology content), whereas the online group more often talked about application of knowledge (i.e., applying psychology content). Moreover, the on-campus students were more likely to identify far transfer aspects relative to their personal life, and the online group applied their learned knowledge to their family and professional career. Though this study provided interesting findings – especially relative to pedagogical strategies for teaching in higher education – the study only looks at how self-regulation and transfer can be assessed together. In other words, the study does not investigate how self-regulation skills transfer across learning and performance environments.

Third, Llorens, Vidal-Abarca, and Cerdán (2016) applied an experimental design to assess the transfer of self-regulation skills for high school students' reading strategies in two sequential studies. Both experiments created learning environments with built-in feedback structures (i.e., *search&revisit* and *select&revisit*) which helped students

transfer their strategic decision-making relative to *when* and *what* to search as they self-regulate their learning. A control group was used for comparison with the two experimental conditions. All students went through a learning phase (phase one) and a performance phase (phase two; transfer task). The students in two experimental conditions first went through a lesson (phase one) where they were provided feedback about their decision-making and were provided time to assess their decision making after the training process. The control group went through the same lesson but did not receive feedback. This part of the design is a representation of Zimmerman's (2000) observation and emulation phases of the developmental model, as feedback was provided to the students to assess their strategic decision making. However, students were only encouraged to revisit the lesson after feedback, so it is unknown how many students were reflecting on and emulating the feedback. Doing so provided the students a degree of autonomy, and autonomy support has been noted to have a positive relationship with SRL in the classroom (Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009) as well as in the sport domain (Goffena, 2015). Though autonomy support may be ideal for SRL, research shows that emulating feedback is a crucial part of the learning process which help students develop their self-controlled practices (Kolovelonis, Goudas, & Dermitzaki, 2010; Kolovelonis, Goudas, Hassandra, & Dermitzaki, 2012). This highlights a critical limitation for measuring the transfer of self-regulation in study designed by Llorens, Vidal-Abarca, and Cerdán (2016). In particular, the second part of the design (phase two) assessed an alternative, longer text and the students did not receive feedback about their decision-making. This non-feedback phase was conceptualized by the authors to

represent a transfer phase and assessed their task-oriented self-regulatory decision-making (i.e., what and when searching strategies).

Experiment one compared the two experimental conditions (i.e., *search&revisit* & *select&revisit*) to a *placebo* control group. The *placebo* control group did not receive feedback in the training phase of the lesson. It was hypothesized for phase one that the *select&revisit* condition would more regularly revisit the text and use self-regulation strategies compared to the *search&revisit* condition, and subsequently outperform the *search&revisit* condition relative to their reading comprehension. Further, both *select&revisit* and *search&revisit* will show more self-regulatory decision-making as well as outperform the *placebo* control group during phase one. Phase two specifically assessed the frequency of *what* and *when* decisions. It was further hypothesized in phase two that both *what* and *when* decision-making strategies will be associated with stronger reading comprehension, and that the *select&revisit* will score higher than the *search&revisit* condition for *what* decision.

The performance results for experiment one suggests that there was a difference between the experimental conditions and control group during the training phase, but not with the transfer phase. Satisfying their hypothesis for reading compression during the training phase, the *select&revisit* performed significantly better than the *search&revisit* and *placebo* group, and the *search&revisit* outperformed the *placebo* group. However, the transfer phase performance assessment yielded non-significant main effects when comparing the *select&revisit*, *search&revisit*, and *placebo* groups relative to their performance.

Experiment two specifically assessed the *select&revisit* condition, *placebo* control group, but created a new *selection-task* condition. The *selection-task* condition was created because it was unknown if the *select&revisit* condition would increase performance due to the selection task component and feedback component. Therefore, the *selection-task* condition did not receive feedback in the initial training phase similar to that of the *placebo* control group. With results that are analogous to experiment one, experiment two found significant performance differences between the *select&revisit* condition compared to both the new *selection-task* condition and the *placebo* condition during the training phase. There was not a performance difference between *selection-task* and *placebo* conditions. Further, in the transfer phase, experiment two yielded a non-significant result between *select&revisit, selection-task,* and the *placebo* groups.

Llorens, Vidal-Abarca, and Cerdán (2016) identified a limitation for both experiment one and two was due to the shortness of the training intervention, therefore providing a justifiable reason for the transfer phase not showing differences in performance in each experiment. Although this limitation could be attributed to the performance differences in the transfer phase, a greater limitation that inherently impacted the study was in their research design; that is, the authors are labeling their assessment phases as training and transfer, but their transfer phase is not indicative of a true transfer test rather a retention test. They indicated transfer of strategy, but the transfer is between training and a retention test. The decision-making skills seemed to have transferred from training (lesson) to performance (assessment), but the study is not providing evidence of transfer across performance contexts. The study suggests that once

self-regulation is trained that it can be transferred into performance, however more research is needed to specifically assess self-regulation transfer (i.e., the transfer of self-regulation across performance environments). The present study builds upon Llorens, Vidal-Abarca, and Cerdán (2016) by assessing three distinct aspects of learning and performance as suggested by the strategy transfer literature (e.g., Phye, 1990, 1991; Phye & Sanders, 1992): (a) learning assessments (assessment of motor performance across training sessions; acquisition of motor proficiency), (b) performance assessment (assessment of motor performance after acquisition phase and strategic understanding of self-regulation), and (c) transfer assessment (assessment of motor performance on a transfer task and strategic understanding of self-regulation).

With the exception of anecdotal evidence with transferring self-regulation from the arts to other academic classrooms (Baum, Owen, & Oreck, 1997), the three studies highlighted in this section are not citing research on how SRL skills are learned alongside the learning of a specific task (Zimmerman, 2000). Though Baum, Owen, and Oreck (1997) mention Zimmerman's classic SRL article (Zimmerman, 1986), this non-empirical article does not provide evidence toward how SRL processes can broadly transfer across academic environments. Barak, Hussein-Farraj, and Dori (2016) empirically assessed student's SRL processing and transfer among undergraduate students and found empirical evidence for cognitive transfer, but they did not assess how self-regulation skills transferred across learning or performance environments. Finally, Llorens, Vidal-Abarca, and Cerdán (2016) assessed students' SRL strategies through a training phase and transfer phase. Performance (i.e., reading comprehension) differences

between the two SRL conditions and control were found during the training phase, however no performance differences were found within the transfer phase.

The three studies elaborated in this section had a specific purpose to assess both SRL and transfer. However, the transfer of cognitive knowledge and other skills is not equivalent to the transfer of learned self-regulation. Therefore, an operationalized definition of self-regulation transfer is warranted. The following section operationalizes self-regulation transfer situated in the motor skill learning context.

Operationalizing self-regulation transfer for motor skill acquisition. The transfer of perceptual-motor skills is closely related to the conceptualization of developing self-regulatory skills because self-regulation is goal-directed and process-focused. Further, as self-regulation is a task-specific process, it is important to highlight the relationship between the acquisition of motor skills (e.g., learning how to juggle) and how self-regulation skills (e.g., learning how to set goals) are acquired. Llorens et al. (2016) provided initial evidence to the transfer of self-regulation between the self-regulation training and self-regulation performance, but it is still unclear about what and how self-regulation transfers across performance environments (i.e., on a true transfer test). Building off the developmental model of SRL (Zimmerman, 2000), the present study assessed the development of physical skills and SRL skills, and the subsequent transfer of these newly learned skills. Self-regulation transfer was conceptualized as the strategic use of self-regulation (i.e., goal setting, self-monitoring and self-evaluation) as trained by self-regulation coaching. The assessment of this type of transfer was informed by motor learning research designs and is situated in the context of learning a novel

motor skill. Motor performance and the development of SRL were evaluated during a training phase (pre- and mid-tests), performance phase (post-test), and transfer phase (transfer test). In this sense, self-regulation transfer is the transfer of learned SRL across performance environments when performing a similar but new motor task.

Implications from the Literature

Because there are many theoretical orientations that self-regulation researchers use within the sport psychology literature (Crews, Lochbaum, & Karoly, 2001), it is important to build upon prior self-regulation research to identify context-specific models regarding the development of self-regulatory skills for motor learning and performance. Zimmerman's (2000) developmental model of self-regulation (i.e., observation, emulation, self-control, and self-regulation) outlines the ways in which novice learners can develop important aspects of self-regulation while learning a new skill. Kirschenbaum's (1984) problem-solution model of self-regulation (i.e., problem identification, commitment, execution, environmental management, and generalization) suggests a sequence of phases that aid the process of maintaining self-regulation. This process helps athletes manage their self-regulation by acknowledging when a problem exists and using self-monitoring strategies to extinguish the problem. Both Zimmerman and Kirschenbaum's models are effective self-regulation models, however Zimmerman emphasizes how self-regulation can be developed when learning a new task or skill whereas Kirschenbaum focuses on how self-regulators can generalize their self-regulation skills within new performance situations which enables them resist self-regulatory failure (Kirschenbaum & Tomarken, 1982). Though generalization has

important implications for the transition of self-regulatory skills across different performance conditions, the fifth step to Kirschenbaum's five-level model primarily has application for the generalization of self-regulation with athletes who hold a large degree of expertise in their sport. To that end, the generalizability of self-regulation from Kirschenbaum's clinical perspective does not illustrate how novices develop self-regulation and how self-regulatory skills subsequently transfer across learning and performance contexts.

A new conceptualization for how self-regulation transfers is needed to distinguish the differences between novices and experts, and the collective literature on the transfer of learning directly informs this new conceptualization. In particular, the research has indicated a strong application toward assessing the mechanisms that influence how transfer is occurring (See Table 6; Bransford & Schwartz, 1999; Nokes, 2009; Nokes-Malach & Mestre, 2013; Salomon & Perkins, 1989). The mechanisms that influence cognitive transfer (i.e., the transfer of declarative or procedural knowledge) may be useful when objectively analyzing how problem-solving strategies transfer across performance environments. The research on cognitive transfer and problem-solving transfer paved the way for the transfer of self-regulation, or the strategy of using goal setting, self-monitoring and self-evaluation as a process that enhances the learning of a motor skill. Motor learning researchers can directly evaluate the transfer of perceptual-motor skills by assessing the differences in performance of a specific motor task across performance environments or differential performance tasks, but the transfer of self-regulation is not as directly observable. Therefore, the assessment of SRL across

performance environments may be indicative of a new form of transfer. Therefore, the purpose of the present study was to examine the effectiveness of a self-regulation intervention for novice learners and understand the degree to which self-regulation coaching influences self-regulation transfer.

Research Questions from the Literature

The following research questions were inquired to determine the effectiveness of self-regulation coaching as a learning guide to develop self-regulation and the assessment of how self-regulation transfers across performance contexts:

1. Are there group differences in motor performance for post-intervention testing (i.e., post-test and transfer task) between the control and experimental conditions?
2. Are there group differences in self-regulatory strategic planning between the control and experimental conditions?
3. How do experimental group participants engage in task analysis (i.e., goal setting and strategic planning), strategic self-monitoring, self-judgements and self-evaluations (i.e., perceived performance and causal attribution), as well as perceive their self-regulatory skills to be transferring across performance changing environments?
    a. From a quantitative perspective, how did the experimental group members transfer their self-regulation skills (i.e., self-judgements, goals, and strategic self-monitoring) from the post-test to the transfer test?

b. From a qualitative perspective, what findings emerged from the participant's verbal responses that further illustrate adaptive self-regulation transfer?

First, it was expected to see the control group perform show a higher average CPA than the experimental group at the mid-test evaluation. Due to the presence of shifting goals (i.e., the shift from process to outcome goals after the mid-test evaluation), it was then hypothesized that the experimental group would show a large increase in juggling performance from the mid-test to the post-test evaluation. Second, it was hypothesized that the experimental group that received the self-regulation coaching will outperform the control group in juggling performance on both post-test and transfer test evaluations. These two hypotheses assume that teaching the motor task of juggling from a social cognitive perspective (i.e., self-regulation coaching) will enhance the learning process, and this enhancement will lead to observable differences in juggling performance. These hypotheses resemble prior work conducted focused on the development of self-regulation (e.g., Zimmerman & Kitsantas, 1997). These two main hypotheses are directed toward research question one.

Research question two was concerned with how participants engaged in strategies to aid their performance on the juggling task. It was generally expected that self-regulation coaching would increase the likelihood that the experimental group would engage in more adaptive forms of strategy usage.

Research question three expanded upon the prior studies in self-regulation development (i.e., Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary,

2000; Zimmerman & Kitsantas 1996; 1997) as it specifically inquired about how SRL (e.g., goal setting, strategic planning, strategic self-monitoring, and self-judgements) transfers across performance environments. It was predicted that the experimental group will identify and apply more self-regulation strategies than the control group. Within the experimental group, it was assumed that participants will engage in SRL between the post-test evaluation and the transfer test. Though a prediction for research question three was specified, emergent findings are expected to further indicate the degree to which self-regulation is transferring across performance environments.

Chapter Three: Methods

The general aim of this research is to determine the degree to which novice learners develop self-regulation skills as they develop proficiency performing a motor task. The specific aim of this research is to assess how participants transfer self-regulation across performance environments. The following sections outline aspects of how the research was conducted. First, the design of the dissertation will be discussed. Second, characteristics regarding the participants are outlined. Third, data collection instruments (i.e., variables and measures) are specified. Fourth, the framework of the intervention is specified. Fifth, the procedure of the study is outlined.

Research Design

This dissertation incorporated a pragmatic approach to research and used a framework best characterized as an iterative sequential mixed method research design (Teddlie & Tashakkori, 2009). A design sequence was created for this dissertation which incorporated a combination of quantitative and qualitative approaches that complement each other for the practical purpose of answering the question: *how does self-regulation transfer across performance environments*? Specifically, a qualitative cross-case analysis directly informed the construction of a randomized, experimental intervention, and the experiment was followed up by a qualitative exit-questionnaire. See Figure 5 for an illustration of the iterative sequential mixed method design used for this dissertation.

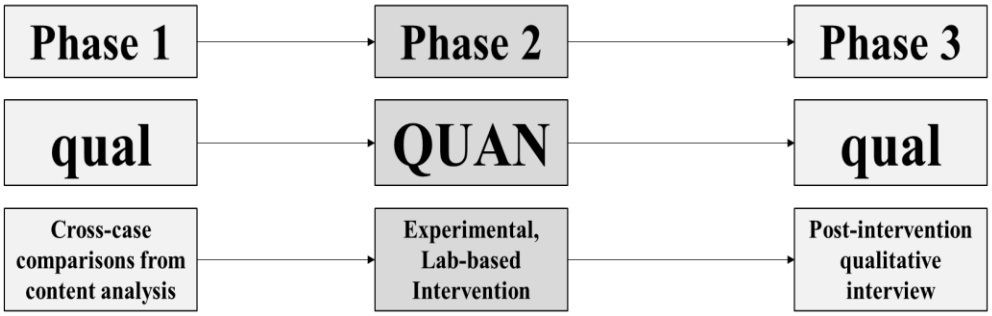

Figure 5. Iterative sequential mixed method design.

Morse (2003) established a notation scheme for mixed method designs that can be used to better understand the structure of Figure 5. Generally, mixed method designs use a combination between quantitative (i.e., "quan") and qualitative (i.e., "qual") at the same time (i.e., parallel; "+") or in a specified order (i.e., sequential; "→"). Often, mixed method studies will be positioned toward either "quan" or "qual" and a capitalization of one of the design notations emphasize a quantitatively driven project (i.e., "QUAN") or a qualitatively driven project (i.e., "QUAL"). The present study used an iterative sequential mixed method research design which is a complex design that uses one or more phases of data collection or analysis (Teddlie & Tashakkori, 2009). As seen in Figure 5 and as outlined by Morse's (2003) notation, this research design is quantitatively driven but also used supplemental data from two qualitative projects before and after an experimental learning intervention.

The mixed method sequence began with a qualitative content analysis that identified juggling performance goals and strategies from a cross-case content analysis from referred instructional videos for the cascade juggling task (i.e., phase one; "qual"). The information retrieved by the content analysis was directly incorporated into the experimental design of the study. The information derived from the content analysis highlighted important features of the juggling task and was used to make necessary changes in the learning intervention (i.e., phase two; "QUAN") in order to make it as effective as possible. Following the interview, a post-intervention qualitative interview was established to assess the effectiveness of the intervention (i.e., phase three; "qual"). The first section below outlines the main components derived from the content analysis with cross-case comparisons (i.e., "qual → QUAN" in Figure 5). The second section below describes the features of the subsequent explanatory sequential mixed method design (i.e., "QUAN → qual" in Figure 5).

Cross-case comparisons from content analysis. The content analysis (phase one) provided pertinent information regarding the physical skill learning of the three-ball cascade juggling task. The analysis discovered the basic, main components for coaching the juggling task to novice learners through a cross-case comparison between three instructional videos endorsed by the *International Jugglers' Association*. The cross-case comparison, as outlined by Yin (2002), focused on drawing out goals and strategies described by expert jugglers. Findings from the cross-case comparison were directly embedded into the study as the information informed the instructional development of the initial coaching lesson and self-regulation coaching. The components taught to the

participants in the learning intervention which outlined the basics (for the initial coaching lesson) and the specifics (for self-regulation coaching) came directly from the content analysis.

The instructional videos described the skill acquisition process is often taught in three steps: start with one ball practice, move to two ball practice, and then three ball practice. During the first part of the lesson, when using only one ball, it is best to instruct the performer to start in a relaxed, athletic stance and keep their head up. The throw should be in front of the body in a parabolic arc and the first few throws should go from the learners' dominant hand to their non-dominant hand. The arc height should be at eye level or above the head ranging approximately two to three feet above eye level. The main goal during this process is to consistently place the juggling balls within the preferred arc range relative to the individual learner. Learners should not throw the ball too far outside of the shoulders (i.e., from left-to-right, right-to-left) or too close to the body/ far from the body (i.e., forward-to-back, back-to-forth).

Once the learner is comfortable with the basics with one ball, the learner should practice with two balls. While looking at the arc of the first ball (thrown from the dominant hand), the learner should throw the second ball (from the non-dominant hand) once the first ball drops down from the highest point of the arc. During this part of the practice, it is important to give conscious attention to how hard or soft the ball is being thrown and caught. As one throws the second ball up into the air, the same hand will circle around the catch the dropping ball. See Table 7 for a list of *Do's* and *Don'ts* as outlined by the cross-case comparisons in the content analysis of referred instructional

videos. The findings from the cross-case content analysis were then directly implanted into the experimental design. Specifically, the content analysis helped create the initial coaching lesson and the specific components taught as self-regulation coaching (See the *intervention* section below for a full description).

Table 7
Generalizations Across Instructional Videos for Acquiring Juggling Proficiency

Juggling *Do's*	Juggling *Don'ts*
Stance with feet should-width apart	Don't squat or stand too straight up
Maintain relaxed shoulders at the start	Don't shrug the shoulders
Arms at 90° angle and hands in front of body	Don't throw ball outside shoulder length
Keep vision forward and looking up	Don't look at hands
Ball arc should be at the same consistent height (range from eye-level to three feet above head)	Don't throw too high or too low
Catch and release the balls using a circular motion with hand	Don't throw balls in a circle
Throws should be as controlled as possible	Don't flick or roll the ball in the throw
Catches should be soft	Don't grab and clutch the ball
Start with the dominant hand	
Start with an open hand position	

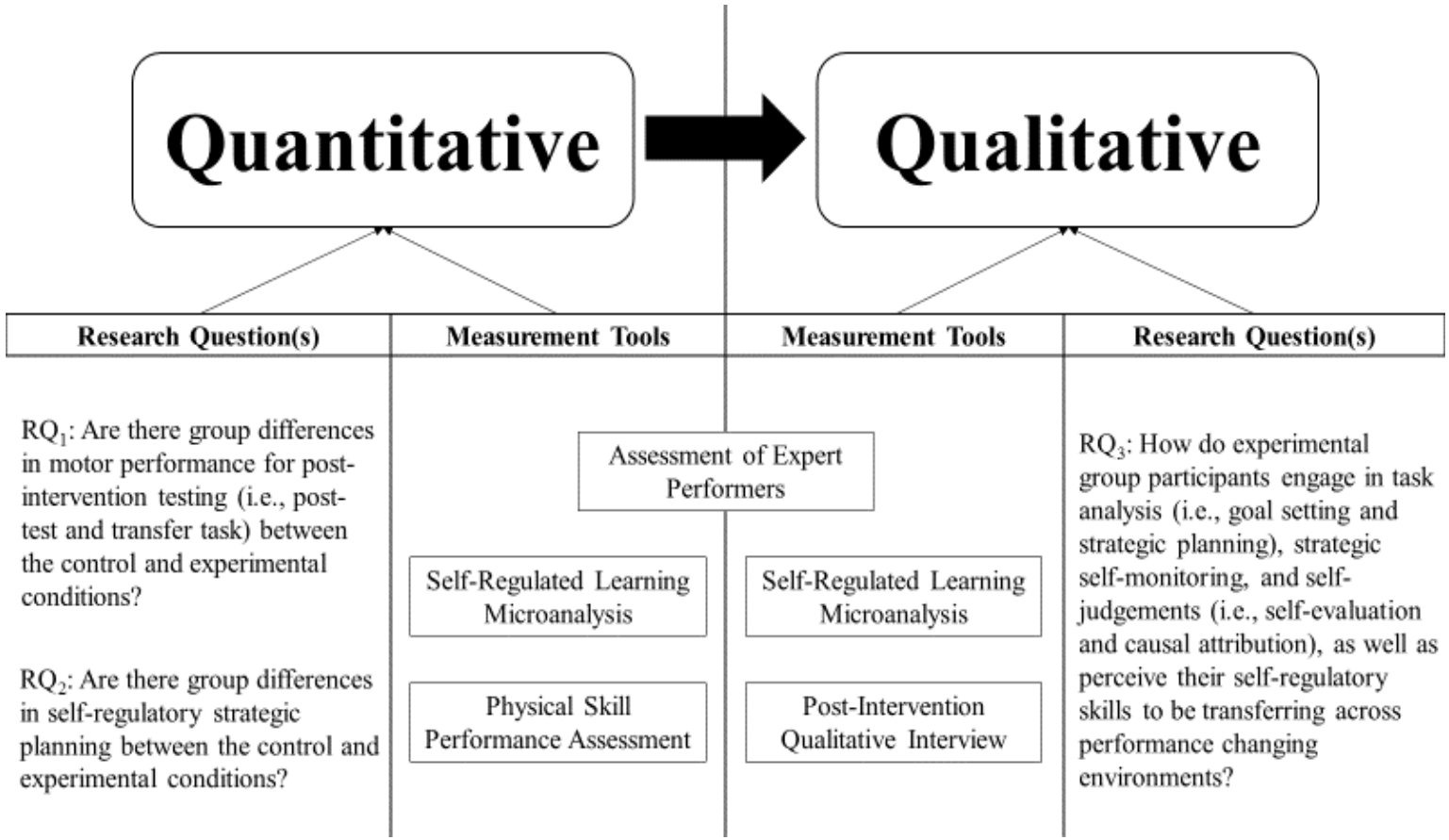

Figure 6. Explanatory sequential research design separated by research question and measurement tools.

Explanatory sequential design. Following the content analysis, the research design is best explained as an explanatory sequential mixed methods design (Teddlie & Tashakkori, 2009; Creswell & Plano-Clark, 2007). This component of the design is foundational to the assessment of the development and transfer of self-regulation for the performance of the cascade juggling task. This sequence of the study will transition from a quantitative, experimental intervention (phase two) to qualitative analyses and interpretation (phase three) for the purpose of answering the research questions. See Figure 6 to view the relationship between the design, research questions, and measurement instruments.

The quantitative portion comprised of a randomized experimental design for the purpose of determining group differences between a control and experimental groups. As described by Teddlie and Tashakkori (2009), this dissertation research quantitized qualitative responses within an SRL microanalytic interview protocol conducted during post-intervention performance testing (i.e., post-test and transfer test). The microanalytic protocol uses both quantitative and qualitative questions to highlight important aspects of self-regulation in real time (i.e., during performance; see *data collection instruments* for more detail). The qualitative portion of the design (i.e., post-intervention qualitative interview) then aimed to further explain key components or mechanisms of self-regulation transfer. Altogether, the explanatory sequential mixed methods design allows for the assessment and evaluation of both quantitative and qualitative data while being supported by a structured, experimental framework.

Sample

A total of 29 novice-level learners participated in the learning intervention for the three-ball cascade juggling task. These college-aged learners ranged from 18 to 27 (*M* = 20) and all identified as right-hand dominant. The sample included freshmen (*n* = 6), sophomores (*n* = 9), juniors (*n* = 10), seniors (*n* = 3), and one graduate student. Sixty-five percent of the participants were female (*n* = 19) and 34.5% male (*n* = 10). The sample self-identified ethnicities as White (*n* = 11; 37.9%), Black/ African American (*n* = 7; 24.1%), Asian/ Pacific Islander (*n* = 4; 13.8%), identified multiple ethnicities (*n* = 4; 13.8%), and Hispanic/ Latino (*n* = 3; 10.3%). Only three participants indicated they did not have any prior sport experience, but the other 90% of the sample averaged seven years of sport experience (*range* = 1 – 17 years). Most sport participants only played high school sports (*n* = 12), but others played recreational (*n* = 3), high school club (*n* = 3), or college club (*n* = 8). Of the sports played, 85% participants indicate their top sport was a team sport (e.g., basketball, soccer, volleyball) and 15% competed in individual sports (e.g., track and field, swimming and diving).

One expert-level and three moderate-level performers also took part in the study but did not undergo the learning intervention due to their increased skill level for the juggling task. The expert-level performer was a senior status (*age* = 22), left-handed male who identified with multiple ethnicities. The expert's primary sport was volleyball and had been playing competitively for eight years. He learned how to juggle from his father at age nine and described that he had not engaged in the juggling task much beyond his initial learning. The three moderate-level performers, one freshman (*age* = 18), one

sophomore (*age* = 19), and one senior (*age* = 22), were all right-handed and their main sports were soccer (*years of experience* = 13; high school level of competition), tennis (*years of experience* = 9; high school level of competition), and volleyball (*years of experience* = 12; college club level of competition). One of the moderate-level participants identified as middle eastern and the other two identified as white. Of the three, one was self-taught, one was taught by a friend, and the other learned components of juggling from a skill enhancement program but never directly learned the three-ball cascade juggling task.

Data Collection Instruments

All data collection instruments were approved by the Institutional Review Board (IRB). See Appendix A for the official approval letter. The instruments used for this dissertation research comprised of: (a) a demographic questionnaire, (b) a physical skill performance assessment, (c) a microanalytic interview protocol, and (b) a post-intervention qualitative interview. Each instrument is described below.

Demographic questionnaire. A demographic questionnaire was administered to gather the contextual information from all participants. See Appendix B to view the demographic questionnaire. Gender, ethnicity, age, and year in school were recorded. Further, prior sport experience (type of sport, level of sport, and number of years of sport experience) and prior task experience (i.e., juggling experience) were inquired.

Physical skill performance assessment. The physical skill learned was the three-ball cascade juggling task. The juggling performance consisted of the three-ball cascade juggling task, and the pre-, mid-, and post-test used standard juggling balls each weighing

75 grams with a diameter of 2.5 inches. The same three-ball cascade juggling task was performed during the transfer task but incorporated a large change in the performance environment as the transfer task incorporated a small sized (75g, 2.2 in), medium sized (155g, 2.8 in), and large sized (495g, 3.9 in) balls. CPA measures are represented by the average of three performance attempt during each performance evaluation. All participants were assessed on their juggling performance.

Juggling proficiency was measured by *catches per attempt* (CPA). Prior studies have used CPA as the primary outcome measure and proficiency is described as low (i.e., CPA $\leq$ 4), moderate (CPA range 5 – 19), and high (CPA $\geq$ 20; Laughlin et al., 2015; Bebko et al., 2003). CPA was measured at four different time points: pre-test, mid-test, post-test, and transfer test. See Appendix C to view the assessment used at each time point. CPA is reported as the average performance of three trials. CPA performance scores were also recorded at the last three attempts of each practice session where participants were told: "We are now at the last three practice attempts for this session. These are the attempts that count, so please do the best you can." These performance scores for all six practice sessions were recorded and averaged across phase one (i.e., the first three practice sessions) and phase two (i.e., the last three practice sessions) skill acquisition.

SRL microanalytic interview protocol. An SRL microanalytic interview protocol was used to assess context-specific self-regulation processes during juggling performance for the post-test and transfer performance evaluations. See Appendix D to view the microanalytic interview protocol. The microanalysis represents a mixed method

interview protocol that identifies and measures task-specific SRL, helps discover and investigate individual differences, examine multiple SRL processes in real time, and link the SRL phases together before, during, and after task performance (Cleary, 2011). SRL microanalytic designs have been used to assess SRL processes in basketball shooting (Cleary & Zimmerman, 2001; Cleary, Zimmerman, & Keating, 2006) and volleyball serving (Kitsantas & Zimmerman, 2002). The SRL microanalytic protocol is unique in that both open-ended and Likert-based questions are used directly within the context of the task being performed. A microanalysis for juggling performance was created to identify SRL components outlined by the temporal bounds of the forethought (i.e., before performance), performance (i.e., during performance), and reflection (i.e., after performance) phases.

Two main benefits can be extracted from the microanalytical protocol. First, quantitizing qualitative data can yield statistically significant results. SRL research in sport has successfully quantitized qualitative data derived from a microanalytical protocol and were able to make statistical inferences based on the converted data (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002; Cleary, Zimmerman, & Keating, 2006). Further, the quantitization of qualitative data has been linked to predictive validity (Cleary, 2011; Kitsantas & Zimmerman, 2002). Second, the microanalytic protocol can utilize expert perspectives to help orient the quantitization of qualitative data. Cleary (2011) recommends evaluating expert performers which subsequently provides a top-end anchor to assess skill development for the novice learners. The present dissertation collected data with one expert-level and three moderate-level jugglers, and these data

were incorporated into the analyses to better judge novice-level learners' development of self-regulation.

The following sections highlight the SRL variables derived from the microanalytic interview protocol. The SRL processes of goal setting, strategic planning, strategic self-monitoring, self-judgments, and self-evaluations (i.e., perceived performance and attributions) are described. These SRL processes were measured alongside the assessment of motor skill performance (i.e., juggling performance).

Goal setting. Categories of goals were developed post hoc based on three components: (a) verbatim responses from the novice participants, (b) prior research, and (c) the verbatim responses from the moderate-level and expert-level participants as indicators of high performance goal setting. Cleary and Zimmerman (2001) categorized goals as being outcome specific, outcome general, process specific, process general, focus specific, focus general, rhythm, other, or none, whereas Kitsantas and Zimmerman (2002) more generally categorized goals as either outcome, technique or process, other or none. Before the juggling performance trails, each participant answered: "Do you have a goal or goals in mind as you prepare for the juggling assessment?" Responses about goals were recorded. Goal responses were then coded into one of three categories: outcome goal(s), outcome and process goals, or process goal(s).

An example of an outcome goal is "to get a personal record" or "to get at least a CPA of 10." An example of a process goal is to "relax" or "put the ball in front." Goals stated as a combination of outcome and process (e.g., "to get a CPA of 10 and stay relaxed") were labeled as outcome and process. Goals were coded as either containing

only outcome goals as 1, a combination of outcome and process goals as 2, and only process goals as 3. Only the experimental group participants were assessed regarding goal setting.

Strategic planning. Strategic planning consisted of the strategies participants planned to use prior to performance in the juggling trials. Categories of strategies were developed post hoc based on (a) verbatim responses from the novice participants and (b) prior research, and the two were subsequently compared to (c) the verbatim responses from the moderate-level and expert-level participants. The responses from the moderate-level and expert-level participants were used as the top anchor response for strategy usage. Prior research studies have categorized strategies as technique (specific or general), concentration, both technique and concentration, visualization, focus (specific or general), distractions, rhythm, practice, don't know, and other (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). Before the juggling performance trials, participants were also asked: "Do you have a strategy or strategies you plan to use to help your performance on the juggling assessment?" Verbal responses were recorded. Strategies were categorized as visualization, focus, rhythm, relax, technique, position, or none.

An example of visualization is "imagining a figure-8." An example of focus is "look up" or "keep my eyes on the arc," whereas an example of technique would be "make sure I throw the ball to the arc" or "rotate my arms." An example of rhythm is when a participant uses counting as a strategy for performance. An example of relaxation is when a participant reminds himself or herself to relax or say, "keep relaxed shoulders."

An example of position is “keep arms in.” If a participant does not use a strategy, the planning was coded as none. Strategic planning was coded as “absent” or “present.” Both control and experimental group participants were assessed regarding strategic planning as the two groups were compared to each other on their plan for using a certain strategy (i.e., before performance).

Strategic self-monitoring. Strategic self-monitoring consisted of the strategies participants actually used during performance in the juggling trials. Categories of strategies for self-monitoring were created and coded exactly as strategic planning (i.e., post hoc, based on verbatim responses from novices and the expert participant, based on prior research). Because the expert performer was mostly using mental-skill oriented strategies for performance, the role of mental skills was incorporated into the comparison of planned strategies and the strategies monitored during performance. Generally, mental skills for skilled performance are imagery (i.e., visualization; Vealey & Greenleaf, 2015), attentional focus and energy management (i.e., focus and relaxation; Vealey, 2007). Rhythm was also categorized as mental-skill oriented due to the connection rhythm (i.e., counting) has with developing temporal coordination (Schmidt & Lee, 2011). Directly after the juggling performance trials, participants responded to the question: “Did you use any specific strategies to perform well on the juggling task?” Verbatim responses were recorded and the categorized.

Each category for self-monitoring referred to strategies outlined for strategic planning but grouped together relative to only mental-skill oriented, only physical-skill oriented, or a combination between mental- and physical-skill strategies. Mental-skill

strategies consisted of visualization, focus, rhythm, and relax, whereas physical-skill oriented were either technique or position. Self-monitored strategies were coded as either only mental-skill oriented (i.e., 1), mental-skill and physical-skill oriented (i.e., 2), and only physical-skill oriented (i.e., 3). Only the experimental group participants were assessed regarding strategic self-monitoring because the verbally stated strategy responses were compared between strategic planning (i.e., directly before the performance) and strategic self-monitoring (i.e., directly after performance).

Self-judgements. Categories of self-judgements were developed post hoc based on (a) verbatim responses from the novice participants and how they compared to (b) the verbatim responses from the moderate-level and expert-level participants, but also (c) prior literature. Specifically, learners who are developing self-regulation can judge their task performance relative to a model's demonstration (i.e., observation phase), to the social feedback given from the model (i.e., emulation phase), to internal and process-oriented standards of performance (i.e., self-control phase), and/ or external and outcome-oriented standards of performance (i.e., self-regulation phase; Schunk, 1999; Schunk & Zimmerman, 1997; Zimmerman, 2000). After the performance assessment, participants responded to: "Did you use any criteria or standards to judge how well you performed? If yes, what were they?" Exact responses were recorded.

Self-judgements were coded into categories labelled as outcome-oriented feedback, process-oriented feedback, or none. Outcome-oriented feedback refers to comparing performance to either their individual PR or their overall CPA performance. Process-oriented feedback refers to strategy usage or the feeling involved with juggling

(e.g., “how smooth it was”). If the participant did not indicate they used criteria or standards of performance, then the self-judgement was coded as none. Only the experimental group participants were assessed regarding self-judgements.

Self-evaluation. Two questions were asked regarding self-evaluations, one as an indication of perceived performance and other as an attribution for their perceived performance. The first question, “How well do you think you performed during the juggling task?” was asked and participants rated their response on a sliding scale ranging between zero and 10. The Likert-scale identified perceived performance as either very low (i.e., 0-1.5), low (i.e., 1.5-3.4), moderate (i.e., 3.5-6.5), high (i.e., 6.6-8.5), and very high (8.5-10). Participants physically moved a measurement applicator along the zero to 10 scale when asked to identify their level of perceived performance. Immediately following their answer on the sliding scale, participants answered the prompt: “[*Refer to perceived performance score above*] Why do you think you performed this way on the juggling task? In other words, why did you score yourself at [*refer to performance score*]?” Direct quotes were recorded.

Perceived performance and their attribution for their performance were analyzed together as a self-evaluation, and self-evaluations were broadly categorized based on juggling proficiency (i.e., low CPA ≤ 4, moderate CPA range 5 – 19, and high CPA ≥ 20; Bebko et al., 2003; Laughlin et al., 2015). In other words, participants were grouped based on their proficiency level, and after they were split between low, moderate, or high, self-evaluations (i.e., perceived performance and attribution for performance) and were interpreted qualitatively. Verbatim responses were categorized as strategy, ability,

improvement, practice, expectation, pressure, nervous, fatigue, and other. Only the experimental group participants were assessed regarding self-evaluations.

Post-intervention qualitative interview. Experimental group participants completed a qualitative interview at the conclusion of the transfer task performance evaluation. See Appendix E to view the interview protocol. An open-ended questionnaire was created in order to further assess how self-regulation coaching might be connected to or explain self-regulation transfer. Participants were asked general questions relative to self-regulation coaching and these types of questions refer to goal setting (e.g., "Do you feel like you can now successfully set goals when learning new forms of juggling? What is an example of a new goal you would set for yourself?"), self-monitoring (e.g., "What strategies, routines, or techniques would you now use when learning new forms of juggling?"), and self-evaluation (e.g., "How would you evaluate your performance if you were to learn a new form of juggling?"). Further, specific questions were asked regarding their perception for how self-regulation can be transferred across performance environments. Examples of these questions are, "Overall, do you think your skills for juggling transferred from your learning to the transfer task? What are those skills?" and "Do you think the skills you learned during the learning intervention will transfer to any other aspect of your life?" The post-intervention questions were interpreted qualitatively for emergent findings.

Procedures

Before recruitment, IRB approval was received. See Appendix A to view the official copy of the IRB approval letter. College-age participants were recruited.

Participants qualified for the study if they were (a) an undergraduate or graduate student, (b) over the age of 18, and (c) showed that they have little or no prior experience with the three-ball cascade juggling task. Students were recruited through on campus means of communication such as email listservs, student organization activities and classroom presentations. See Appendix F to view the official copy of the IRB approved recruitment script (i.e., IRBNet #: 1479477-1). The script was sent or read aloud for each recruitment activity. Individuals were incentivized to participate with a cash reward at the conclusion of all data collection procedures. Specifically, participants received $10 per day that they took part in the study (i.e., $10 for expert-level performers; $40 for novice-level participants). After recruitment, interested individuals set up an appointment via email. Upon arrival to the lab the participant read and signed the IRB informed consent form. See Appendix G to view the official copy of the IRB informed consent form. At the conclusion of the first meeting, in attempt to minimize participant bias, all participants were instructed to (a) not practice the juggling task outside their scheduled practice sessions, and (b) not actively talk about their participation or their performance in the study.

Pre-screening procedures. After consent was received, the participant underwent the pre-test evaluation. The pre-test consisted of three trials to get as many catches as possible (i.e., CPA) for the three-ball cascade juggling task. Participants who attained an average CPA equal to or less than four (i.e., novice status) qualified for the learning intervention. These novice learners were then randomly assigned to either control or experimental conditions (see *intervention procedures*). Participants who achieved an

average CPA above four bypassed the learning intervention and went directly into post-intervention procedures (see *expert performance procedures*). After the pre-test evaluation, all participants completed the same demographic questionnaire.

Intervention procedures. After random assignment and the completion of the demographic questionnaire, all intervention participants (i.e., control and experimental group participants) received an initial coaching lesson. See Appendix H to view the initial coaching lesson. The coaching lesson was standardized across all participants and lasted approximately 10-15 minutes. All participants underwent six training sessions consisting 150 attempts at the three-ball cascade juggling task for a total of 900 attempts throughout the entire learning process. The training sessions were divided up into two phases: phase one skill acquisition holding the first three practices and phase two skill acquisition holding the last three practices. The acquisition phases split the performance evaluations where phase one was between the pre- and mid-test, and phase two was between the mid- and post-test. The transfer test followed the post-test. See Table 8 for a general description of the intervention framework and procedure timeline.

Table 8
Intervention Design and Procedures Time Line

	Day 1	Day 2	Day 3	Day 4

Practice Sessions and Performance Evaluations	Evaluation: Pre-Test Practice: Session One	Practice: Session Two Practice: Session Three Evaluation: Mid-Test	Practice: Session Four Practice: Session Five	Practice: Session Six Evaluation: Post-Test Evaluation: Transfer Test
Approximate Time Block per Day	60 minutes	45-60 minutes	45-60 minutes	60 minutes

Note. Post-test and transfer test included the SRL microanalysis for experimental group participants.

The dissertation researcher observed (i.e., counted) and recorded all practice and evaluation attempts. Video recordings were collected for retrospective analysis. Video recordings were used as a tool to reexamine observation errors and to record verbal answers on the performance evaluations. Video recordings were retrieved using a Samsung HMX-F90 digital camcorder. The camcorder was located approximately four feet high on a tripod and was aimed at the frontal plane of the participants. The starting position was placed seven feet away from the camcorder and allowed for an approximate two feet radius to move around. Video recordings for the pre- and mid-test were the same

evaluations for both the control and experimental conditions. The control group then completed the performance evaluation for the post-test and transfer test in the same format as the pre- and mid-test. However, unlike the control group, the experimental group answered additional questions regarding SRL processes before and after the performance evaluation for both the post-test and transfer test (i.e., SRL microanalytic protocol). Before performance on the transfer test, all participants underwent a two-minute practice period before the performance trails to allow the opportunity to become familiar with the different sized and shaped balls. At the conclusion of the transfer test evaluation the control group exited the study, however the experimental group completed a post-intervention qualitative interview to further assess their engagement in SRL processes (as outlined by self-regulation coaching) and to evaluate their perspective regarding self-regulation transfer.

Expert performance procedures. Participants who bypassed the learning intervention were either moderate-level performers with zero to little prior experience with juggling who attained an average CPA between five and 19 or were expert-level performers who could attain an average CPA of 20 or more. After participants were characterized as moderate-level or higher, the participants verbally responded to the microanalytic questions to identify their engagement in SRL processes. Specifically, the moderate-level or higher participants answered the SRL microanalytic questions relative to their pre-test evaluation performance. The moderate-level or higher participants then underwent the same procedures for assessing their transfer task performance by taking two minutes of practice before and answering SRL microanalytic before and after the

three performance trials. Finally, the moderate-level or higher participants completed an adapted version of the post-intervention qualitative interview. The questions were generally the same, however the emphasis on what was learned in the intervention was taken out and questions referred to how they initially learned the three-ball cascade juggling task.

Intervention

The learning intervention consisted of six practice sessions broken down into two phases: phase one skill acquisition and phase two skill acquisition. The intervention was created to teach novice learners the task of juggling. Once novice status was discovered in a pre-test evaluation, participants were randomly placed into control or experimental conditions. The performance evaluation consisted three controlled attempts of making as many catches as possible. Phase one skill acquisition contained the first three practice sessions and fell between the pre- and mid-test evaluations. Phase two skill acquisition contained the final three practice sessions between the mid- and post-test evaluations. Each practice session consisted of 150 attempts at performing the three-ball cascade juggling task, and participants could take as long as they needed to complete the attempts. A total of 900 attempts were completed prior to post-intervention testing.

All novice-level participants (both control and experimental participants) received an initial coaching lesson at the conclusion of the pre-test evaluation and before the first practice session. See Appendix H to view the initial coaching lesson. Participants received juggling coaching in order to learn the basic components of the three-ball cascade juggling task. Juggling coaching involved verbal instruction and demonstration

from the dissertation researcher as well as time to physically practice for the participants. Instruction was standardized across all participants. The coaching session consisted of a 10 to 15-minute lesson focused on (a) starting stance, (b) one-ball throwing mechanics and practice, (c) two-ball throwing and catching and practice, and (d) initial three-ball practice juggling. Basic components taught in the initial coaching session were derived from the content analysis (see *cross-case comparisons in content analysis* section above). All participants were coached until they could successfully catch three balls in a row at the conclusion of the lesson.

Control group. The control group only received coaching during the initial juggling lesson. Thereafter, members of the control were instructed to practice the physical task of juggling during the practice sessions. No additional instructions regarding the aspects of juggling were provided during practice attempts, but all practice attempts were recorded. See Appendix I to view the *Juggling Skill Acquisition Packet* where information was recorded for participants randomly assigned to the control group. At the beginning of each session (i.e., practices sessions one through six) the dissertation researcher said, "The camera is now on and we are about to start session [indicate session one through six]. This session is another set of 150 practice attempts, we can stop mid-way at 75 for a short break if you'd like, but the last three are the ones that count so that is when I want to see you do the best you can do. So, until then, let's keep practicing and do the best you can." At the conclusion of the last throw (i.e., 150th practice attempt), the practice time was recorded, and the control group participant was finished with that practice session.

Experimental group. The experimental group also received coaching in the initial juggling lesson. Along with physical practice, the experimental condition received self-regulation coaching. See Appendix J to view the *Juggling Skill Acquisition Packet* for the randomly assigned experimental group. All general intervention components and the format of the juggling skill acquisition packet (i.e., prompts and scripts) are the same as the control group with the exception of self-regulation coaching. Self-regulation coaching is an instructional framework within the learning intervention that guided learners to consciously think about task analysis (goal setting and strategic planning), use self-monitoring strategies, and evaluate goal attainment and performance throughout the process of skill acquisition. See Table 9 for the overall framework of the intervention relative to self-regulation coaching.

Table 9
Intervention Framework for Self-Regulation Coaching

	Shifting Goals	Strategic Self-Monitoring	Self-Evaluation
Phase One Acquisition	Focus on Process Goals	Monitor Strategies for Process Goal Attainment	Evaluation of Performance & Process Goal Attainment

Phase Two Acquisition	Focus on Outcome Goals	Monitor Strategies for Outcome Goal Attainment	Evaluation of Performance & Outcome Goal Attainment

Note. The mid-test evaluation was positioned between phase one and phase two acquisition. The highest CPA recorded in the mid-test evaluation was used as the outcome goal starting in phase two acquisition.

Self-regulation coaching. Self-regulation coaching refers to the teaching of task-specific strategic skills during motor skill acquisition. Built upon the tenants of Zimmerman's (2000) developmental model of self-regulation (i.e., observation, emulation, self-control, self-regulation), the purpose of self-regulation coaching is to explicitly guide learners out of the emulation phase into the self-control and self-regulation phases. Primary features of self-regulation coaching within the intervention include shifting goals, strategic self-monitoring and self-evaluation.

The first main feature of self-regulation coaching refers to shifting goals. Shifting goals are goals that progressively shift from process to outcome as the learner gains experience with the learning task (Zimmerman & Kitsantas, 1997). During phase one skill acquisition, experimental group participants will be presented with process goals and strategies for goal attainment. As derived from the juggling instruction content analysis, three process goals embedding into phase one skill acquisition: Visual-Gaze (VG), Catch-

and-Release Patterning (CRP), and Stance for Control (SC). Specifically, VG was taught at the begging of practice session one, CRP taught before practice session two, and session three focused on SC. See Table 10 for goal definitions and strategic cues each process goal taught during phase one skill acquisition. The shift from process goals to outcome goals happened between phase one and phase two skill acquisition, directly following the mid-test evaluation. The highest performance score (i.e., CPA) recorded in the mid-test then became the first outcome goal each participant. Thereafter, as each participant progressed in their outcome goal attainment (i.e., received a new personal record; PR), the new personal record became the next goal. Once a new PR had been achieved, the observing researcher informed the participant that they had attained a new record.

Table 10
Process Goals, Definitions, and Strategic Cues used during Self-Regulation Coaching

	Goal Definition	Goal Strategic Cues
Visual Gaze	VG is a process goal that focuses on one's vision toward the arc of the ball flight (and not looking at the hands).	1. vision forward 2. look up 3. arc at eye-level 4. consistency of arc height

Catch-and-Release Patterning	CRP is a process goal that refers how the participant is releasing (i.e., "putting" the ball as compared to flicking or rolling) and catching (cushioning the ball as compared to grabbing the ball).	1. open hand position 2. circular motion of the hands 3. put the ball 4. cushion the ball
Stance for Control	SC is a process goal focuses on the timing of the release and the posture of the body.	1. shoulder-width stance 2. arms at 90° from elbow 3. relaxed shoulders 4. throwing the balls on the same plane

The second main feature of self-regulation coaching refers to strategic self-monitoring. Strategic self-monitoring was embedded into the learning intervention for each of the six practice sessions (i.e., 150 attempts), and experimental group participants monitored strategy usage before (i.e., before attempt 1; "What cues do you plan to use during the session?"), during (i.e., after attempt 75; "What cues have been the most

helpful so far in your learning?") and after (i.e., after attempt 150; "What cues were the most helpful during your learning for the entire session?") each session. During phase one skill acquisition, participants monitored strategy usage relative to four strategic cues taught for each process goal (see Table 10). Phase two skill acquisition monitored strategy usage relative to all three process goals, where the experimental group participant used the strategic cues best fit to attain their new PR (i.e., outcome goal). Research has shown that novice jugglers generally transition from requesting knowledge of performance to knowledge of results during skill acquisition (Laughlin et al., 2015). In a sense, strategic self-monitoring emulates shifting goals because as participants monitored strategy usage relative to knowledge of performance in phase one skill acquisition and monitored strategy usage relative to knowledge of results in phase two skill acquisition.

The final feature of self-regulation coaching refers to self-evaluation. At the conclusion of each practice session, participants completed a self-reflection worksheet. Prompts about their learning progress were answered at the conclusion of each practice session, and participants reflected on their goal attainment. Specifically, experimental group participants reflected on their process goal attainment during phase one skill acquisition and reflected on their outcome goal attainment during phase two skill acquisition. Participants recorded self-evaluations for overall goal and performance attainment, made attributions for their successes and failures, and identified how satisfied they were with their learning during each session.

Chapter Four: Results

The following research questions guided this dissertation focused on the development and transfer of SRL:

1. Are there group differences in motor performance for post-intervention testing (i.e., post-test and transfer task) between the control and experimental conditions?
2. Are there group differences in self-regulatory strategic planning between the control and experimental conditions?
3. How do experimental group participants engage in task analysis (i.e., goal setting and strategic planning), strategic self-monitoring, self-judgements and self-evaluations (i.e., perceived performance and causal attribution), as well as perceive their self-regulatory skills to be transferring across performance changing environments?
    a. From a quantitative perspective, how did the experimental group members transfer their self-regulation skills (i.e., self-judgements, goals, and strategic self-monitoring) from the post-test to the transfer test?
    b. From a qualitative perspective, what findings emerged from the participant's verbal responses that further illustrate adaptive self-regulation transfer?

Related to juggling performance, it was hypothesized that the experimental group participants who received self-regulation coaching would outperform the control group participants at the conclusion of the learning intervention. However, due to the presence of shifting goals in the experimental condition, stronger performances were expected from the control group at the mid-test evaluation. Once the goals shift from process to outcome after the mid-test evaluation, an increase in performance during phase two skill acquisition was expected for the experimental group. Lastly, it was expected that the experimental group will outperform the control group on the transfer task evaluation. Similar to prior research (Laughlin et al., 2015), it was expected that the average CPA for the transfer task evaluation would be lower than the post-test evaluation score. Research question one was analyzed by conducting a 2 x 4 repeated measures analysis of variance (ANOVA) to determine between group differences between the control and experimental groups, as well as within group differences on the juggling performance assessments (i.e., pre-, mid-, post-, and transfer tests).

Related to strategies for performance, it was expected that the experimental group would engage in more adaptive forms of strategic planning. Research question two was analyzed by conducting a series of chi-square tests for independence. Chi-square tests were performed to determine between group differences in the control and experimental participants for strategy usage prior to the mid- and post-test evaluations.

Finally, a combination of quantitative and qualitative procedures were used to answer research question three. Generally, it was expected that experimental group participants would engage in SRL for both the post-test and transfer test evaluations, but

a drop in frequency may be observed during the transfer task (e.g., similar to the expected drop in CPA performance on the transfer task evaluation). Quantitatively, a series of chi-square test for independence were performed to assess the difference between post-test and transfer test performances regarding the experimental group's self-judgements, goals, and strategic self-monitoring (to satisfy research question 3.a). However, self-evaluations (i.e., perceived performance and attributions) and other direct quotes regarding the self-regulation transfer from the post-intervention interview were analyzed qualitatively for emergent findings (to satisfy research question 3.b).

Differences between Control and Experimental Groups

The purpose of this section is to assess the differences between the control and experimental groups relative to juggling performance and strategic planning (research question one and two). The first section describes the differences between the two groups regarding participants' performance evaluation and their performance for the three-ball cascade juggling task throughout the learning intervention (research question one). The second section describes the differences between the two groups regarding participants' plan to use strategies to help aid their performance during performance evaluations (research question two).

Group differences in motor performance. A primary aim for this dissertation was to discover if there are group differences in motor performance for post-intervention testing (i.e., post-test and transfer task) between the control and experimental conditions (research question one). See Figure 7 to view the comparison between control and experimental groups across the pre-, mid-, post-, and transfer evaluation time points.

Descriptive statistics and expected trends regarding CPA are outlined below. As expected, all participants started the study with low performance (*M* = 0.72, *SD* = 0.86). Differences can be observed between the control (*M* = 10.4, *SD* = 14.67, *range* = 1.33 – 55.33) and experimental (*M* = 3.98, *SD* = 3.46, *range* = 1 – 13.67) groups as early as the mid-test evaluation. Though there is a large degree of variability in the control group as compared to the experimental, higher performances were expected in the control group at this time point due to the fact that the experimental group members were explicitly focusing on process-oriented goals and not outcome-oriented goals. Similarly, a drastic increase in performance for the experimental group between mid-test and post-test was expected primarily due to the shift between phase one and phase two skill acquisition (i.e., the shift from using process-oriented to outcome-oriented performance goals). As hypothesized, the experimental group (*M* = 30.05, *SD* = 45.93, *range* = 1.33 – 133.67) had a higher performance score the control group (*M* = 22.16, *SD* = 39.86, *range* = 0 – 153.33).

Additionally, information regarding performance was collected for all six practice sessions. During phase one skill acquisition (i.e., across the first three practice sessions), the control group (*M* = 5.42, *SD* = 5.83) and experimental group (*M* = 5.67, *SD* = 5.58) showed similar averages in their performance. CPA scores remained similar across each session for the control group (session one *M* = 2.91, *SD* = 1.41; session two *M* = 5.84, *SD* = 6.59; session three *M* = 7.51, *SD* = 10.32) and the experimental group (session one *M* = 3.69, *SD* = 2.36; session two *M* = 6.21, *SD* = 6.32; session three *M* = 7.10, *SD* = 8.94). However, similar to the increase in performance between the mid- and post-test for the

experimental group, there was a clear increase between phase one and phase two skill acquisition. Across the performance scores for the last three practice sessions, the experimental group (M = 20.12, SD = 28.83) had a higher performance score than the control group (M = 11.83, SD = 15.81). The experimental group in phase two skill acquisition (while focusing on outcome goals) started to pull away from the control group in session five. Specifically, the experimental group showed an average CPA score of 10.33 for session four (SD = 12.66), 16.45 for session five (SD = 21.22), and 33.57 for session six (SD = 53.32), and performed higher than the control group through all sessions of phase two skill acquisition (session four M = 9.16, SD = 10.68; session five M = 12.67, SD = 16.75; session six M = 13.67, SD = 21.85).

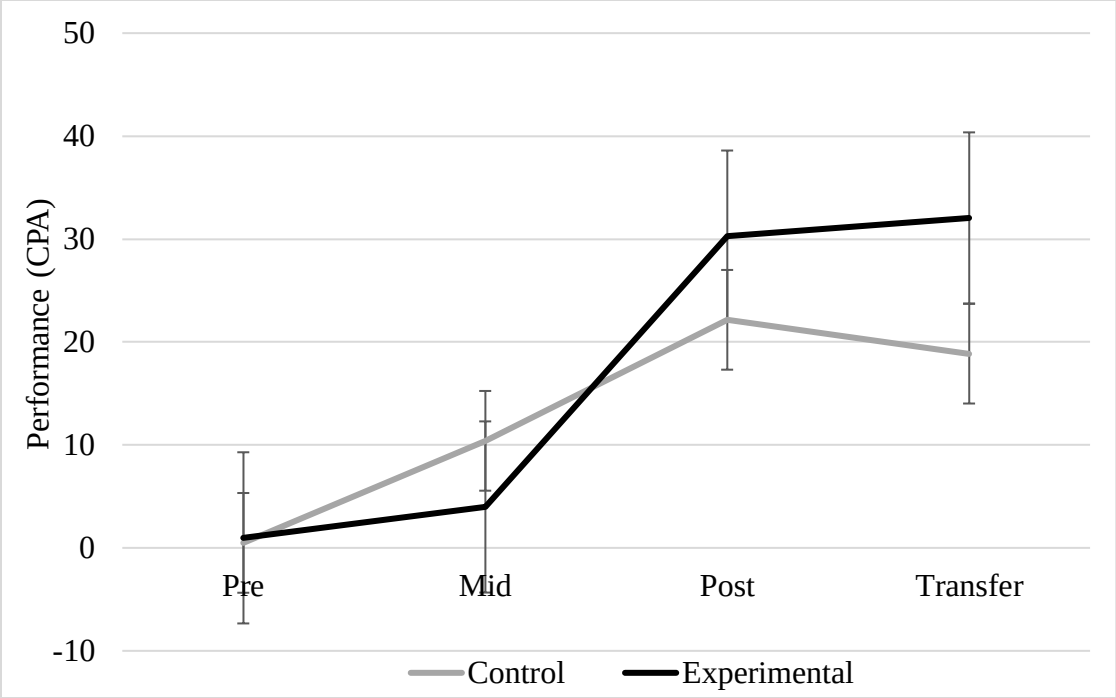

Figure 7. Average counts per attempt (CPA) for conditions across performance evaluations.

Data representing CPA across all time points did not display normal distributions for either control (skewness range = 2.12 – 5.04; kurtosis range = 1.38 – 8.25) or experimental (skewness range = 1.72 – 3.39; kurtosis range = 0.10 – 4.13) conditions in the descriptive statistics outlined above. The CPA descriptive statistics showed severe positive skewness. This was expected because a higher CPA is indicative of stronger performances (i.e., higher proficiency), and a main goal of the intervention was to observe stronger performances from participants who received self-regulation coaching. Having positive skewness with an outcome variable such as CPA is a direct suggestion

that learning has occurred. Therefore, outliers present in the raw CPA scores from the descriptive statistics were kept.

In order to run repeated measures statistical analyses for CPA (i.e., pre-, mid-, post-, transfer tests), data transformations were conducted. These data were transformed using a "log10 + 1" transformation as explained by Meyers, Gamst, and Guarino (2013). These data transformation procedures were conducted because the original CPA variables represented highly, positively skewed data and held data points at a score of zero (e.g., having zero catches at the pre-test evaluation). Transformed CPA data then showed normality across all distributions for both control (skewness range = 0.91– 2.50; kurtosis range = -0.72 – 2.09) and experimental (skewness range = 0.66 – 1.50; kurtosis range = -0.92 – 0.10) conditions. There were no outliers present after transformation procedures.

A 2 x 4 repeated measures ANOVA was performed to assess the differences between the control and experimental conditions across performances from the pre-, mid-, post-, and transfer tests. A post hoc power analysis was performed indicating 89% power achieved. Transformed data were used to satisfy the assumption of normality, and the assumption of independence was met based on random assignment. The homogeneity of variance assumption was met for all variables except the mid-test ($F(1, 27) = 5.73$, $p = .024$). The assumption of sphericity was not met ($\chi^2(5) = 32.66$, Mauchly's $W = .28$, $p < .001$), therefore results will be reported relative to the lower bound epsilon. A multivariate main effect was found for the interaction between condition and performance, Wilks' lambda = .63, F (3, 25) = 4.89, $p = .008$. A statistically significant within-subjects main effect (F (1, 27) = 49.4, $p < .001$) contributed the most to the overall

multivariate effect because a significant between-subjects main effect was not found, F (1, 27) = .02, p = .88. Post hoc pairwise comparisons for the difference between pre-, mid-, post-, and transfer tests indicate a significant difference between all performance evaluations with the exception of the transition from the post-test (M = 1.01, SE = .11) to the transfer test (M = 1.04, SE = .11). Though the experimental group averaged a higher performance score than the control group, support for research question one was not found as between-subjects differences were not statistically significant.

Results for CPA were reported relative to how many catches were made across each performance trial. There was a very large degree of variation discovered between individual participants in both control and experimental conditions, and this variation is the likely reason statistical significance was not found. Information in Table 11 provides a more nuanced look at the variation between participant condition and their categorization of proficient at the conclusion of the intervention. Categories described as low pertain to a CPA ≤ four, moderate-level performance as a CPA range between five to 19, and high performance as having a CPA ≥ 20 (Laughlin et al., 2015; Bebko et al., 2003).

Table 11

Average Performance Scores for High-, Moderate-, and Low-Performers in the Control v Experimental Groups

	Low-level Performers		Moderate-level Performers		High-level Performers	
	Control (n = 7)	Experimental (n = 6)	Control (n = 5)	Experimental (n = 4)	Control (n = 3)	Experimental (n = 4)
Pre-Test	.52 (.77)	0.44 (.54)	.40 (.44)	1.00 (.77)	.56 (.51)	1.75 (1.5)
Mid-Test	2.19 (.72)	1.78 (.62)	8.13 (4.5)	3.83 (2.19)	33.33 (20.66)	7.42 (4.58)
Post-Test	2.14 (1.32)	2.44 (1.00)	12.8 (5.08)	10.17 (3.68)	84.44 (60.19)	92.17 (43.93)
Transfer Test	3.05 (.97)	3.11 (.96)	13.67 (10.58)	8.33 (5.82)	64.44 (20.67)	99.17 (51.53)

Note. Each box indicates the mean and standard deviation *m* (*SD*) for Counts per Attempt (CPA) throughout the juggling intervention. Low performance = CPA ≤ 4, moderate performance = CPA range 5 – 19, and high performance = CPA ≥ 20.

Group differences in strategy use. In order to assess the group differences in self-regulatory strategic planning, a series of chi-square test for independence were conducted (research question two). These tests were performed across the control and experimental groups for the mid-test, post-test, and transfer test. Though the experimental group identified more strategies (f = 23) over the control group (f = 18), no significantly different results were found for strategic planning for the transfer test. The following sections identify the results of the expert and moderate-level selected strategies, the between group differences for the mid- and post-tests, and one additional section that describes the flow of strategies between the mid- and post-test evaluations for both control and experimental group participants.

Expert and moderate-level strategies. Overall, the moderate-level and expert participants were physically skilled in the three-ball cascade juggling task. Beyond CPA performance, though, these participants were consciously aware and engaged in specific strategies for alongside their successful performance. Table 12 outlines the type of strategy the moderate-level and expert performers engaged in before (i.e., strategic planning) and during (i.e., strategic self-monitoring) their performance trials.

Table 12
Expert and Moderate-level Performers and their Strategies

	Post Test		Transfer Test	
	Strategic Planning	Strategic Self-Monitoring	Strategic Planning	Strategic

				Self-Monitoring
Expert	None	Visualization (x2) Technique	Visualization (x2) Focus Rhythm	Visualization (x2) Technique
Mod 1	Position	Visualization Technique	Position	Focus (x2) Rhythm (x2)
Mod 2	Rhythm Technique Position	Visualization Rhythm Technique	Focus Technique	Position
Mod 3	Rhythm (x2) Technique	Technique (x2)	Position	Rhythm Technique Position

Note. The "(x2)" represents the participants verbally reporting the strategy twice.

Mid-test strategy differences. Overall, major differences were not found between the control and experimental groups for the mid-test evaluation. Though the experimental group generally indicated they would be engaging in strategies more (f = 31) than the control group (f = 20), the only statistically significant difference was found for the technique strategy (experimental f = 8, control f = 3, $p < .05$). See Table 13 for the group

differences for the strategies of visualization, focus, rhythm, relaxation, technique, position and none.

Table 13
Group Differences in Strategies for the Mid-test Performance Evaluation

	Control Group (n = 15)		Experimental Group (n = 14)		
Strategies	*f*	%	*f*	%	$\chi^2(1)$
Visualization	2	13.3	6	42.9	3.16
Focus	6	40.0	5	35.7	.056
Rhythm	1	6.7	3	21.4	1.33
Relax	1	6.7	3	21.4	1.33
Technique	3	20.0	8	57.1	4.24*
Position	7	46.7	6	42.9	.042
None	2	13.3	0	0	2.01

Note. *p ≤ .05.

Post-test strategy differences. As expected, the experimental group engaged in more strategies (f = 39) than the control group (f = 18). Differences between the two conditions can be seen in Table 14. Though some of the control group indicated they were planning to use mental-skill oriented strategies (e.g., visualization, f = 3; focus, f = 4), the majority of the group were planning to engage in physical-skill oriented strategies

(e.g., position, $f = 8$). The experimental group generally planned to use a mix of mental-skill and physical-skill oriented strategies, but the most important aspect is that 100% of the group were engaging in strategy usage. To that end, a significant group difference was observed as many control group members were not engaging in any strategies ($f = 4$, $p < .05$). One statistically significant difference was found for physical-skill oriented strategy of technique ($p < .05$), and two statistically significant differences were found for mental-skill oriented strategies of rhythm ($p < .05$) and relaxation ($p < .01$).

Table 14
Group Differences in Strategies for the Post-test Performance Evaluation

	Control Group ($n = 15$)		Experimental Group ($n = 14$)		
Strategies	*f*	*%*	*f*	*%*	$\chi^2(1)$
Visualization	2	13.3	6	42.9	3.16
Focus	4	26.7	8	57.1	2.78
Rhythm	1	6.7	6	42.9	5.18*
Relax	0	0	5	35.7	6.47**
Technique	3	20.0	9	64.3	5.86*
Position	8	53.3	5	35.7	.91
None	4	26.7	0	0	4.33*

Note. *p ≤ .05. **p ≤ .01.

Illustration of strategy usage across performance in the mid- and post-test.

Though some statistical inferences help provide insight on the group difference between the control and experimental conditions, many of these differences are clouded by the immense amount of individual difference discovered through this dissertation research. In other words, each participant learned how to juggle in their own way throughout the learning intervention. In order to bring to focus these individual differences, a Sankey diagram was created. See Figure 8 to view the flow of strategies between the mid- and post-test evaluations. The visual offers a stimulating illustration of each participant's transition between the mid-test and post-test relative to strategy usage, but also provides important information regarding their intervention condition, categorization of juggling proficiency, and their overall performance (i.e., their PR for the post-test evaluation).

Participants are outlined in descending order on the far left of the image. Each participant, upon admittance to the study, were randomly placed into a control or experimental condition, and the movement from the numbers in the first column to the second column indicate the random assignment. Each individual participant is represented by a line that varies in size. The size difference is indicative of juggling proficiency where a thin line represents low proficiency (i.e., CPA ≤ 4) and a thick line represents high proficiency (i.e., CPA ≥ 20). The overall classification of proficiency can be viewed on the far-right column, where juggling performances ranged between five and 19. The third and fourth columns from the left identify performance strategies for the mid- and post-test respectively. Strategies are assembled in hierarchical order, where mental-skill oriented strategies are higher and physical-skill oriented strategies are lower.

The nuanced CPA result across high, moderate, and low performing participants (as highlighted in Table 11) can otherwise be viewed in Figure 8. In the Sankey diagram, individual difference in CPA performance is coupled with the strategies each individual engaged with during the mid- and post-test evaluations. Though there were clear variations in strategy choice between the participants, general trends can be observed throughout the figure. For example, the downward flow of lower performing participants who selected more basic, position oriented strategies or no strategies at all are seen in the transition between the mid-test to post-test. This downward trend is corroborated by the significant chi-square results between the control and experimental group (e.g., Table 14). On the other end, a general flow upward can be seen for the experimental group because they selected more mental-skill oriented strategies (i.e., visualization, focus, rhythm, relax) than the control group. Significant differences were found between the control and experimental groups, and the differences between technique strategy selection and mental-skill oriented strategy selection are seen when comparing the high peaks vs. low peaks for the mid-test and post-test. Finally, a unique finding derived from the diagram showed that different combinations of strategies were often selected. In other words, individuals were not limited to choosing just one strategy to facilitate performance, but many participants selected multiple strategies. It appears, generally, the experimental group participants were selecting more combinations of strategies than the control group.

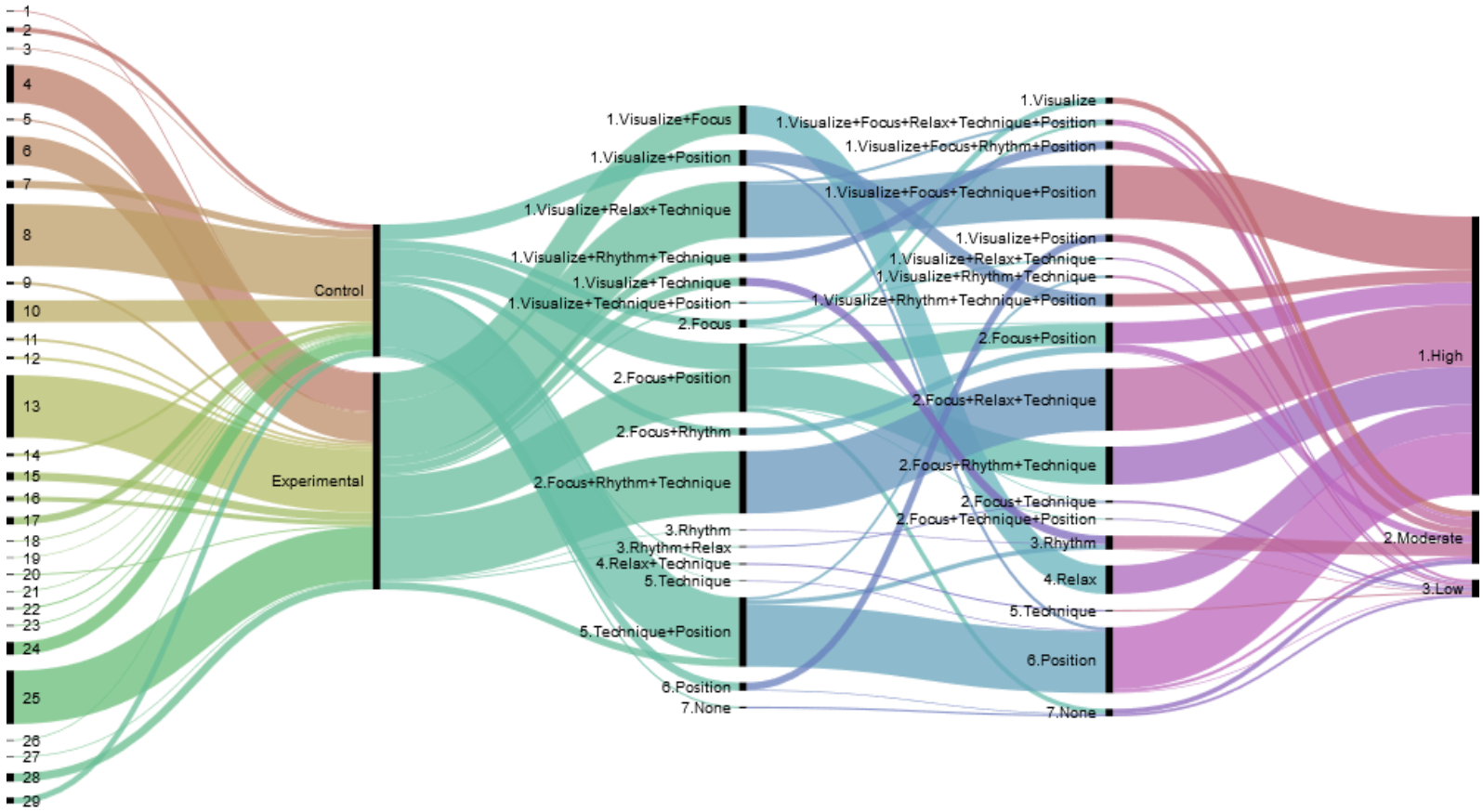

Figure 8. Sankey diagram illustrating strategies used from all participants (column one) between conditions (column two) for the mid- (column three) and post-test (column four). Juggling proficiency determined at post-testing can be found on the far-right (column five), and participants' overall PR is indicated through the thickness of the lines (i.e., low PR = thin lines; high PR = thick lines).

Development and Transfer of SRL for the Experimental Group

To further assess the experimental group's verbal reports, a chi-square test of independence was performed to make sure the participants are not showing a significant decrease in making outcome-oriented self-judgements (in partial assessment of research question 3.a). Generally, verbal reports from the experimental participants indicate that they have developed an ability to self-regulate their learning by the conclusion of the juggling intervention.

When asked about what standards of performance the participants were judging their performance on, the moderate-level and expert performers expressed they were using specific judgements toward their performance. These participants made adaptive inferences and judged their performances on self-regulatory performance standards (i.e., process- or outcome-oriented standards of performance). Generally, the expert performer, and the first two moderate-level performers indicated that they were judging their performance based on outcome-oriented criteria, but the third moderate-level performer assessed his ability to perform the task relative to process-oriented performance criteria. The expert juggler compared his performance on the post-test to his nine-year-old self (i.e., his ability to go for a long time with juggling), but then specifically compared his performance on the transfer task to his initial CPA goal of 500 catches and then his adapted CPA goal of 1000 catches. Comparing his performance in the post-test and transfer test to these outcome-oriented standards of performance is an indication of internalized self-regulatory behavior.

All experimental group members (*f* = 14; 100%) indicated that they were using specific criteria and standards to judge their performance on the post-test trials. Twelve group members (i.e., 86%) were judging their performance based on outcome-oriented feedback. Specifically, outcome-oriented self-reports from six of the group members spoke in terms of obtaining their personal record and the other half (*f* = 6) referred to specific CPA during the post-test performance trials. Simply put, the verbal data from these 12 experimental group participants are indicative that they have internalized the juggling task and are self-regulating their performance. However, two experimental group members judged their post-test performance on process-oriented feedback. Specifically, the first participant using process-oriented standards judged performance primarily on "how smooth the juggling was," and the other judged performance based on strategy usage. Though these two participants are not demonstrating adaptive self-regulation, it is still clear that they are in the process of internalizing process-oriented standards of performance within the self-control phase of the developmental model.

During the transfer test, however, there was a decrease in participant use of specific criteria and standards to judge performance (*f* = 11; 79%). Altogether, participants either did not compare to any criteria (*f* = 3), compared to process-oriented feedback (*f* = 4), or judged their transfer task performance on outcome-oriented standards of performance (*f* = 7). The process-oriented feedback group mostly indicated standards of performance based on differences in the physical features of the juggling balls (e.g., the way the different sized balls feel compared the regular sized balls). The outcome-oriented feedback group primarily used CPA as a reference point (*f* = 5), but one

participant indicated his personal record and while the other compared his outcome to "what [he] assumed other people got around." Therefore, 50% of the experimental group are maintaining self-regulation and 29% are showing signs of self-control during the transfer task.

To assess the statistical significance in criteria and standards of performance between post-test (i.e., regular sized balls) and the transfer test (i.e., different sized balls), a chi-square test of independence was performed. A non-significant result was found, $\chi^2(2) = .88$, $p > .05$. That is, though there is a general decrease in the number of participants using outcome-oriented performance feedback (which is generally expected during a transfer task assessment), there was not a significant decrease between those who are self-regulating in the post-test and those who maintained their self-regulation in the transfer test. Approximately 80% of the experimental group participants maintained advanced forms of self-regulatory judgements (i.e., used process-oriented and outcome-oriented standards of self-judgment) across the post-test and transfer performance evaluations.

Transfer of SRL across Performance Environments for the Experimental Group

Relative to use of criteria and standards of performance, self-regulation learned within the context of the learning intervention appears to be adequately transferring across performance environments (partially supporting research question 3.a). This section breaks down the components of self-regulation coaching in order to further assess the transfer of self-regulation (research question 3.a & 3.b). In other words, the following

sections evaluate the role of goal setting, strategic self-monitoring, and self-evaluation between the post-test and transfer evaluations within the experimental group.

Goals. The assessment of goal setting involved of the comparison of participants' choices to use outcome or process goals during performance (in partial assessment of research question 3.a). The relationship of identifiable goals between the post-test and transfer test was non-significant ($\chi^2(2) = .93$, $p > .05$). In other words, there is no statistical difference between the type of goal (i.e., outcome, outcome and process, or process goals) used by the experimental group in the post-test (i.e., $f = 6$, $f = 6$, $f = 2$ respectively) and the transfer test (i.e., $f = 10$, $f = 4$, $f = 0$ respectively), which is a sign that the experimental group learned to utilize outcome goals and maintained their goals toward achieving a new personal record with their performance on the transfer task.

Strategic self-monitoring. Evaluating strategic self-monitoring consisted of assessing the difference between physical-skill or mental-skill oriented strategy usage on the post-test and transfer test (in partial assessment of research question 3.a). There were no significant differences in strategy use between planning and monitoring during the post-test ($\chi^2(2) = 1.12$, $p > .05$). Specifically, no experimental group participants selected only physical skill strategies to aid their performance. Rather, most participants selected either only mental-skill strategies or a combination between mental- and physical-skill strategies before the post-test trials (i.e., strategic planning; $f = 4$, $f = 10$, respectively) as compared to the strategies used during the three performance trials (i.e., strategic self-monitoring; $f = 7$, $f = 5$, respectively).

On the other hand, strategy usage during the transfer test yielded different results. It appears many of the SRL group participants reverted back to a plan that used basic, physical-skill oriented strategies ($f = 7$) as they prepared for the transfer task as compared to mental-skill only ($f = 2$) or a combination of both mental- and physical-skill strategies ($f = 5$). A significant difference between strategic planning and strategic self-monitoring during the transfer task was found ($\chi^2(6) = 12.64$, $p = .05$). Specifically, the significance is attributable to the difference between physical-skill strategic planning and self-monitoring using only physical-skill strategies ($\chi^2(1) = 5.60$, $p = .018$). In other words, though many participants went into the transfer task trials with a plan to use only physical-skill strategies, a significant number of participants changed to a mental-skill oriented strategy ($f = 1$) or a combination of mental- and physical-skill strategies ($f = 2$).

Self-evaluation. In order to fully understand the experimental group's self-evaluation, a combination of perceived performance and attributions were assessed together for both the post-test and transfer test (in partial assessment of research question 3.b). Perceived performance ranged on a scale between 0 – 10 (i.e., low to high), and attribution quotes were categorized as strategy, ability, improvement, practice, expectation, pressure, nervous, fatigue, and other.

See Table 15 to view the expert and moderate-level performers PR, perceived performance, and attribution quote and category. They rated their performance with concern. For example, even though the expert performer scored a PR of 288 CPA he still felt like he "could have done more or done a lot better." Because of this, he attributed his strong performance to his strategy usage while at the same time indicating that he could

have done more to focus, use visualization strategies (i.e., "crisscross") and use physical technique. In other words, he indicated there was room for improvement if he engaged with his strategies more effectively. The moderate-level performers all gave themselves lower self-rating of perceived performance, and when asked why they attributed their performance not having enough practice with the task. So, even though they had a natural ability for the task, they did not perceive their performance strongly as they knew they could do better.

Table 15
Personal Records, Perceived Performance, and Attributions from Expert and Moderate-level Participants during the Post-test Evaluation

Participant	PR (CPA)	Perceived Performance	Attribution	Attribution Quote
Expert Performer	288	7.00	Specific Strategy Improvement	"I feel like I could have done more, or done a lot better, if I was able to focus more…focusing on doing the crisscross, height, not putting it too close to me but in between"
Moderate Performer 1	8	3.50	Practice	"I only averaged 5 touches…with more chances to

				do the juggling I would have performed better each time"
Moderate Performer 2	15	5.00	Practice	"If you're able to juggle, you can go on like forever. But this still showed that, with practice, I'd be able to do that…I have potential to be fluent"
Moderate Performer 3	8	3.80	Practice	"I think it's because I thought I was going to be a lot better than what I actually did…I think I can still do better, but it's going to take a bit more trials."

The experimental participants indicated a large range in perception for how well they thought they performed on the post-test. Self-reports ranged between 2.50 to 10.00. Self-reports of perceived performance were then categorized as low (i.e., range 0-3.4), moderate (i.e., range 3.5-6.5), and high (range 6.6-10). See Table 16 for participants self-evaluations (i.e., perceived performance and attributions), goals, and PR for the post-test. Overall, five participants (35.7%) perceived their performance higher on the scale, five more participants (35.7%) rated their performance moderately, and four participants (28.6%) indicated low perceived performance. The out of the five participants with high

perceived performance, four attributed their performance to ability and improvement and one credited her performance to improvement. Generally, individuals who perceived their performance as strong had a post-test PR at or above their goal for performance and indicated they have learned a lot and improved since the pre-test.

Table 16
Performance Goals, Personal Records, Perceived Performance, and Attributions from Experimental Group Participants during the Post-test Evaluation

Participant	Goal (CPA)	PR (CPA)	Perceived Performance	Attribution	Attribution Quote
High Perceived Performance					
25	192	245	10.00	Ability Improvement	"I came in not knowing anything, so for me to go from the first time I tried [zero] to 245… I think that's a great accomplishment"
4	110	174	10.00	Ability Improvement	"I've grown a lot. When I first started, I couldn't do it and now I am getting to a consistent high

					number where I feel like I have learned.”
16	18	16	9.00	Ability Improvement	"In the beginning of this I didn’t really think I would get this good at juggling…I exceeded my expectations"
13	100	71	8.00	Ability Improvement	“I feel like compared to when we first started to now, I have definitely improved. Before I was only getting like 2 catches per attempt whereas now, I’m getting an average of 60 maybe”
20	No goal	5	7.70	Improvement	“So, with me actually doing better and progressing and learning how to do things my own way…and finding what works for me”

Moderate Perceived Performance

28	34	38	6.50	Fatigue	“I think if I wasn't so fatigued, I would have gotten a higher number”
27	4	3	5.00	Nervous	“I think I could have done better…but I guess I was a little bit nervous”
9	13	6	4.70	Pressure Practice	“I performed better when I could just continue [juggling]… but the momentum of the [juggling assessment] kinda – not ruined – but had an effect”
6	100	102	4.40	Expectation	“I reached one of the goals for the second trial, but I wanted to reach at least over 100 for all three”
5	No goal	2	3.90	Other	“I gave myself a 3 just for the fact that I have learned exactly how to

					keep the balls going… but I am also a perfectionist so not being able to get it down pat and continue is kinda [frustrating]"
Low Perceived Performance					
15	38	14	3.40	Expectation	"I did not get anywhere close to my goal on any of the attempts"
11	10	6	3.10	Pressure Nervous	"Throughout my practice I was doing really well, but then all of a sudden when I was pressured by the title of the post-test, I was kinda getting nervous and not really performing well compared to practices"
12	13	4	2.80	Expectation	"I know I didn't get more than 4 [CPA], which is really, really bad… so I

					feel like this is a day 2 performance and I'm on the final day"
1	4	3	2.50	Practice	"Usually when I try to learn something new, I try to practice it as much as I can…but I had to try to re-learn it every time I came in."

Attributions from participants in the moderate-level or low-level perceived performance express different reasons for why they performed the way they performed on the post-test. All of these participants (with the exception of participant 28) expressed concerns relative to stress, anxiety, and/ or concentration. These participants either (a) set too high of a goal for their performance and got stressed because they set too high of an expectation for themselves (e.g., participant 6, 12, 15), (b) were overthinking their performance which led them to experience "choking" during their performance trials (e.g., participant 5, 9, 15), or (c) felt the pressure of having to perform to the best of their abilities after 900 attempts throughout the intervention (e.g., participant 6, 11, 27). A few of these lower-perceived performance individuals indicated a combination of these anxiety-elevation feelings. For example, participant 12 who felt "like this [was] a day 2

performance" set a goal three-times higher than her actual performance on the post-test and had to stop between attempts due having sweaty palms which is a sign of somatic anxiety.

Altogether, though the experimental group participants engaged in self-regulatory behavior, it appears most of the low proficiency post-test performances can be attributable to undesirable feelings (i.e., high anxiety, overthinking) that surfaced during the evaluation. Interestingly, the performance-altering feelings were not as prevalent in the transfer task. First, participants rated their perceived performance much higher in the transfer test as compared to the post-test. Some participants still had low (n = 1; 7.1%) and moderate (n = 4; 28.6%) self-perceptions, but many more indicated higher perceived performance (n = 9; 64.3%). The lower level perceived performance group indicated they performed the way they performed due to (a) not mastering the regular size balls, (b) the heaviness of the transfer task balls, (b) not having enough practice with the new balls, (c) having a lower standard of performance, and (d) one participant who "compared myself to what I assumed other people did." Generally, the participants who perceived their performance to be lower were attributing their performance toward external and uncontrollable factors.

Out of the nine experimental group participants who perceived their performance as high (i.e., 6.6 or higher out of 10), five of these participants accrued a higher average CPA in the transfer test as compared to the post-test. For example, participant 13 averaged 42 CPA on the post-test, but then averaged 152 CPA for the transfer test (i.e., a CPA score 3.62 times higher). This explains how the experimental group scored an

average transfer test CPA higher than their average post-test CPA (see Figure 7 above). These participants explained their high perceived performance through their higher confidence, strategy use, focus on rhythm, and one participant focused on her self-comparison to their post-test CPA (see adaptive inference case below). These attributions are task-focused, internal, and controllable. Further, these participant's attributions are more in line with the moderate-level and expert performers, where one of the moderate-level performers compared his transfer CPA to the post-test CPA and the expert performer attributed his strong performance to his use of specific strategies.

Self-evaluation and adaptive inference. In particular, one individual expressed a highly adaptive change from post-test to transfer test. Participant 15 scored an average CPA of 8.67 (PR = 14) on the post-test evaluation which then increased to an average CPA of 15.67 (PR = 19) on the transfer test. She first perceived her performance at a 3.4 Likert-scale rating for the post test, but then perceived her performance at an 8.80 Likert-scale rating for the transfer test. She expressed that she "did not get anywhere close to my goal on any of the attempts" in the post-test evaluation due to reaching a PR of 38 during the learning intervention. She did not reach her goal which she strongly expected to reach during the post-test evaluation. In response to that, she said:

> I was so concerned with doing it the right way instead of just doing it. Because if you do it the right way it will make it easier to do it, but then it makes it harder to do it…So like, when you're thinking about all the little things you have to do to juggle then you're thinking about so many different things instead of the holistic approach of juggling.

In short, she was overthinking during her post-test trials, or in other words, she choked. This participant then made a clear shift in her goal for the transfer test and lowered her goal to a CPA of one. When asked about her performance, she increased her perceived performance score by 5.4 points on the sliding scale and said:

> When I first went into [the transfer test trials] I was thinking that I would do really bad, and then I didn't. I did better than I thought I was going to! Just the fact that I got the motion down and kinda got going a little bit before the ball fell, I wasn't struggling through it… This one I was just less stressed about.

It appears she adaptively shifted her goals to establish a more confident mind-set for performance. This regulatory strategy paid off as she performed approximately two times better on the transfer test as compared to the post-test evaluation.

Physical Skill Transfer and the Transfer of Self-Regulatory Skills

Two primary findings emerged as themes from the participants verbal reports during the post-intervention testing relative to transfer (further assessing research question 3.b). First, it appears that strongly proficient learners are transferring their physical skills from prior motor learning experiences. Second, participants exposed to self-regulation coaching indicate that their goals and strategies were helpful with their performance on the transfer task. Therefore, the two sections below highlight the main qualitative findings from physical skill transfer and self-regulation skill transfer.

Transferrable physical skills. The first emergent finding was centered on the transfer of physical skills. Out of the control group participants, three successfully learned the skill of juggling and became highly proficient (i.e., CPA $\geq$ 20). It is possible

that these highly performing control group members are stronger jugglers because of their sport experience (e.g., all held seven or more years of sport experience), but it appears the link may actually be more connected to their strategy usage. In other words, the stronger performing control group members are engaging with highly structured strategies for performance.

For example, participant 8 was a high performing female with seven years of competitive volleyball experience. She came to the study with zero background or knowledge of how to juggle. In fact, her attempts in the pre-test evaluation indicated she had never even attempted the task before as she continued to throw the balls in a circle and throwing the balls in a circle is a common misconception for the three-ball cascade juggling task. Throughout the learning intervention she became very invested to perfect her technique. Across the six training sessions she started using more advanced strategies for performance (e.g., keep the balls low and in front; correcting her position to move back to the center), and her incorporation of these strategies may have been the reason she was able to get a mid-test PR of 119 CPA and a post-test PR of 284 CPA. However, at the conclusion of the intervention she verbally indicated that the skills she practiced during her juggling learning were transferrable skills from her sport experience. Her verbal report was corroborated with my own research memo from her second practice session. I wrote, "participant moves around a lot similar to [her] volleyball position." To that end, when she would "correct her position" as a strategy for juggling it mirrored the movements of a libero on the volleyball court. This appears to be a type of physical skills transfer, or her way of using transferrable skills from her prior sport experience.

Additional support to the claim that physical skills are transferring to the juggling task from prior experience can be seen from another strongly performing novice in the study. In particular, the first individual who did not qualify for the study as his average CPA from the pre-test evaluation was too high (i.e., moderate-level performer 1; CPA range 5 – 19) also referred to the transfer of similar physical skills. When asked about his stronger performance, he indicated his prior sport experience really helped him with the juggling task and those skills transferred over to help him perform well on the task. He said, "I think it was just transferrable skills from one thing to another and not necessarily practice," and specifically attributed his stronger performances to "[his] background with playing sports and with doing the bounce juggling." When asked about if there were any other skills that transferred directly over to his juggling performance, he said:

> It was mostly 'tracking' from doing the bounce juggling when I was younger. I think it was also just like playing sports; there are moments when it's like you can't think too much about strategy when you're in the middle of a game. You just have to react to it and improvise on the spot, which I was kinda used to, I guess. Of like, you're not always going to have a coach in your ear, so you have to make decisions on the field, in the pool, or on the court, or something like that, and I was used to making changes to a situation in order to see what works or what doesn't.

This participant identified a recurring process to help him with his performance. Above, he spoke in terms of reacting and not thinking too much. Building on that, he said:

> With me playing like volleyball and being very hand-eye coordinated from a lot of different sports, a lot of the time I would be very reflective on something that I did and not necessarily think about it while doing it and kind of like leave it up to subconscious muscle memory… Like, when I see a volleyball I don't think like 'left foot, right foot, up, arms back, elbow high' and then I hit the ball, I just do it. And like, over time it's not like thinking about the strategy behind it but implementing it into my second nature of automatically going to that [strategy]. So, I think that's what I am trying to do in this case.

Overall, the stronger performing individuals represented in these data are using their prior experience, using strategies that they have already learned from a different context, and are describing them as transferable skills that aided their performance and helped them successfully adapt to the changing performance environment.

Transferrable self-regulation skills. The second emergent finding was outlined by the experimental group's thoughts about goal setting. Generally, the experimental group participants indicated that goal setting helped their juggling learning and identified that slow progressions are important for practice. This was best captured by participant 11 when she indicated that, when setting goals for new motor skills, the "goals would be action/behavior oriented first (do certain actions in order to achieve the motor skill better), and then as I improve, set number goals realistically."

Participant 20 expressed that her goals for performance on the transfer task helped her perform well and build up compared to her performance in the post-test. Regarding her goals, she said, "it helped me perform better because it gave me an idea of what I

wanted to get, and then it gave me something that I, like, 'climb the stairs' and reach to…like, setting goals basically makes building blocks for how you want to achieve things." Further, she said, "I think it helped me more with the transfer task … because I was faced with really different circumstances and then only two minutes of practice, so I had to figure out what was going to work best for me and how am I going to reach my goal of 3." Though participant 20 was not strongly proficient by the end of the juggling intervention, she maintained a positive, persistent attitude.

When indicating what participant 20 would do when learning a completely new motor skill, she said, "I could take my time, analyze what works better for me, and set smaller goals that will help me reach my bigger goals." Fellow experimental group members supported the link between goal setting and persistence. Participant 9 said, "use proper techniques and don't be disappointed when something goes wrong. Just do it again;" participant 4 said, "I could set different types of smaller achievements that will help me learn the big task;" and participant 13 said, "take my time when learning, then when performing start off small to the point where I exceed those goals and create a new goal to challenge myself." Interestingly, participant 4 and participant 13 excelled drastically and became highly proficient in the juggling task.

Participant 13 expressed a unique perspective about his juggling. He said, "I was able to use what I did from the performance task and implement them into the transfer with some slight adjustments." Additionally, when asked about things that were learned from the juggling intervention that were helpful during the transfer task (i.e., skills or strategies that transferred from the post-test to the transfer test), participant 13 said, "Um,

just mindset. Pretty much just keeping the same mindset of having positive thoughts making sure that I always have control and not, or not losing control all the time." When asked to elaborate on what he meant by mindset, he then said, "Before, with only the three balls, it was simple to not over think it and relax, pretty much. But with this [transfer task], I did have to think some to make sure I apply the right amount of force, so I probably planned this stuff out as far as where I wanted to place it."

Finally, it seems that it was important for lower performing participants to be setting process-oriented goals for the transfer task. Participant 9 said, "when I was doing the regular juggling balls session, I had set particular goals. However, when I did the transfer balls, it didn't really work how I wanted it to work since I was so eager to just beat my score." Therefore, caution might be warranted for lower performing learners transferring over their outcome goals when the performance environment is changed.

Chapter Five

The purpose of this dissertation research was to assess the development and transfer of self-regulation for novice learners as they acquire a new, complex motor skill. To that end, the role of self-regulation coaching was vital as it was the main conditional difference within the experimental design. The first section provides a synopsis of the findings of the development and transfer of SRL for each research question. The following sections provide a discussion of the results relative to prior research for (a) performance and motor skill development, (b) performance and motor skill transfer, (c) the development of SRL, and (d) the transfer of SRL. The next section highlights important differences between the transfer of physical skills and transfer of SRL skills across performance environments. Finally, future directions, limitations and implications for research and practice are advanced.

Assessment of Research Questions

This section focuses on components of this dissertation that were answered relative to the three main research questions. Hypotheses and expected results are outlined. This section serves as a synopsis of findings.

Group differences in motor performance for post-test and transfer task evaluations between the control and experimental conditions. First and foremost, it was hypothesized that the experimental group participants who received self-regulation

coaching would outperform the control group participants at the conclusion of the learning intervention (research question one). This was hypothesized due to evidence from prior research suggesting that novice motor learners in self-regulation conditions (as compared to control conditions) also exhibited significantly higher performances in the motor skill being learned (Kitsantas & Zimmerman, 1998; Kitsantas, Zimmerman, & Cleary, 2000; Zimmerman & Kitsantas 1996, 1997). Though the experimental group showed higher overall performances for the post-test and transfer task evaluations as compared to the control group, the results of the 2 x 4 repeated measures ANOVA did not yield a significant difference.

Two additional expected findings were expressed for research question one. First, it was expected to observe stronger performances from the control group (as compared to the experimental group) at the mid-test evaluation. This observation was confirmed, however statistical significance was not found. Second, it was expected to observe an overall drop in performance on the transfer task evaluations as compared to the post-test for both experimental and control groups. As expected, this was confirmed in the control group. Unexpectedly, this observation was not confirmed for the experimental group therefore indicating a link (though not significant) between self-regulation coaching and performance on a transfer task. These results are connected to prior literature on motor skill development and transfer and are associated with perceptual-motor skill transfer and the mechanisms that influence how motor skills can be adaptively transferred (Collard, Oboeuf, & Ahmaidi, 2007; Rosalie & Müller, 2012; see the *performance scores and motor skill transfer* section below for more detail).

Group differences in self-regulatory strategic planning between the control and experimental conditions. It was hypothesized that the group receiving self-regulation coaching (as compared to the control group) would engage in more strategic planning (research question two). A series of chi-square tests were performed and confirmed that the experimental group approached the performance trials with specific strategies as compared to the control group. Generally, the experimental group more frequently used strategic plans than the control group for the mid-test, post-test, and transfer task evaluations. Specifically, the experimental group selected significantly more technique strategies for the mid-test evaluation and selected significantly more technique, relaxation, and rhythm strategies for the post-test evaluation. A number of control group members did not set any strategies at all, which was statistically different than the experimental group.

Support for research question two was found. These findings are consistent with prior research that describe the differences between novices, non-experts, and experts and their engagement with SRL processes (e.g., increased specific techniques for experts; Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). However, the present findings extend these studies by using an experimental design to assess the differences between a control and experimental group (i.e., the differences between initial coaching and self-regulation coaching) and their engagement with strategies. In other words, the present study showed that self-regulation coaching as an intervention was successful in teaching toward adaptive strategic planning.

Experimental group participant's engagement in self-regulation and perception of self-regulation transfer. Research question three (broken down into a quantitative sub-question and a qualitative sub-question) was focused on the development and transfer of self-regulation for the participants who received self-regulation coaching. Generally, support for research question three was found. The discussion of self-regulation coaching and its role with aiding the development and transfer of self-regulation was largely aimed at (a) assessing the assumptions of self-regulation (Schunk, 1999; Schunk & Zimmerman, 1997; see *the development of self-regulation* section below for more detail) and (b) connecting it to empirical evidence supporting the developmental model of self-regulation (e.g., Kolovelonis, Goudas, & Dermitzaki, 2010; Kolovelonis, Goudas, & Dermitzaki, 2012; Kitsantas, Zimmerman, & Cleary, 2000; see *the development and transfer of self-regulation* section below for more detail).

The quantitative question asked, "did the experimental group members transfer their self-regulation skills (i.e., self-judgements, goals, and strategic self-monitoring) from the post-test to the transfer test?" It was expected that participants would engage in self-regulation during post-test and transfer test evaluations but a drop in frequency would be observed during the transfer task (similar to the expected drop in performance on the transfer task evaluation described in research question one). As expected, a drop in the number of participants engaging in self-regulation was observed. However, this drop in participation was not significant for making outcome-oriented self-judgements, setting outcome-oriented goals, and strategy use between strategic planning and strategic self-monitoring during the post-test evaluation. An unexpected significant finding was found

for strategic self-monitoring during the transfer task, where participants planned to use physical-skill oriented strategies but switched to using mental-skill oriented strategies for performance.

The qualitative question asked, "what findings emerged from the participant's verbal responses that further illustrate adaptive self-regulation transfer?" There were not hypotheses or expectations for this sub-question. Rather, emergent findings outside the scope of the quantitative questions and analyses were sought. Differences were found within experimental group participants with their perceived performance and attributions for why they performed the way they did on the post-test and transfer task evaluations. Specifically, participants who perceived their performance as high made attributions about ability and improvement, whereas moderate or low level perceptions of performance were connected with high expectancies, overthinking, and pressure that maladaptively affected their performance. Additional emergent findings described individuals who gained strong proficiency in the motor task were transferring physical skills from prior experiences (regardless of condition), and the use of goals and strategies were important learning experiences for the experimental group members.

Performance Scores and Motor Skill Development

A key aspect of the self-regulation coaching condition (i.e., experimental group) was their use of shifting goals. Shifting goals, simply put, are goals that shift from process to outcome throughout phases of learning (Zimmerman & Kitsantas, 1997). In the present research design, the first three training sessions focused on process goals (e.g., visual gaze, catch and release patterning, stance for control, respectively) and then

shifted to outcome goals (e.g., PR) during the last three training sessions. As expected, though not statistically significant, stronger CPA performances during phase two skill acquisition were observed for the experimental group (as compared to the control group).

The use of shifting goals aided both development self-regulation and, to some degree, the development of motor skill proficiency. See the working model of self-regulation for motor learning and sport performance (Figure 4) to view the theoretical model used as the guiding framework for this dissertation research. It was originally hypothesized that experimental group participants would quickly learn the fundamentals of self-regulation (as taught through self-regulation coaching; e.g., goal setting, self-monitoring), but all participants would gradually and progressively get better throughout the learning intervention. Though both experimental and control conditions were expected to gain proficiency in their juggling, it was expected that the experimental group would perform better than the control group. See Figure 9 for an illustration that represents the first half of the working model for motor learning and performance with original data from the present dissertation research.

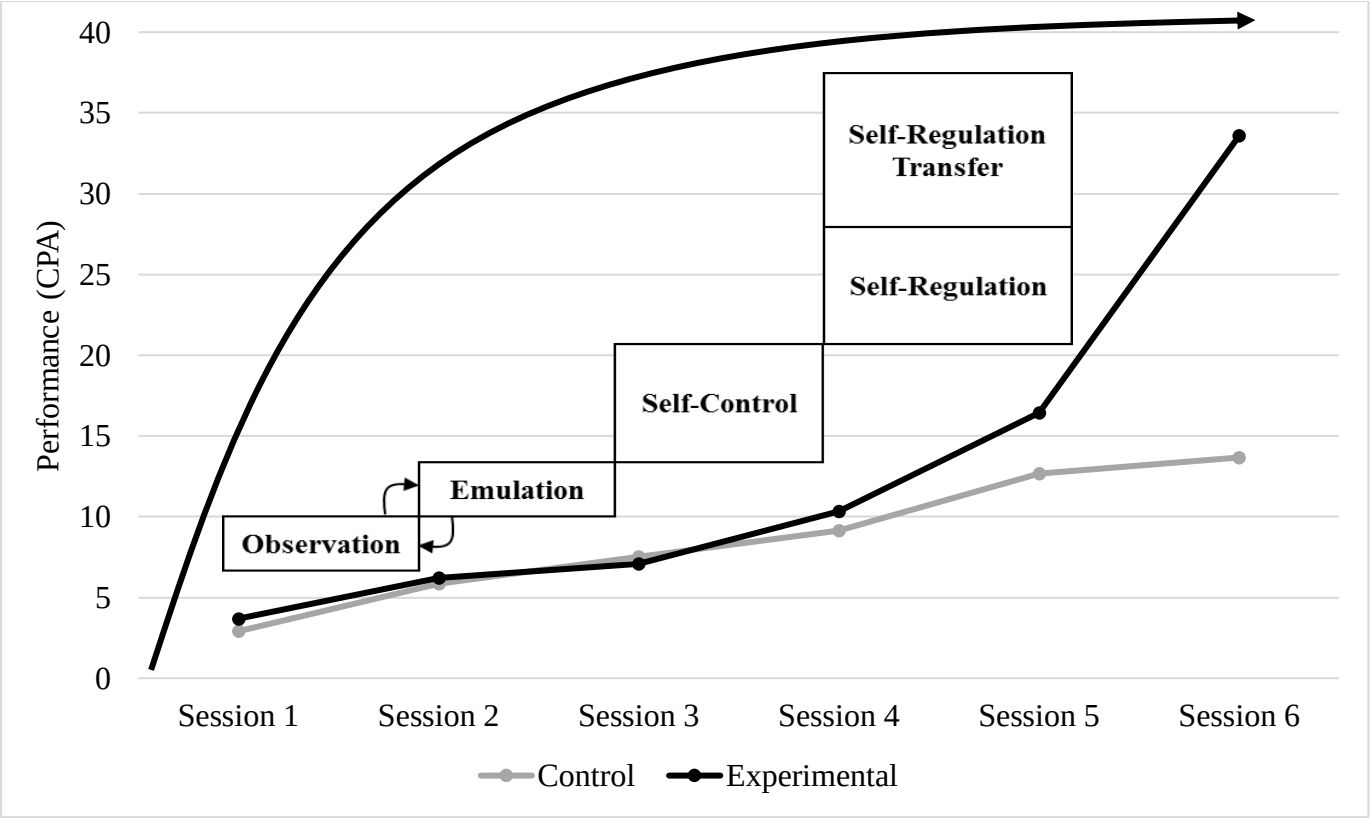

Figure 9. Adapted working model of self-regulation for motor performance with actual data from the control and experimental groups. The curved black line with an arrow represents the hypothesized development of self-regulation (as seen in the original working model on page 56).

As seen in Figure 9, the two conditions were relatively equal throughout phase one skill acquisition. However, the experimental group started to separate from the control group after the mid-test evaluation. During this time, the experimental group started to focus on the outcome (i.e., use PR as outcome goal; self-monitor outcome goal attainment) rather the process (i.e., use process goals; self-monitor process goal attainment). The shift from process to outcome provided learners a unique way to understand their progress and monitor their own performance, and the strong increase in practice performance in Figure 9 captures the relationship between goals and performance.

Interpreting these data highlights a few important notes about the hypothesized working model of self-regulation for motor learning and sport performance. First, the present study only focused on motor learning which limits the connection to the working model to only the first half of the model (i.e., the development of self-regulation as seen in Figure 9). From the data presented in Figure 9, many participants were still developing their proficiency for the motor skill (i.e., low- and moderate-level performers). However, the learning curve from the experimental group does generally mirror the hypothesized curve. Future research should consider using hierarchical linear modeling to better illustrate a direct performance curve and assess the learning curves from low, moderate, and high proficiency levels.

Second, caution is warranted for broader application to sport performance as the present study primarily focused on initial motor learning. The hypothesized model indicated a leveling off of skill over time (e.g., s-curve), and the present data does not

fully represent the scope of long term practice for skill refinement over time. In other words, to better understand how novice learners develop their juggling proficiency, more time is needed to view a leveling off in skill. Some participants developed quickly and showed very strong performances with a rapidly increasing CPA, but it was unclear at what number of CPA would represent the highest level of skill proficiency with juggling. Researchers should consider using motor learning or sport tasks with incremental levels to better judge performance.

Performance Scores and Motor Skill Transfer

Motor learning studies often assess transfer for the purpose of determining (a) the relative permanence of the learned skill from the acquisition phase, (b) the directionality of transfer, and (c) the generalizability of transfer (i.e., to understand how well the learned skill can be performed in a new performance context; Christina, 1997). It is common to see in many motor learning studies assess the latter purpose (i.e., generalizability), and it is likely to observe a drop in skill proficiency when assessing performance on transfer tasks as compared to post-tests or retention tests. For example, Laughlin et al.'s (2015) study with novice jugglers found, when assessing the average CPA score of all participants, a drop in performance on the transfer task as compared to the retention test. Specifically, an average CPA of 24.17 dropped to an average CPA 12.37, indicating a drop in performance by approximately 50% (Laughlin et al., 2015). That juggling study assessed novices using a descriptive research design, whereas the present research used a randomized, experimental design.

A primary finding from this dissertation is that self-regulation coaching helped novice jugglers learn the three-ball cascade juggling task well enough that, as a group, their transfer scores were higher than their post-test scores. This was an unexpected finding as it was anticipated to see a drop in performance on the transfer task evaluation (e.g., Laughlin et al., 2015). The control group participants average a post-test CPA of 22.16 that dropped to an average CPA of 18.87, which indicates a CPA drop of 14.85%. In contrast, the experimental group averaged a post-test CPA of 30.05 that then increased to a CPA of 32.05 on the transfer task. This increase highlights the novices in the experimental condition improved their CPA in the transfer test by 6.4%. It is important to note that these comparisons did not yield any statistical significance. However, it does suggest that self-regulation coaching helped the experimental group participants achieve an overall higher CPA performance on both the post-test and transfer test (as compared to the control group), as well as produce an increase in overall performance between the post-test and transfer test.

Out of all participants in this dissertation research, only one entered the study with an expert status. The expert performer not only exhibited automaticity in the juggling task, but displayed highly self-regulatory behavior before, during, and after performance. He averaged a CPA of 275.33 during his performance using the standard size juggling balls. Though he was highly proficient with the task, he had not taken part in a juggling exercise, such as the three trials to display strong performances for this research, since he was nine-years-old; he had also never attempted the three-ball cascade juggling task with different size and shaped balls. Those skills transferred over to his performance on the

transfer task, where he then averaged a CPA of 427.33, which is an increase in CPA performance on the transfer task by over 35%. This is a direct result that demonstrates that self-regulatory expert performance can successfully transfer across performance environments.

After separating the participants by proficiency, highly proficient performers from prior juggling studies dropped their CPA performance by 55.69% between the final performance assessment after an acquisition period and the transfer task assessment ($M_{\text{post-test}} = 68.65$, $M_{\text{transfer}} = 30.42$; Laughlin et al., 2015). Showing a similar decrease in performance, though not as drastic, the highly proficient learners in the control group in the present study showed a drop in CPA performance by 23.69% ($M_{\text{post-test}} = 84.44$, $M_{\text{transfer}} = 64.44$). Conversely, the expert-level performers from the experimental condition boosted their CPA performance between the post-test ($M_{\text{post-test}} = 92.17$) to the transfer test ($M_{\text{transfer}} = 99.17$) by 7.06%. Though causal connections cannot be expressed in full, there seems to be a similarity between the expert performer and the novices who became expert performers with their ability to transfer their strong performances across performance contexts.

When comparing the findings from the present study to the findings from prior literature we can see clear differences between the control and experimental group in their motor skill development and transfer. This discussion of skill development and transfer for juggling proficiency is connected to (a) perceptual-motor skill transfer and (b) it appears to be largely connected to individual difference factors and anticipatory mechanisms that aid the transfer process. Perceptual-motor skill transfer refers to how

learners can adapt their previously learned knowledge and experiences across performance environments (Collard, Oboeuf, & Ahmaidi, 2007). Among the many mechanisms that influence perceptual-motor skill transfer, three appear to be directly connected to the present study: (a) transfer occurs across a continuum and may depend on several variables, (b) human behavior is goal-directed and motivated by performance demands, and (c) transfer depends on anticipatory mechanisms (Rosalie & Müller, 2012). Among the three, anticipatory mechanisms appear to be most connected to self-regulation coaching of a juggling task. Rosalie and Müller (2012) identified anticipatory mechanisms as coordination, movement execution, procedural knowledge and strategic skill, to name a few. Though individual difference factors clearly limited certain participants from becoming highly proficient in the juggling task, self-regulation coaching explicitly taught strategic skills and procedural knowledge throughout the intervention and is likely the reason why the experimental group participant's average performance was higher between the post-test and transfer test. However, more research is needed to confirm anticipatory mechanisms are directly connected to self-regulation coaching. Future research focused on self-regulation coaching should consider the impact anticipatory mechanisms may have on skill development and transfer and how these mechanisms may act as important antecedents that influence motor performance.

The Development of Self-Regulation

Self-regulation, by definition, is goal-directed and goal-focused (Pintrich, 2000; Zimmerman, 2000). Early forms of self-regulation, as described by social cognitive theory, included of self-observation, self-reactions, and self-judgement (Bandura, 1986).

Self-judgement played a major role in the present dissertation, and self-judgements refer to perceived performance of a task as compared to their goals or other standards of performance (Schunk & Usher, 2013). Asking about self-judgements in the present study was important in two ways. First, the way in which participants responded and judged their own performances is directly connected to self-regulatory processing relative to social cognitive theory (i.e., self-regulation processing as the third basic assumption of social cognitive theory). Second, the microanalytic design allowed for the experimental group participants to directly respond to the self-judgement question (i.e., "Did you use any criteria or standards to judge how well you performed? If yes, what were they?") moments after they performed the juggling task.

The real-time responses were recorded, and these data provided evidence that the experimental participants were making self-judgements base on their goal attainment. Specifically, 12 members of the group were judging their performance based on outcome-oriented standards (e.g., judging performance based on their PR) and the other two were judging their performance on process-oriented standards of performance (e.g., strategy and rhythm). These self-judgments were goal-oriented and goal-focused. Therefore, these data provided evidence that self-regulation coaching supported the development of self-regulation. Self-regulation, in this sense, is best understood through the lens of internalization (Schunk, 1999; Schunk & Zimmerman, 1997) throughout the phases of the developmental model of self-regulation (Zimmerman, 2000). During the observation and emulation phases, internalization is initially developed when the basic skills are learned and directed practice is initiated. However, instead of making self-

directed self-judgments, learners typically rely on watching, emulating and receiving social feedback from a learning model demonstration during this time. Upon continued, independent practice (i.e., self-control phase), process-oriented standards of performance are used to strengthen the internalization of important skills and strategies. Finally, self-regulation is established when learners adapt internalized process-level information and use outcome-oriented standards of performance. Based on the participants own verbal responses, 100% of the self-regulation coaching group are positioned in the self-control or self-regulation phase, and 86% of the group were showing signs of self-regulation.

Research has shown that expert performers are more likely to use self-regulatory skills for performance (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). A major implication from the present findings is that all the learners in the self-regulation coaching group, regardless of their skill proficiency, were making self-regulatory self-judgments by the conclusion of the intervention. This is likely due to the use of shifting goals in self-regulation coaching. A relative limitation to this finding is that only one component of the many SRL processes (i.e., self-judgment) is being evaluated to conclude that self-regulation has been developed. However, the SRL sub-process of self-judgement represents a major assumption of social cognitive self-regulation (i.e., the transition from social to self; Schunk, 1999; Schunk & Zimmerman, 1997). Research assessing skill development of novice learners and the development of self-regulation should consider the utility of the SRL sub-process of self-judgment as a critical indicator for social cognitive self-regulation.

The Development and Transfer of Self-Regulation

A key focus of this dissertation was to understand how learned self-regulation can adaptively transfer across performance environments and to determine which SRL elements from self-regulation coaching are most coupled to the transfer process. The transfer of self-regulation is discussed within the context of self-regulation coaching for the learning and performance of the juggling task. The SRL elements of primary focus are goals, strategies, and self-evaluations because those are the main components of self-regulation coaching received by the experimental condition.

It appears self-regulation coaching showed to be an adequate guiding framework which allowed for meaningful engagement in SRL processes during the juggling acquisition process. In part, this is due to these participants being provided goals and specific strategy cues to focus on alongside physical skill practice in the intervention. The results focused on the experimental group participant's engagement in and use of SRL processes during their task performance, and the majority of the group were found to be using outcome-oriented goals and mental-skill oriented strategies (or at least some combination between mental-skill and physical-skill oriented strategies for performance) for the post-test and transfer test evaluations. Specifically, self-regulation coaching appears to have been helpful in guiding participants to engage in adaptive forms of goal setting (forethought phase) and self-monitoring (performance phase), and these participants engaged in these SRL processes despite their juggling proficiency level (low, moderate or high).

However, differences were found relative to participants self-evaluations (i.e., perceived performance and attributions) and the differences were linked to their perception of high, moderate, and low-level performances. On the post-test, participants who perceived their performance strongly reported positive attributions for their successful performance (e.g., based on ability and/or improvement), but the participants who expressed moderate or lower levels of perceived performance held attributions that based on unsuccessful performances (e.g., based on high expectations, anxiety, and/or choking). The undesirable feelings associated with the post-test after completing a total of 900 practice attempts revealed itself to be a confounding variable for the study. The transition between post-test and the transfer test, however, yielded an interesting change in participant self-evaluations. Generally, more participants perceived their performance much higher on the transfer test than on the post-test. In other words, the confounding effect outlined above was not as prevalent for the transfer task and participants were attributing their performance to more controllable factors such as strategy choice and rhythm.

Overall, the experimental group's engagement in SRL (e.g., task analysis, strategic self-monitoring, and self-evaluation as taught through self-regulation coaching) between the post-test and transfer test evaluations provided support that novice learners can adaptively learn and transfer their newly developed self-regulation across performance environments. Evidence of the effectiveness of the developmental model of self-regulation can be seen in many studies (see reviews from Goudas, Kolovelonis, & Dermitzaki, 2013; Kolovelonis & Goudas, 2013; Kitsantas & Kavussanu, 2011), but

much of the empirical support is focused on developing self-regulation up through the self-control phase (i.e., the transitions between emulation and self-control; Kolovelonis, Goudas, & Dermitzaki, 2010; Kolovelonis, Goudas, & Dermitzaki, 2012; Kitsantas, Zimmerman, & Cleary, 2000). The present study took the developmental model a step further by assessing how novice learners engaged in self-control and self-regulatory processes as outlined by the regulatory features the self-regulation phases (Zimmerman, 2013) and the subsequent transfer of using these learned processes across performance environments.

Physical-skill Oriented Transfer vs. Self-Regulation Transfer

This section focuses on the differences between the physical-skill oriented transfer and the transfer of SRL. Physical-skill oriented transfer was found for highly experienced sport participants and appeared to be helpful in the learning process, however this form of broad transfer was distinct from SRL transfer (e.g., near transfer). The following sections elaborate on (a) the transfer of physical skills, (b) the transfer of SRL skills, and (c) a case for the transfer of self-regulatory processing by way of physical-skill oriented transfer and increased sport experience.

Physical-skill oriented transfer. A result of the study revealed that participants with more competitive sport experience were inclined to use their prior sport experience to guide their learning and performance with the new motor task. The example used focused on a college club athlete who used similar movement patterns for her juggling performance as should would on the volleyball court. Further supporting the idea that highly experienced athletes can use their prior sport experience to help their motor

learning, a moderate-level performer (also a college club athlete) also indicated that transferrable skills could be accounting for his increased performance. Though he compared his juggling performance to his prior sport experience, he primarily connected his three ball cascade juggling performance to his prior experience with the three ball bounce juggling task. These are examples of positive transfer from one physical skill to another.

However, caution is warranted to directly link all experienced athletic performance with the ability to learn new complex motor skills. Though routinized physical skills from sport practice may have been helpful and the automatic processing from sport skills aided learning how to juggle (e.g., libero using a crouched stance for juggling performance; bounce juggler transferring over starting position techniques), other types of skills learned from prior sport practice may not be as salient for the transfer process. For example, a high school club level rowing athlete who participated in the experimental condition could not seem to develop the finesse to fully control the juggling balls. It's possible that the rapid and powerful movements needed for the physical skill of rowing hindered his progress in learning the three ball cascade juggling task. This, then, would be an example of negative physical skill transfer and be counterproductive for skill learning.

Self-regulation transfer. The primary aim of this dissertation research was to determine if and how newly developed self-regulation transfers across performance environments as a result of self-regulation coaching. The purpose of self-regulation coaching was to provide a structure to better understand and use goals, self-monitor

performance based on goal attainment, and then reflect on both goal attainment and performance at the end of a training session. The two aspects of self-regulation coaching that connected with participant self-regulation was the use of goals and strategies. As self-regulation transfer is situated within the context of self-regulation coaching, it is important to position the conversation about goals in the context of shifting goals and strategies in the context of strategic self-monitoring. These two aspects of self-regulation coaching appeared to be adaptively transferring across performance environments (i.e., post-test to the transfer test).

Among the three, goal setting seemed to have the largest impression on the participants who received self-regulation coaching. The group as a whole was primarily using outcome goals, which is in alignment with their use of outcome-oriented self-judgments. Emergent findings from the qualitative analyses complimented the results of the quantitative analyses. Self-regulation coaching helped the participants use outcome-oriented judgements and set outcome-oriented goals for performance, and this was also connected to gains in performance throughout the second phase of the learning during the intervention. It was found that these two outcome-oriented self-regulation responses were aptly transferring from the post-test to the transfer test, therefore providing evidence that their self-regulation was transferring. Further, these participants noted that setting goals (with many specifically referred to the use of shifting goals) would largely contribute to how they would proceed in learning new motor skills in the future.

Similar to the transition seen with shifting goals, monitoring strategies showed a general transition that outlined the use of physical-skill oriented strategies earlier in the

learning process to either mental-skill oriented or a combination between mental-skill and physical-skill oriented strategies latter in the learning process. The selection of strategies is a very individualized process. That said, individual difference is the likely culprit for the variance in participants' strategy selection (refer back to Figure 8 for a visual representation of the variation in strategy choice). Despite the individual difference factor, it appears the self-regulation coaching provided a useful framework for planning and monitoring strategies for learning and performance.

Taken together, there appears to be alignment between goal setting and self-monitoring by way of the selection and use of goals and strategies by the experimental group. These SRL outcomes were distinct from the responses outlined by physical-skill oriented transfer. The physical strategies that transferred were from routinized practice (i.e., general physical strategies from their sport of focus) and the participants seemed to use the strategies automatically. However, the main differences between physical-skill oriented transfer and self-regulation transfer is that the SRL skills (i.e., goals and self-monitoring) operate as a metastrategy. In other words, as the participants learned how to set proper goals and monitor their goal progress, they started to use the two SRL processes as a guiding framework which aided their learning and performance.

Self-regulation transfer through high performing physical-skill oriented transfer. One interesting finding emerged that warrants further attention. One participant in particular made an adaptive inference in the transition between the post-test and transfer test. Adaptive inferences are self-reactions during the self-reflection phase that provide the learner information on how to successfully change one's approach for

performance on subsequent attempts (Zimmerman, 2006). This case was highlighted in the results, but it is not clear if adaptive inferences was learned through self-regulation coaching or if this was an SRL process that transferred (more broadly) from other sporting contexts. Specifically, the case focused on a participant's response to an upsetting performance but responded positively in the transition between the post-test and transfer test. Curiously, the participant also held the highest status regarding sport performance (i.e., college-level varsity athlete), and could have been transferring this "mindset" from her prior sport experience. In other words, the way she adapted her goals and strategies for performance on the transfer test could be more in line with performance strategies she gleaned from her experience in highly competitive competitions. McCardle's (2015) assessment of the broad transfer of SRL between academics and sport could perhaps inform how sport skills and sport skill learning can broadly transfer across sports and motor learning environments. However, more research is needed to determine the role of adaptive inferences for self-regulation transfer, but it appears a broad-level SRL transfer occurred rather a near-level SRL transfer as learned from her learning experience with the task of juggling.

Strengths to the Study

The present study used a laboratory-based experimental design for the purpose of reducing the possible effects of social-facilitation (Rajecki, Ickes, Corcoran, & Lenerz, 1977; Zajonc, 1965). This was helpful in isolating performance of the three-ball cascade juggling task, but also helped in the assessment of the differences between the control and experimental conditions. Specifically, the design helped provide support that self-

regulation coaching was, to some degree, helping participants learning and performance of the juggling task (i.e., research question one). However, a quantitative, laboratory-based methodology, alone, was not enough to conceptualize and problematize the development and transfer of self-regulation within the context of acquiring motor task proficiency. To that end, this dissertation research used an iterative-sequential mixed method design to better understand how the participants are not only transferring their motor skills across performance environments (e.g., research question one), but also how they are transferring their self-regulation skills across performance environments (e.g., research question two and three). The mixed-method approach provided a format where multiple data sources could be utilized for the purpose of answering the research question of interest. In this case, the qualitative data from the present study supported and advanced the identification of self-regulatory skills that were connected to the performance of the outcome variable (i.e., juggling CPA).

The microanalytic protocol developed for this dissertation research was created to elicit direct responses about the SRL processes temporally situated before, during, and after performance trials. Because of the temporal component of the protocol, the use of the microanalysis was a strength to the overall design of the study. The microanalytic interview protocol was only conducted for the participants in the experimental condition. Though the control group responded to some SRL oriented questions (e.g., strategic planning; self-efficacy), the control did not receive the full set of questions geared toward other SRL processes. The purpose of not using the SRL microanalysis for the control group was to take away the possibility of prompting the participants to answer the

questions in a certain way. For example, when asking post hoc questions about self-monitoring, this may trigger a response due to the specificity (i.e., about specific strategies for performance) and timing (i.e., directly after performing the task) of the question. This, in turn, helped maintain a true control group (i.e., did not receive any form of the SRL microanalysis as designed to assess self-regulation coaching).

This research provides additional evidence of the usefulness of the microanalytic measurement tool for evaluating SRL processing for SRL learning interventions in motor learning and skilled performance. Microanalytic research designs from prior research have particularly shown the differences in self-regulatory functioning between novices, non-experts, and experts (Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). The present study showed that using the microanalytic interview protocol was useful in assessing the similarities and differences of developing novice learners as well as was a novel method for tracking SRL processes across post-testing and transfer testing (i.e., across performance environments).

Limitations to the Study

Overall, the two issues concerning sample size and individual difference generally limit the study. However, a primary limitation to the study can be found in the selection of the outcome variable. The three-ball cascade juggling task is simple yet challenging, and discovering important learning components (i.e., process goals from cross case comparisons/ initial content analysis) for the task provided a more authentic, task-specific experimental design. However, the task yielded much variation and skill learning and performance ranged from low (e.g., CPA $\leq$ 4) to very high (e.g., CPA > 100). Though a

higher CPA is indicative of stronger performances, the variability that came as a result of the skill learning became a barrier for a proper statistical analysis. In other words, if an outcome variable were selected with less variability, data transformation processes would not be needed. Individual difference factors should be considered before selecting a motor task as an outcome variable when coupled with self-regulation coaching.

A second primary limitation of the study is centered on the role of self-efficacy. Self-efficacy is an important SRL process, especially when assessing SRL development from a social cognitive perspective (Zimmerman, 2000). As such, the present study is limited. However, self-efficacy was not used in the current study due to (a) the study focused on SRL processes relative to self-regulation coaching (i.e., goals, self-monitoring, and self-evaluations), and (b) a possible misrepresentation of the variable from participants responses. The present study used the question "How confident are you in your juggling ability for the [evaluation trial number]?" and was collected before each of the three performance trials (for all pre-, mid-, post-, and transfer test evaluations). Though some studies have successfully used confidence to describe self-efficacy (e.g., Cleary, Callan, Malatesta, & Adams, 2015; Cleary, Dong, & Artino, 2015), the term confidence might have been misunderstood as a measure of self-efficacy in the current study. For example, a participant from the current study verbally stated that she was a confident person and subsequently gave herself a high rating when asked about her confidence in her juggling ability. Other studies have used sureness to represent self-efficacy beliefs (e.g., "On a scale from 0-100 with 10 being Not Sure, 40 being Somewhat Sure, 70 being Pretty Sure, and 100 being Very Sure, how sure are you

that…"; Cleary & Zimmerman, 2001; Kitsantas & Zimmerman, 2002). The wording of microanalytic questions should be carefully examined for SRL development studies so that the questions are situated in the context of the skill being assessed and they are accurately representing the variable of interest. For example, a revision for the self-efficacy prompt within the present study could be, "how strongly do you believe that you will perform well on the juggling task?" Therefore, it is recommended that future studies on the development of SRL use highly specific language situated within the context of the task performance.

Future Directions for Research on the Development and Transfer of SRL

The microanalytic interview protocol served as an important design feature to assess the development and transfer of SRL. Though the microanalysis was formed to assess SRL processes from the forethought, performance, and self-reflection phases (i.e., the cyclical model of SRL), it appears it have been a valuable tool to assess and track the development of SRL (i.e., the multi-level model of SRL) as a result of self-regulation coaching. The social cognitive nature of SRL development assumes that self-regulation can be learned if SRL is modeled appropriately within the context of the new skill or task, and that teachers and coaches are important in facilitating said SRL development (Schunk, 1999; Schunk & Zimmerman, 1997). The results of the present study indicate that assessing self-judgments is an important SRL process to examine to determine the degree to which a learner has developed self-regulatory functioning. Zimmerman (2013) outlined this form of self-judgment relative to standards of performance as *sources of regulation* in alignment with the *levels of regulation*, but also identified other features of

regulation such as *sources of motivation, task conditions,* and *performance indices*. It is recommended that future research focused on SRL development incorporate more questions in the microanalytic interview protocol focused on other features of self-regulation and the interactions of those features to form a holistic picture of what learned SRL looks like in the context of the new skill being learned. Once a more complete representation of SRL development is documented, the comparison of these SRL features across performance environments will provide a more detailed understanding of what aspects of SRL are contributing the most to the transfer of self-regulation.

Educational Implications for Motor Learning and Sport Performance

The practical application of this research is focused primarily on the role of the coach during motor skill acquisition or sport learning. The collective research on social cognitive SRL outlines that self-regulation is a learned skill and can be taught to athletes alongside skill training. To that end, self-regulation coaching can help a learner be more metacognitive with their learning and learning SRL skills concurrent with acquiring the physical skills needed for task performance is beneficial for setting their own goals and monitoring their goal attainment. In the context of self-regulation coaching, two educational implications are advanced.

First, self-regulation coaching appears to have a connection with the use of mental skill strategies for performance. The condition that received self-regulation coaching more regularly used mental-skill oriented strategies for performance (e.g., relax, focus) than the control group. Self-regulation is a key component and is an important goal for PST or mental skill training (Weinberg & Gould, 2015; Weinberg & Williams, 2015). I

suggest that Zimmerman's (2000) developmental model and cyclical model of SRL would best serve athletes who are preparing for highly competitive situations, and both physical skill and mental skill coaches could use self-regulation coaching to effectively teach their athletes how to prepare for (forethought phase), monitor (performance phase), and evaluate (reflection phase) their performance. If an athlete is able to develop and internalize these SRL processes, they could then, perhaps, more adaptively transfer across their competitive performances.

Second, in regard to self-regulation coaching and the internalization of SRL (Schunk, 1999; Schunk & Zimmerman, 1997), coaching for self-regulation has an inherent parallel with a coaching strategy called bandwidth feedback. Simply put, bandwidth feedback postulates that as skill increases in an athlete over time, the coaches feedback can be gradually reduced (Coker, 2015, 2018; Smith, Taylor, & Withers, 1997). In other words, a coach should be more frequently providing performance feedback for an athlete during the earlier stages of learning, but once the athlete shows consistency in performing the task correctly the coach can provide less feedback regarding the performance task. Chambers and Vickers (2006) found that asking questions once skill increases was a good coaching strategy. I suggest, based on the present study, that self-regulation coaching is a coaching strategy that is compatible and complimentary with bandwidth feedback and could perhaps further enhance SRL. In other words, as physical skill performance increases and the feedback regarding physical skill performance decreases over time (i.e., bandwidth feedback), a coach could increase the amount of feedback on goal setting, monitoring, or reflecting on the physical skill being practiced

once the athlete's physical skill performance increases. This would, in turn, put more emphasis on the athlete regulating their own behavior, cognition, and or motivational beliefs for the task being practiced.

Conclusion

This dissertation is among the few studies that has assessed motor skill performance – and is the first (to my knowledge) to assess motor skill acquisition for the cascade juggling task – from the social cognitive SRL perspective. The transfer of SRL and self-regulatory processing is a new and emerging area of inquiry within the sport and educational psychology domains. Recent research has focused on the broad transfer of SRL across academic and sport (McCardle, 2015), but little emphasis has been placed on research that analyzes the transfer of self-regulation through the development of a novel motor skill. This dissertation is among the first to empirically analyze and operationalize the development of SRL and subsequent transfer of self-regulation across performance environments. The social cognitive nature of SRL and its connection to the development and transfer of SRL, as it relates to self-regulation coaching, appear to be advantageous theoretical perspectives for direct and applied practice.

Appendix A

IRB APPROVAL LETTER

GEORGE MASON UNIVERSITY

Office of Research Integrity and Assurance

Research Hall, 4400 University Drive, MS 6D5, Fairfax, Virginia 22030
Phone: 703-993-5445; Fax: 703-993-9590

DATE:	September 6, 2019
TO:	Anastasia Kitsantas
FROM:	George Mason University IRB
Project Title:	[1479477-1] Self-Regulation Transfer during Motor Skill Acquisition
Reference:	
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	September 6, 2019
REVIEW TYPE:	Expedited Review
REVIEW TYPE:	Expedited review category # 7

Thank you for your submission of New Project materials for this project. The George Mason University IRB has APPROVED your submission. This submission has received Expedited Review based on applicable federal regulations.

Please remember that all research must be conducted as described in the submitted materials.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form unless the IRB has waived the requirement for a signature on the consent form or has waived the requirement for a consent process. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by the IRB prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to the IRB office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed (if applicable).

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the IRB.

This study does not have an expiration date but you will receive an annual reminder regarding future requirements.

Please note that all research records must be retained for a minimum of five years, or as described in your submission, after the completion of the project.

Please note that department or other approvals may be required to conduct your research in addition to IRB approval.

If you have any questions, please contact Rotanya Bryan at (703) 993-9628 or rbryan4@gmu.edu. Please include your project title and reference number in all correspondence with this committee.

GMU IRB Standard Operating Procedures can be found here: https://rdia.gmu.edu/topics-of-interest/human-or-animal-subjects/human-subjects/human-subjects-sops/

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within George Mason University IRB's records.

Appendix B

DEMOGRAPHIC QUESTIONNAIRE

Please answer the information below to the best of your ability.

GENDER:

What is the gender you most identify with? Check below.

_____ Male

_____ Female

_____ Other: _____

ETHNICITY:

What is the ethnicity you most identify with? Check below.

_____ Hispanic / Latino

_____ Black / African-American

_____ Asian / Pacific Islander

_____ Native American / American Indian

_____ White

_____ Other: _____

AGE:

What is your age? Write in below.

_____ Number in Years

YEAR IN SCHOOL:

What is your current student status? Check below.

_____ Freshman

_____ Sophomore

_____ Junior

_____ Senior

_____ Graduate School

PRIMARY MAJOR / SPECIALIZATION:

What is your current major or specialization for your degree? Write in below.

_____

PRIOR SPORT EXPERIENCE:

Have you participated in any organized sports?

_____ Yes

_____ No

If yes, what sport(s)?

_____

_____

What sport have you dedicated the most time toward? Circle the sport above.

What is the number in years that you have played the sport circled above? Write in below.

_____

What was the highest level of competition for the sport indicated above? Check below.

_____ Recreation

_____ High School/ Interscholastic

_____ High School Club

_____ College Club

_____ College/ Intercollegiate

_____ Professional

PRIOR MUSICAL EXPERIENCE:

Have you learned/ played any musical instruments?

_____ Yes

_____ No

If yes, what instrument(s)?

_____

_____

What instrument have dedicated the most time toward? Circle the instrument above.

What is the number in years that you have played the musical instrument circled above?

Write in below.

_____

PRIOR GAMING EXPERIENCE:

Do you frequently play video games?

_____ Yes

_____ Sometimes

_____ No

If yes or sometimes: on average, how many hours per week do you play video games?

Write in below.

_____

What type of video games do you play? Check all that apply below.

_____ Massively Multiplayer Online (MMO)

_____ Simulations

_____ Adventure

_____ Real-Time Strategy (RTS)

_____ Puzzle

_____ Action

_____ Stealth Shooter

_____ Combat

_____ First Person Shooters (FPS)

_____ Sports

_____ Role-Playing Games (RPG)

_____ Educational

Have you participated in any Esport (electronic sports) activities?

_____ Yes

_____ No

TASK EXPERIENCE:

Have you ever juggled 3-balls before?

_____ Yes

_____ No

If yes: How, or from whom, did you learn how to juggle?

_____

_____

Appendix C

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

Do you have a strategy or strategies you plan to use to help your performance on this assessment?

_____

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

Appendix D

TASK PERFORMANCE MICROANALYSIS

Please answer the questions below to the best of your ability. There are no right or wrong answers.

FORETHOUGHT

Refer to Prompt 2 on the scale:
How interesting is the task of juggling to you?
Perceived Interest: _____

Refer to Prompt 2 on the scale:
How important is it to you to perform well on the juggling task?
Perceived Importance: _____

In your own opinion, what are the most important elements to perform well on the juggling task?

_____

_____

Do you have a goal (or goals) in mind as you prepare for the juggling assessment?

_____

_____

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

_____

_____

POST-ASSESSMENT:
TASK PERFORMANCE ASSESSMENT
Complete the tasks and answer the questions to the best of your ability.

TRIAL 1

Refer to Prompt 2 on the scale:
How confident are you in your juggling ability?
Perceived Confidence: _____
CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:
How confident are you in your juggling ability?
Perceived Confidence: _____
CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:
How confident are you in your juggling ability?
Perceived Confidence: _____
CPA: _____

Assessment Scores:
Average Confidence: _____
Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

PERFORMANCE
Did you use any specific strategies to perform well on the juggling task?
Yes: _____
No: _____
What were they?

_____

_____

Did anything happen during performance that changed your plan for performance?
Yes: _____
No: _____
What was it?

_____

_____

Did you keep track of any changes during your performance?

_____

_____

REFLECTION
Refer to Prompt 2 on the scale:
How satisfied are you with your juggling performance?
Perceived Satisfaction: _____

Refer to Prompt 2 on the scale:
How well do you think you performed during the juggling task?
Perceived Performance: _____

[*Refer to perceived performance score above*] Why do you think you performed this way on the juggling task? In other words, why did you score yourself at [*refer to performance score*]?

_____

_____

Did you use any criteria or standards to judge how well you performed?
Yes: _____
No: _____
If yes, what were they?

_____

_____

Do you think your goals or strategies help you perform better on the assessment?
Yes: _____
No: _____
Why or why not?

_____

_____

If you were given the chance to perform the juggling assessment again, what would you do different?

_____

_____

Is there anything else you'd like to share with me regarding your performance?

_____

_____

First Direction:
*Take two minutes to practice the 3-ball cascade juggling **transfer** task to get warmed up for your assessment.*

TRANSFER TASK MICROANALYSIS

Please answer the questions below to the best of your ability. There are no right or wrong answers.

FORETHOUGHT

Refer to Prompt 2 on the scale:
How interested are you in performing the transfer task?
Perceived Interest: _____

Refer to Prompt 2 on the scale:
How important is it to perform well on the transfer task?
Perceived Importance: _____

In your own opinion, what are the most important elements to perform well on the transfer task?

_____

_____

Do you have a goal (or goals) in mind as you prepare for the transfer task assessment?

_____

_____

Do you have a strategy or strategies you plan to use to help your performance for the

transfer task assessment?

_____

_____

TRANSFER-TASK ASSESSMENT:
TASK PERFORMANCE ASSESSMENT
Complete the tasks and answer the questions to the best of your ability.

TRIAL 1

Refer to Prompt 2 on the scale:
How confident are you in your juggling ability?
Perceived Confidence: _____
CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:
How confident are you in your juggling ability?
Perceived Confidence: _____
CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:
How confident are you in your juggling ability?
Perceived Confidence: _____
CPA: _____

Assessment Scores:
Average Confidence: _____
Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):
Low – Moderate – High

PERFORMANCE
Did you use any specific strategies to perform well on the transfer task?
Yes: _____
No: _____
What were they?

_____

_____

Did anything happen during performance that changed your plan for performance?
Yes: _____
No: _____
What was it?

_____

_____

Did you keep track of any changes during your performance?

_____

_____

REFLECTION
Refer to Prompt 2 on the scale:
How satisfied are you with your performance on the transfer task?
Perceived Satisfaction: _____

Refer to Prompt 2 on the scale:
How well do you think you performed on the transfer task?
Perceived Performance: _____

[*Refer to perceived performance score above*] Why do you think you performed this way on the juggling task? In other words, why did you score yourself at [*refer to performance score*]?

_____

_____

Did you use any criteria or standards to judge how well you performed on the transfer task?
Yes: _____
No: _____
If yes, what were they?
_____

_____

Do you think your goals or strategies help you perform better on the transfer assessment?
Yes: _____
No: _____
Why or why not?
_____

_____

If you were given the chance to perform the juggling assessment again, what would you do different?
_____

_____

Is there anything else you'd like to share with me regarding your performance?
_____

_____

Appendix E

POST-MICROANALYSIS QUALITATIVE QUESTIONNAIRE

Please answer the questions below to the best of your ability. There are no right or wrong answers.

Do you feel like you will now be able to successfully set goals when learning new motor skills?

Yes: _____

No: _____

Why?

_____

_____

Based on your experience in the study, what type of goals could you set for yourself if you were to learn new motor skills?

_____

_____

What strategies or routines could you use when learning motor skills?

_____

_____

How would you reflect on your learning and performance if you were to learn new motor skills?

_____

_____

During the study, do you think the skills you learned for juggling transferred from learning to performance?

Yes: _____

No: _____

If so, how?

_____

_____

What are those skills?

_____

_____

During the study, do you think your skills for juggling transferred from performance to the transfer task?

Yes: _____

No: _____

If so, how?

_____

_____

Do you think you could strategically learn and perform new complex motor skills?

Yes: _____

No: _____

If so, how?

_____

_____

What would make your approach to learning new complex motor skills more strategic?

_____

_____

Do you think the skills you learned during the learning intervention will transfer to any other aspect of your life?

_____

_____

Is there anything else you would like to share with me about your learning and performance through the study?

_____

_____

Appendix F

IRB RECRUITMENT SCRIPT

IRBNet #: 1479477-1

Hello,

My name is Jordan Goffena, PhD candidate in educational psychology, and I am conducting dissertation research to assess self-regulation during motor skill acquisition. The general aim of this research is to determine the degree to which novice learners develop and transfer self-regulation skills as they develop proficiency learning and performing a motor task. The task for motor learning is the 3-ball cascade juggling routine.

I am collecting data for two different types of participants: novice jugglers and experienced jugglers. Novice jugglers will be taught how to juggle and will continue practicing juggling for four consecutive days. At the conclusion of the four days, novice learners will receive $40.00 cash. More experienced jugglers will meet for one day. At the conclusion of the session, more experience learners will receive $10.00 cash.

Your participation in this research is voluntary, and you may withdraw from the study at any time, for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party to participate in this research. Finally, your

privacy will be protected through a data coding system and will only be viewed by me and my dissertation advisor. My advisor is Dr. Anastasia Kitsantas and can be reached at 703-993-2688.

If interested, please email Jordan at jgoffena@gmu.edu to schedule an appointment.

Appendix G

IRB CONSENT FORM

The Development and Transfer of Self-Regulation during Motor Skill Acquisition

INFORMED CONSENT FORM

RESEARCH PROCEDURES
This research is being conducted to assess self-regulation during motor skill acquisition. The purpose of this research is to determine the degree to which novice learners develop and transfer self-regulation skills as they develop proficiency learning and performing a motor task. The task for motor learning is the 3-ball cascade juggling routine. If you agree to participate, you will be asked to learn and perform the juggling task. Data will be collected from novice jugglers and experienced jugglers. Novice jugglers will be taught how to juggle and will continue practicing juggling over four consecutive days for approximately 60 minutes per day. More experienced jugglers will meet on one day for approximately 60 minutes. This research is being funding by the Dissertation Research Fellowship from the College of Education and Human Development.

RISKS
There are no foreseeable risks for participating in this research. However, due to the physical nature of learning motor skills, foreseeable discomforts may include light to heavy perspiration and/or cognitive fatigue. Participants are encouraged to wear light weight, athletic clothing to reduce possible discomfort.

BENEFITS
There are no benefits to you as a participant other than to further research in psychology and applied motor learning.

CONFIDENTIALITY
The data in this study will be confidential. Jordan Goffena (dissertation student) will protect your privacy using a coding system. A master list of personal information/ personal identifier codes will be kept by Jordan and de-identified data will only be viewed by Jordan and his dissertation faculty advisor. The de-identified data could be used for future research without additional consent from participants.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

College-age learners (i.e., 18+ years of age) enrolled in an undergraduate or graduate program are welcome to participate in the study. Exclusion from the study will only occur if the number of participants in the moderate-level and high-level proficiencies reach a max of 10 participants. If learners are under the age of 18, they will be excluded from the study.

Upon completion of the study, you will receive compensation for your time and effort. You will be rewarded $10.00 per day. Two types of rewards will be offered. One-day participants will receive $10.00 at the conclusion of data collection. Four-day participants will receive $40.00 at the conclusion of data collection.

CONTACT

This dissertation research is being conducted by Jordan Goffena in the department of Educational Psychology at George Mason University. He may be reached at (937) 638-9674 for questions or to report a research-related problem. The dissertation faculty advisor is Dr. Anastasia Kitsantas and can be reached at (703) 993-2688. You may contact the George Mason University Institutional Review Board office at (703) 993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

VIDEO RECORDING

Video recordings will be collected during each performance assessment and during each practice session. The purpose of recording the assessments and sessions is for recall of performance and the learning experience. The dissertation researcher will use the videos to analyze learning and performance, and to have a record of the participant's progress from start to finish. The video files will be locked and stored behind closed doors in West hall, where only Jordan Goffena and his dissertation faculty advisor will have access to the files. The video files will be stored for at least five years and the electronic device holding the files will be wiped clean after five years.

_____ I agree to video recording.

_____ I do not agree to video recording.

CONSENT

I have read this form, all of my questions have been answered by the research staff, and I agree to participate in this study.

_____ _____

Signature Date of Signature

Appendix H

INITIAL COACHING LESSON

This lesson consists of a 10 to 15-minute lesson which teaches the basic components of the 3-ball cascade juggling task. Participants will receive verbal instruction and a demonstration of the 3-ball cascade juggling task. The lesson was created from the learning protocol content analysis and consists of a learning progression which transitions from 1-Ball practice to 3-Ball practice. Below outlines the key instructional points for cognitive coaching. Each component will be taught in approximately 2-4 minutes during the cognitive lesson.

1. Stance
   - Feet shoulder-width apart, relaxed stance, relaxed shoulders, arms at 90° angel.
2. 1-Ball practice
   - One ball in dominant hand.
   - Line of vision will be up and forward.
   - Focus is on consistency of the arc of the parabola at eye-level up to 3-feet above the head.
3. 2-Ball practice
   - One ball in each hand.
   - Instruction on hand placement and throwing.
     - E.g., as the first ball drops from the arc, throw the second ball.
     - Practice with dominant hand throwing.
     - Practice with non-dominant hand throwing.
4. 3-Ball practice
   - Instruction on flight pattern
     - The balls will move in a sideways figure-8; infinity sign (∞).
   - Instruction on placement of two balls in dominate hand.
   - Instruction on a 1-Ball throw with three balls in hands.
   - Instruction on 2-Ball throwing with three balls in hands.
   - Instruction on 3-Ball throwing with three balls in hands.

At the conclusion of the 3-Ball throwing instruction, participant will begin the first practice session.

Appendix I

CONTROL GROUP – LEARNING INTERVENTION PACKET

Juggling Skill Acquisition Packet

Participant Name: _____

Participant G#: _____

PRE-ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

Session 1: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning.*				
Session Goal:	**Practice**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	○ New Record	**Trial 125**	CPA:	○ New Record
Trial 82	CPA:	○ New Record	**Trial 126**	CPA:	○ New Record
Trial 83	CPA:	○ New Record	**Trial 127**	CPA:	○ New Record
Trial 84	CPA:	○ New Record	**Trial 128**	CPA:	○ New Record
Trial 85	CPA:	○ New Record	**Trial 129**	CPA:	○ New Record
Trial 86	CPA:	○ New Record	**Trial 130**	CPA:	○ New Record
Trial 87	CPA:	○ New Record	**Trial 131**	CPA:	○ New Record
Trial 88	CPA:	○ New Record	**Trial 132**	CPA:	○ New Record
Trial 89	CPA:	○ New Record	**Trial 133**	CPA:	○ New Record
Trial 90	CPA:	○ New Record	**Trial 134**	CPA:	○ New Record
Trial 91	CPA:	○ New Record	**Trial 135**	CPA:	○ New Record
Trial 92	CPA:	○ New Record	**Trial 136**	CPA:	○ New Record
Trial 93	CPA:	○ New Record	**Trial 137**	CPA:	○ New Record
Trial 94	CPA:	○ New Record	**Trial 138**	CPA:	○ New Record
Trial 95	CPA:	○ New Record	**Trial 139**	CPA:	○ New Record
Trial 96	CPA:	○ New Record	**Trial 140**	CPA:	○ New Record
Trial 97	CPA:	○ New Record	**Trial 141**	CPA:	○ New Record
Trial 98	CPA:	○ New Record	**Trial 142**	CPA:	○ New Record
Trial 99	CPA:	○ New Record	**Trial 143**	CPA:	○ New Record
Trial 100	CPA:	○ New Record	**Trial 144**	CPA:	○ New Record
Trial 101	CPA:	○ New Record	**Trial 145**	CPA:	○ New Record
Trial 102	CPA:	○ New Record	**Trial 146**	CPA:	○ New Record
Trial 103	CPA:	○ New Record	**Trial 147**	CPA:	○ New Record
Trial 104	CPA:	○ New Record	**Trial 148**	CPA:	○ New Record
Trial 105	CPA:	○ New Record	**Trial 149**	CPA:	○ New Record
Trial 106	CPA:	○ New Record	**Trial 150**	CPA:	○ New Record
Trial 107	CPA:	○ New Record	**Time Completed:**		
Trial 108	CPA:	○ New Record			
Trial 109	CPA:	○ New Record	**Notes:**		
Trial 110	CPA:	○ New Record			
Trial 111	CPA:	○ New Record	**Average CPA:** _____		
Trial 112	CPA:	○ New Record			
Trial 113	CPA:	○ New Record			
Trial 114	CPA:	○ New Record			
Trial 115	CPA:	○ New Record			
Trial 116	CPA:	○ New Record			
Trial 117	CPA:	○ New Record			
Trial 118	CPA:	○ New Record			
Trial 119	CPA:	○ New Record			
Trial 120	CPA:	○ New Record			
Trial 121	CPA:	○ New Record			
Trial 122	CPA:	○ New Record			
Trial 123	CPA:	○ New Record			
Trial 124	CPA:	○ New Record			

Session 2: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning.*				
Session Goal:	**Practice**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	○ New Record	**Trial 125**	CPA:	○ New Record
Trial 82	CPA:	○ New Record	**Trial 126**	CPA:	○ New Record
Trial 83	CPA:	○ New Record	**Trial 127**	CPA:	○ New Record
Trial 84	CPA:	○ New Record	**Trial 128**	CPA:	○ New Record
Trial 85	CPA:	○ New Record	**Trial 129**	CPA:	○ New Record
Trial 86	CPA:	○ New Record	**Trial 130**	CPA:	○ New Record
Trial 87	CPA:	○ New Record	**Trial 131**	CPA:	○ New Record
Trial 88	CPA:	○ New Record	**Trial 132**	CPA:	○ New Record
Trial 89	CPA:	○ New Record	**Trial 133**	CPA:	○ New Record
Trial 90	CPA:	○ New Record	**Trial 134**	CPA:	○ New Record
Trial 91	CPA:	○ New Record	**Trial 135**	CPA:	○ New Record
Trial 92	CPA:	○ New Record	**Trial 136**	CPA:	○ New Record
Trial 93	CPA:	○ New Record	**Trial 137**	CPA:	○ New Record
Trial 94	CPA:	○ New Record	**Trial 138**	CPA:	○ New Record
Trial 95	CPA:	○ New Record	**Trial 139**	CPA:	○ New Record
Trial 96	CPA:	○ New Record	**Trial 140**	CPA:	○ New Record
Trial 97	CPA:	○ New Record	**Trial 141**	CPA:	○ New Record
Trial 98	CPA:	○ New Record	**Trial 142**	CPA:	○ New Record
Trial 99	CPA:	○ New Record	**Trial 143**	CPA:	○ New Record
Trial 100	CPA:	○ New Record	**Trial 144**	CPA:	○ New Record
Trial 101	CPA:	○ New Record	**Trial 145**	CPA:	○ New Record
Trial 102	CPA:	○ New Record	**Trial 146**	CPA:	○ New Record
Trial 103	CPA:	○ New Record	**Trial 147**	CPA:	○ New Record
Trial 104	CPA:	○ New Record	**Trial 148**	CPA:	○ New Record
Trial 105	CPA:	○ New Record	**Trial 149**	CPA:	○ New Record
Trial 106	CPA:	○ New Record	**Trial 150**	CPA:	○ New Record
Trial 107	CPA:	○ New Record	**Time Completed:**		
Trial 108	CPA:	○ New Record			
Trial 109	CPA:	○ New Record	**Notes:**		
Trial 110	CPA:	○ New Record			
Trial 111	CPA:	○ New Record	**Average CPA**: _____		
Trial 112	CPA:	○ New Record			
Trial 113	CPA:	○ New Record			
Trial 114	CPA:	○ New Record			
Trial 115	CPA:	○ New Record			
Trial 116	CPA:	○ New Record			
Trial 117	CPA:	○ New Record			
Trial 118	CPA:	○ New Record			
Trial 119	CPA:	○ New Record			
Trial 120	CPA:	○ New Record			
Trial 121	CPA:	○ New Record			
Trial 122	CPA:	○ New Record			
Trial 123	CPA:	○ New Record			
Trial 124	CPA:	○ New Record			

Session 3: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning.*				
Session Goal:	**Practice**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	○ New Record	**Trial 125**	CPA:	○ New Record
Trial 82	CPA:	○ New Record	**Trial 126**	CPA:	○ New Record
Trial 83	CPA:	○ New Record	**Trial 127**	CPA:	○ New Record
Trial 84	CPA:	○ New Record	**Trial 128**	CPA:	○ New Record
Trial 85	CPA:	○ New Record	**Trial 129**	CPA:	○ New Record
Trial 86	CPA:	○ New Record	**Trial 130**	CPA:	○ New Record
Trial 87	CPA:	○ New Record	**Trial 131**	CPA:	○ New Record
Trial 88	CPA:	○ New Record	**Trial 132**	CPA:	○ New Record
Trial 89	CPA:	○ New Record	**Trial 133**	CPA:	○ New Record
Trial 90	CPA:	○ New Record	**Trial 134**	CPA:	○ New Record
Trial 91	CPA:	○ New Record	**Trial 135**	CPA:	○ New Record
Trial 92	CPA:	○ New Record	**Trial 136**	CPA:	○ New Record
Trial 93	CPA:	○ New Record	**Trial 137**	CPA:	○ New Record
Trial 94	CPA:	○ New Record	**Trial 138**	CPA:	○ New Record
Trial 95	CPA:	○ New Record	**Trial 139**	CPA:	○ New Record
Trial 96	CPA:	○ New Record	**Trial 140**	CPA:	○ New Record
Trial 97	CPA:	○ New Record	**Trial 141**	CPA:	○ New Record
Trial 98	CPA:	○ New Record	**Trial 142**	CPA:	○ New Record
Trial 99	CPA:	○ New Record	**Trial 143**	CPA:	○ New Record
Trial 100	CPA:	○ New Record	**Trial 144**	CPA:	○ New Record
Trial 101	CPA:	○ New Record	**Trial 145**	CPA:	○ New Record
Trial 102	CPA:	○ New Record	**Trial 146**	CPA:	○ New Record
Trial 103	CPA:	○ New Record	**Trial 147**	CPA:	○ New Record
Trial 104	CPA:	○ New Record	**Trial 148**	CPA:	○ New Record
Trial 105	CPA:	○ New Record	**Trial 149**	CPA:	○ New Record
Trial 106	CPA:	○ New Record	**Trial 150**	CPA:	○ New Record
Trial 107	CPA:	○ New Record	**Time Completed:**		
Trial 108	CPA:	○ New Record			
Trial 109	CPA:	○ New Record	**Notes:**		
Trial 110	CPA:	○ New Record			
Trial 111	CPA:	○ New Record	**Average CPA**: _____		
Trial 112	CPA:	○ New Record			
Trial 113	CPA:	○ New Record			
Trial 114	CPA:	○ New Record			
Trial 115	CPA:	○ New Record			
Trial 116	CPA:	○ New Record			
Trial 117	CPA:	○ New Record			
Trial 118	CPA:	○ New Record			
Trial 119	CPA:	○ New Record			
Trial 120	CPA:	○ New Record			
Trial 121	CPA:	○ New Record			
Trial 122	CPA:	○ New Record			
Trial 123	CPA:	○ New Record			
Trial 124	CPA:	○ New Record			

MID-ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

Session 4: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning.*				
Session Goal:	**Practice**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	○ New Record	**Trial 125**	CPA:	○ New Record
Trial 82	CPA:	○ New Record	**Trial 126**	CPA:	○ New Record
Trial 83	CPA:	○ New Record	**Trial 127**	CPA:	○ New Record
Trial 84	CPA:	○ New Record	**Trial 128**	CPA:	○ New Record
Trial 85	CPA:	○ New Record	**Trial 129**	CPA:	○ New Record
Trial 86	CPA:	○ New Record	**Trial 130**	CPA:	○ New Record
Trial 87	CPA:	○ New Record	**Trial 131**	CPA:	○ New Record
Trial 88	CPA:	○ New Record	**Trial 132**	CPA:	○ New Record
Trial 89	CPA:	○ New Record	**Trial 133**	CPA:	○ New Record
Trial 90	CPA:	○ New Record	**Trial 134**	CPA:	○ New Record
Trial 91	CPA:	○ New Record	**Trial 135**	CPA:	○ New Record
Trial 92	CPA:	○ New Record	**Trial 136**	CPA:	○ New Record
Trial 93	CPA:	○ New Record	**Trial 137**	CPA:	○ New Record
Trial 94	CPA:	○ New Record	**Trial 138**	CPA:	○ New Record
Trial 95	CPA:	○ New Record	**Trial 139**	CPA:	○ New Record
Trial 96	CPA:	○ New Record	**Trial 140**	CPA:	○ New Record
Trial 97	CPA:	○ New Record	**Trial 141**	CPA:	○ New Record
Trial 98	CPA:	○ New Record	**Trial 142**	CPA:	○ New Record
Trial 99	CPA:	○ New Record	**Trial 143**	CPA:	○ New Record
Trial 100	CPA:	○ New Record	**Trial 144**	CPA:	○ New Record
Trial 101	CPA:	○ New Record	**Trial 145**	CPA:	○ New Record
Trial 102	CPA:	○ New Record	**Trial 146**	CPA:	○ New Record
Trial 103	CPA:	○ New Record	**Trial 147**	CPA:	○ New Record
Trial 104	CPA:	○ New Record	**Trial 148**	CPA:	○ New Record
Trial 105	CPA:	○ New Record	**Trial 149**	CPA:	○ New Record
Trial 106	CPA:	○ New Record	**Trial 150**	CPA:	○ New Record
Trial 107	CPA:	○ New Record	**Time Completed:**		
Trial 108	CPA:	○ New Record			
Trial 109	CPA:	○ New Record	**Notes:**		
Trial 110	CPA:	○ New Record			
Trial 111	CPA:	○ New Record	**Average CPA:** _____		
Trial 112	CPA:	○ New Record			
Trial 113	CPA:	○ New Record			
Trial 114	CPA:	○ New Record			
Trial 115	CPA:	○ New Record			
Trial 116	CPA:	○ New Record			
Trial 117	CPA:	○ New Record			
Trial 118	CPA:	○ New Record			
Trial 119	CPA:	○ New Record			
Trial 120	CPA:	○ New Record			
Trial 121	CPA:	○ New Record			
Trial 122	CPA:	○ New Record			
Trial 123	CPA:	○ New Record			
Trial 124	CPA:	○ New Record			

Session 5: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning.*				
Session Goal:	**Practice**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	○ New Record	**Trial 125**	CPA:	○ New Record
Trial 82	CPA:	○ New Record	**Trial 126**	CPA:	○ New Record
Trial 83	CPA:	○ New Record	**Trial 127**	CPA:	○ New Record
Trial 84	CPA:	○ New Record	**Trial 128**	CPA:	○ New Record
Trial 85	CPA:	○ New Record	**Trial 129**	CPA:	○ New Record
Trial 86	CPA:	○ New Record	**Trial 130**	CPA:	○ New Record
Trial 87	CPA:	○ New Record	**Trial 131**	CPA:	○ New Record
Trial 88	CPA:	○ New Record	**Trial 132**	CPA:	○ New Record
Trial 89	CPA:	○ New Record	**Trial 133**	CPA:	○ New Record
Trial 90	CPA:	○ New Record	**Trial 134**	CPA:	○ New Record
Trial 91	CPA:	○ New Record	**Trial 135**	CPA:	○ New Record
Trial 92	CPA:	○ New Record	**Trial 136**	CPA:	○ New Record
Trial 93	CPA:	○ New Record	**Trial 137**	CPA:	○ New Record
Trial 94	CPA:	○ New Record	**Trial 138**	CPA:	○ New Record
Trial 95	CPA:	○ New Record	**Trial 139**	CPA:	○ New Record
Trial 96	CPA:	○ New Record	**Trial 140**	CPA:	○ New Record
Trial 97	CPA:	○ New Record	**Trial 141**	CPA:	○ New Record
Trial 98	CPA:	○ New Record	**Trial 142**	CPA:	○ New Record
Trial 99	CPA:	○ New Record	**Trial 143**	CPA:	○ New Record
Trial 100	CPA:	○ New Record	**Trial 144**	CPA:	○ New Record
Trial 101	CPA:	○ New Record	**Trial 145**	CPA:	○ New Record
Trial 102	CPA:	○ New Record	**Trial 146**	CPA:	○ New Record
Trial 103	CPA:	○ New Record	**Trial 147**	CPA:	○ New Record
Trial 104	CPA:	○ New Record	**Trial 148**	CPA:	○ New Record
Trial 105	CPA:	○ New Record	**Trial 149**	CPA:	○ New Record
Trial 106	CPA:	○ New Record	**Trial 150**	CPA:	○ New Record
Trial 107	CPA:	○ New Record	**Time Completed:**		
Trial 108	CPA:	○ New Record			
Trial 109	CPA:	○ New Record	**Notes:**		
Trial 110	CPA:	○ New Record			
Trial 111	CPA:	○ New Record	**Average CPA:** _____		
Trial 112	CPA:	○ New Record			
Trial 113	CPA:	○ New Record			
Trial 114	CPA:	○ New Record			
Trial 115	CPA:	○ New Record			
Trial 116	CPA:	○ New Record			
Trial 117	CPA:	○ New Record			
Trial 118	CPA:	○ New Record			
Trial 119	CPA:	○ New Record			
Trial 120	CPA:	○ New Record			
Trial 121	CPA:	○ New Record			
Trial 122	CPA:	○ New Record			
Trial 123	CPA:	○ New Record			
Trial 124	CPA:	○ New Record			

Session 6: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning.*				
Session Goal:	**Practice**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	○ New Record	**Trial 125**	CPA:	○ New Record
Trial 82	CPA:	○ New Record	**Trial 126**	CPA:	○ New Record
Trial 83	CPA:	○ New Record	**Trial 127**	CPA:	○ New Record
Trial 84	CPA:	○ New Record	**Trial 128**	CPA:	○ New Record
Trial 85	CPA:	○ New Record	**Trial 129**	CPA:	○ New Record
Trial 86	CPA:	○ New Record	**Trial 130**	CPA:	○ New Record
Trial 87	CPA:	○ New Record	**Trial 131**	CPA:	○ New Record
Trial 88	CPA:	○ New Record	**Trial 132**	CPA:	○ New Record
Trial 89	CPA:	○ New Record	**Trial 133**	CPA:	○ New Record
Trial 90	CPA:	○ New Record	**Trial 134**	CPA:	○ New Record
Trial 91	CPA:	○ New Record	**Trial 135**	CPA:	○ New Record
Trial 92	CPA:	○ New Record	**Trial 136**	CPA:	○ New Record
Trial 93	CPA:	○ New Record	**Trial 137**	CPA:	○ New Record
Trial 94	CPA:	○ New Record	**Trial 138**	CPA:	○ New Record
Trial 95	CPA:	○ New Record	**Trial 139**	CPA:	○ New Record
Trial 96	CPA:	○ New Record	**Trial 140**	CPA:	○ New Record
Trial 97	CPA:	○ New Record	**Trial 141**	CPA:	○ New Record
Trial 98	CPA:	○ New Record	**Trial 142**	CPA:	○ New Record
Trial 99	CPA:	○ New Record	**Trial 143**	CPA:	○ New Record
Trial 100	CPA:	○ New Record	**Trial 144**	CPA:	○ New Record
Trial 101	CPA:	○ New Record	**Trial 145**	CPA:	○ New Record
Trial 102	CPA:	○ New Record	**Trial 146**	CPA:	○ New Record
Trial 103	CPA:	○ New Record	**Trial 147**	CPA:	○ New Record
Trial 104	CPA:	○ New Record	**Trial 148**	CPA:	○ New Record
Trial 105	CPA:	○ New Record	**Trial 149**	CPA:	○ New Record
Trial 106	CPA:	○ New Record	**Trial 150**	CPA:	○ New Record
Trial 107	CPA:	○ New Record	**Time Completed:**		
Trial 108	CPA:	○ New Record			
Trial 109	CPA:	○ New Record	**Notes:**		
Trial 110	CPA:	○ New Record			
Trial 111	CPA:	○ New Record	**Average CPA**: _____		
Trial 112	CPA:	○ New Record			
Trial 113	CPA:	○ New Record			
Trial 114	CPA:	○ New Record			
Trial 115	CPA:	○ New Record			
Trial 116	CPA:	○ New Record			
Trial 117	CPA:	○ New Record			
Trial 118	CPA:	○ New Record			
Trial 119	CPA:	○ New Record			
Trial 120	CPA:	○ New Record			
Trial 121	CPA:	○ New Record			
Trial 122	CPA:	○ New Record			
Trial 123	CPA:	○ New Record			
Trial 124	CPA:	○ New Record			

POST-ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

_____

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

First Direction:

*Take two minutes to practice the 3-ball cascade juggling **transfer** task to get warmed up for your assessment.*

TRANSFER-TASK ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

Appendix J

EXPERIMENTAL GROUP – LEARNING INTERVENTION PACKET

Juggling Skill Acquisition Packet

Participant Name: _____

Participant G#: _____

PRE-ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

Session 1: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning. Check the success box when the learner successfully attains the session goal.*				
Session Goal:	**Visual Gaze**				
Trial 1	CPA:	o Successful	**Trial 41**	CPA:	o Successful
Trial 2	CPA:	o Successful	**Trial 42**	CPA:	o Successful
Trial 3	CPA:	o Successful	**Trial 43**	CPA:	o Successful
Trial 4	CPA:	o Successful	**Trial 44**	CPA:	o Successful
Trial 5	CPA:	o Successful	**Trial 45**	CPA:	o Successful
Trial 6	CPA:	o Successful	**Trial 46**	CPA:	o Successful
Trial 7	CPA:	o Successful	**Trial 47**	CPA:	o Successful
Trial 8	CPA:	o Successful	**Trial 48**	CPA:	o Successful
Trial 9	CPA:	o Successful	**Trial 49**	CPA:	o Successful
Trial 10	CPA:	o Successful	**Trial 50**	CPA:	o Successful
Trial 11	CPA:	o Successful	**Trial 51**	CPA:	o Successful
Trial 12	CPA:	o Successful	**Trial 52**	CPA:	o Successful
Trial 13	CPA:	o Successful	**Trial 53**	CPA:	o Successful
Trial 14	CPA:	o Successful	**Trial 54**	CPA:	o Successful
Trial 15	CPA:	o Successful	**Trial 55**	CPA:	o Successful
Trial 16	CPA:	o Successful	**Trial 56**	CPA:	o Successful
Trial 17	CPA:	o Successful	**Trial 57**	CPA:	o Successful
Trial 18	CPA:	o Successful	**Trial 58**	CPA:	o Successful
Trial 19	CPA:	o Successful	**Trial 59**	CPA:	o Successful
Trial 20	CPA:	o Successful	**Trial 60**	CPA:	o Successful
Trial 21	CPA:	o Successful	**Trial 61**	CPA:	o Successful
Trial 22	CPA:	o Successful	**Trial 62**	CPA:	o Successful
Trial 23	CPA:	o Successful	**Trial 63**	CPA:	o Successful
Trial 24	CPA:	o Successful	**Trial 64**	CPA:	o Successful
Trial 25	CPA:	o Successful	**Trial 65**	CPA:	o Successful
Trial 26	CPA:	o Successful	**Trial 66**	CPA:	o Successful
Trial 27	CPA:	o Successful	**Trial 67**	CPA:	o Successful
Trial 28	CPA:	o Successful	**Trial 68**	CPA:	o Successful
Trial 29	CPA:	o Successful	**Trial 69**	CPA:	o Successful
Trial 30	CPA:	o Successful	**Trial 70**	CPA:	o Successful
Trial 31	CPA:	o Successful	**Trial 71**	CPA:	o Successful
Trial 32	CPA:	o Successful	**Trial 72**	CPA:	o Successful
Trial 33	CPA:	o Successful	**Trial 73**	CPA:	o Successful
Trial 34	CPA:	o Successful	**Trial 74**	CPA:	o Successful
Trial 35	CPA:	o Successful	**Trial 75**	CPA:	o Successful
Trial 36	CPA:	o Successful	**Trial 76**	CPA:	o Successful
Trial 37	CPA:	o Successful	**Trial 77**	CPA:	o Successful
Trial 38	CPA:	o Successful	**Trial 78**	CPA:	o Successful
Trial 39	CPA:	o Successful	**Trial 79**	CPA:	o Successful
Trial 40	CPA:	o Successful	**Trial 80**	CPA:	o Successful

Trial 81	CPA:	o Successful	**Trial 125**	CPA:	o Successful
Trial 82	CPA:	o Successful	**Trial 126**	CPA:	o Successful
Trial 83	CPA:	o Successful	**Trial 127**	CPA:	o Successful
Trial 84	CPA:	o Successful	**Trial 128**	CPA:	o Successful
Trial 85	CPA:	o Successful	**Trial 129**	CPA:	o Successful
Trial 86	CPA:	o Successful	**Trial 130**	CPA:	o Successful
Trial 87	CPA:	o Successful	**Trial 131**	CPA:	o Successful
Trial 88	CPA:	o Successful	**Trial 132**	CPA:	o Successful
Trial 89	CPA:	o Successful	**Trial 133**	CPA:	o Successful
Trial 90	CPA:	o Successful	**Trial 134**	CPA:	o Successful
Trial 91	CPA:	o Successful	**Trial 135**	CPA:	o Successful
Trial 92	CPA:	o Successful	**Trial 136**	CPA:	o Successful
Trial 93	CPA:	o Successful	**Trial 137**	CPA:	o Successful
Trial 94	CPA:	o Successful	**Trial 138**	CPA:	o Successful
Trial 95	CPA:	o Successful	**Trial 139**	CPA:	o Successful
Trial 96	CPA:	o Successful	**Trial 140**	CPA:	o Successful
Trial 97	CPA:	o Successful	**Trial 141**	CPA:	o Successful
Trial 98	CPA:	o Successful	**Trial 142**	CPA:	o Successful
Trial 99	CPA:	o Successful	**Trial 143**	CPA:	o Successful
Trial 100	CPA:	o Successful	**Trial 144**	CPA:	o Successful
Trial 101	CPA:	o Successful	**Trial 145**	CPA:	o Successful
Trial 102	CPA:	o Successful	**Trial 146**	CPA:	o Successful
Trial 103	CPA:	o Successful	**Trial 147**	CPA:	o Successful
Trial 104	CPA:	o Successful	**Trial 148**	CPA:	o Successful
Trial 105	CPA:	o Successful	**Trial 149**	CPA:	o Successful
Trial 106	CPA:	o Successful	**Trial 150**	CPA:	o Successful
Trial 107	CPA:	o Successful	**Time Completed:**		
Trial 108	CPA:	o Successful			
Trial 109	CPA:	o Successful	**Notes:**		
Trial 110	CPA:	o Successful			
Trial 111	CPA:	o Successful	**Average CPA:** _____		
Trial 112	CPA:	o Successful			
Trial 113	CPA:	o Successful	**Goal Attainment:**		
Trial 114	CPA:	o Successful			
Trial 115	CPA:	o Successful	**Total:** #_____		
Trial 116	CPA:	o Successful			
Trial 117	CPA:	o Successful	**Percent:** _____%		
Trial 118	CPA:	o Successful			
Trial 119	CPA:	o Successful			
Trial 120	CPA:	o Successful			
Trial 121	CPA:	o Successful			
Trial 122	CPA:	o Successful			
Trial 123	CPA:	o Successful			
Trial 124	CPA:	o Successful			

Session 1: Juggling Learning Guide

Directions	*Use this sheet to help keep track of your learning. Use the space below to assess your progress.*
Session Goal:	**Visual Gaze**

The goal for Session 1 is to attain Visual Gaze (VG).

VG is a goal that focuses on one's vision toward the arc of the ball flight (and not looking at the hands).

1. Strategic Cues for VG are vision forward, look up, arc at eye-level, and consistency of arc height.
2. Error Cue for VG is looking at hands.

Trial 1:

Refer to Prompt 1 on the scale:
How often do you think you will attain your goal for the session?

Perceived Goal Attainment: _____

What cues do you plan to use during the session? Check all that apply:

- ☐ vision forward
- ☐ look up
- ☐ arc at eye-level
- ☐ consistency of arc height
- ☐ other: _____

Trial 75:

Refer to Prompt 1 on the scale:
How often do you think you have attained your goal so far in the session?

Perceived Goal Attainment: _____

What cues have been the most helpful so far in your learning? Check all that apply:

- ☐ vision forward
- ☐ look up
- ☐ arc at eye-level
- ☐ consistency of arc height
- ☐ Other: _____

Trial 150:

Refer to Prompt 1 on the scale:
How often do you think you have attained your goal for the entire session?

Perceived Goal Attainment: _____

What cues were the most helpful during your learning for the entire session? Check all that apply:

- ☐ vision forward
- ☐ look up
- ☐ arc at eye-level
- ☐ consistency of arc height
- ☐ other: _____

Session 1: Juggling Learning Guide	
Directions	*Carefully read through each question and respond to the best of your ability. There are not right or wrong answers.*

Take a moment to evaluate your goal for this session.
Overall, do you feel like you attained the goal for the session?

Did you set any other goal(s) outside the goal for the session?

Did you change your strategy throughout the session? What did you change?

Take a moment to evaluate your performance for the session.
What went well?

Why do you think you performed well?

Take a moment to evaluate your performance for the session.
What went poorly?

Why do you think you performed poorly?

Refer to Prompt 2 on the scale:
How satisfied are you with your performance for this session?

Perceived Satisfaction: _____

Why?

What would you have done differently during the session?

Session 2: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning. Check the success box when the learner successfully attains the session goal.*				
Session Goal:	**Catch-and-Release Patterning**				
Trial 1	CPA:	o Successful	**Trial 41**	CPA:	o Successful
Trial 2	CPA:	o Successful	**Trial 42**	CPA:	o Successful
Trial 3	CPA:	o Successful	**Trial 43**	CPA:	o Successful
Trial 4	CPA:	o Successful	**Trial 44**	CPA:	o Successful
Trial 5	CPA:	o Successful	**Trial 45**	CPA:	o Successful
Trial 6	CPA:	o Successful	**Trial 46**	CPA:	o Successful
Trial 7	CPA:	o Successful	**Trial 47**	CPA:	o Successful
Trial 8	CPA:	o Successful	**Trial 48**	CPA:	o Successful
Trial 9	CPA:	o Successful	**Trial 49**	CPA:	o Successful
Trial 10	CPA:	o Successful	**Trial 50**	CPA:	o Successful
Trial 11	CPA:	o Successful	**Trial 51**	CPA:	o Successful
Trial 12	CPA:	o Successful	**Trial 52**	CPA:	o Successful
Trial 13	CPA:	o Successful	**Trial 53**	CPA:	o Successful
Trial 14	CPA:	o Successful	**Trial 54**	CPA:	o Successful
Trial 15	CPA:	o Successful	**Trial 55**	CPA:	o Successful
Trial 16	CPA:	o Successful	**Trial 56**	CPA:	o Successful
Trial 17	CPA:	o Successful	**Trial 57**	CPA:	o Successful
Trial 18	CPA:	o Successful	**Trial 58**	CPA:	o Successful
Trial 19	CPA:	o Successful	**Trial 59**	CPA:	o Successful
Trial 20	CPA:	o Successful	**Trial 60**	CPA:	o Successful
Trial 21	CPA:	o Successful	**Trial 61**	CPA:	o Successful
Trial 22	CPA:	o Successful	**Trial 62**	CPA:	o Successful
Trial 23	CPA:	o Successful	**Trial 63**	CPA:	o Successful
Trial 24	CPA:	o Successful	**Trial 64**	CPA:	o Successful
Trial 25	CPA:	o Successful	**Trial 65**	CPA:	o Successful
Trial 26	CPA:	o Successful	**Trial 66**	CPA:	o Successful
Trial 27	CPA:	o Successful	**Trial 67**	CPA:	o Successful
Trial 28	CPA:	o Successful	**Trial 68**	CPA:	o Successful
Trial 29	CPA:	o Successful	**Trial 69**	CPA:	o Successful
Trial 30	CPA:	o Successful	**Trial 70**	CPA:	o Successful
Trial 31	CPA:	o Successful	**Trial 71**	CPA:	o Successful
Trial 32	CPA:	o Successful	**Trial 72**	CPA:	o Successful
Trial 33	CPA:	o Successful	**Trial 73**	CPA:	o Successful
Trial 34	CPA:	o Successful	**Trial 74**	CPA:	o Successful
Trial 35	CPA:	o Successful	**Trial 75**	CPA:	o Successful
Trial 36	CPA:	o Successful	**Trial 76**	CPA:	o Successful
Trial 37	CPA:	o Successful	**Trial 77**	CPA:	o Successful
Trial 38	CPA:	o Successful	**Trial 78**	CPA:	o Successful
Trial 39	CPA:	o Successful	**Trial 79**	CPA:	o Successful
Trial 40	CPA:	o Successful	**Trial 80**	CPA:	o Successful

Trial 81	CPA:	o Successful	**Trial 125**	CPA:	o Successful
Trial 82	CPA:	o Successful	**Trial 126**	CPA:	o Successful
Trial 83	CPA:	o Successful	**Trial 127**	CPA:	o Successful
Trial 84	CPA:	o Successful	**Trial 128**	CPA:	o Successful
Trial 85	CPA:	o Successful	**Trial 129**	CPA:	o Successful
Trial 86	CPA:	o Successful	**Trial 130**	CPA:	o Successful
Trial 87	CPA:	o Successful	**Trial 131**	CPA:	o Successful
Trial 88	CPA:	o Successful	**Trial 132**	CPA:	o Successful
Trial 89	CPA:	o Successful	**Trial 133**	CPA:	o Successful
Trial 90	CPA:	o Successful	**Trial 134**	CPA:	o Successful
Trial 91	CPA:	o Successful	**Trial 135**	CPA:	o Successful
Trial 92	CPA:	o Successful	**Trial 136**	CPA:	o Successful
Trial 93	CPA:	o Successful	**Trial 137**	CPA:	o Successful
Trial 94	CPA:	o Successful	**Trial 138**	CPA:	o Successful
Trial 95	CPA:	o Successful	**Trial 139**	CPA:	o Successful
Trial 96	CPA:	o Successful	**Trial 140**	CPA:	o Successful
Trial 97	CPA:	o Successful	**Trial 141**	CPA:	o Successful
Trial 98	CPA:	o Successful	**Trial 142**	CPA:	o Successful
Trial 99	CPA:	o Successful	**Trial 143**	CPA:	o Successful
Trial 100	CPA:	o Successful	**Trial 144**	CPA:	o Successful
Trial 101	CPA:	o Successful	**Trial 145**	CPA:	o Successful
Trial 102	CPA:	o Successful	**Trial 146**	CPA:	o Successful
Trial 103	CPA:	o Successful	**Trial 147**	CPA:	o Successful
Trial 104	CPA:	o Successful	**Trial 148**	CPA:	o Successful
Trial 105	CPA:	o Successful	**Trial 149**	CPA:	o Successful
Trial 106	CPA:	o Successful	**Trial 150**	CPA:	o Successful
Trial 107	CPA:	o Successful	**Time Completed:**		
Trial 108	CPA:	o Successful			
Trial 109	CPA:	o Successful	**Notes:**		
Trial 110	CPA:	o Successful			
Trial 111	CPA:	o Successful	**Average CPA:** _____		
Trial 112	CPA:	o Successful			
Trial 113	CPA:	o Successful	**Goal Attainment:**		
Trial 114	CPA:	o Successful			
Trial 115	CPA:	o Successful	**Total:** #_____		
Trial 116	CPA:	o Successful			
Trial 117	CPA:	o Successful	**Percent:** _____%		
Trial 118	CPA:	o Successful			
Trial 119	CPA:	o Successful			
Trial 120	CPA:	o Successful			
Trial 121	CPA:	o Successful			
Trial 122	CPA:	o Successful			
Trial 123	CPA:	o Successful			
Trial 124	CPA:	o Successful			

Session 2: Juggling Learning Guide

Directions	*Use this sheet to help keep track of your learning. Use the space below to assess your progress.*
Session Goal:	**Catch-and-Release Patterning**

The goal for Session 2 is to attain Catch-and-Release Patterning (CRP).

CRP is a goal that refers how you are releasing (i.e., "putting" the ball as compared to flicking or rolling) and catching (cushioning the ball as compared to grabbing the ball) the balls.

1. Strategic Cues for CRP are open hand position, circular motion of the hands, put the ball, and cushion the ball.
2. Error Cues for CRP are flicking the ball/ rolling the ball and grabbing at the ball.

Trial 1:

Refer to Prompt 1 on the scale:
How often do you think you will attain your goal for the session?

Perceived Goal Attainment: _____

What cues do you plan to use during the session? Check all that apply:

- ☐ open hand position
- ☐ circular motion of the hands
- ☐ put the ball
- ☐ cushion the ball
- ☐ other: _____

Trial 75:

Refer to Prompt 1 on the scale:
How often do you think you have attained your goal so far in the session?

Perceived Goal Attainment: _____

What cues have been the most helpful so far in your learning? Check all that apply:

- ☐ open hand position
- ☐ circular motion of the hands
- ☐ put the ball
- ☐ cushion the ball
- ☐ other: _____

Trial 150:

Refer to Prompt 1 on the scale:
How often do you think you have attained your goal for the entire session?

Perceived Goal Attainment: _____

What cues were the most helpful during your learning for the entire session? Check all that apply:

- ☐ open hand position
- ☐ circular motion of the hands
- ☐ put the ball
- ☐ cushion the ball
- ☐ other: _____

Session 2: Juggling Learning Guide	
Directions	*Carefully read through each question and respond to the best of your ability. There are not right or wrong answers.*

Take a moment to evaluate your goal for this session.
Overall, do you feel like you attained the goal for the session?

Did you set any other goal(s) outside the goal for the session?

Did you change your strategy throughout the session? What did you change?

Take a moment to evaluate your performance for the session.
What went well?

Why do you think you performed well?

Take a moment to evaluate your performance for the session.
What went poorly?

Why do you think you performed poorly?

Refer to Prompt 2 on the scale:
How satisfied are you with your performance for this session?

Perceived Satisfaction: _____

Why?

What would you have done differently during the session?

Session 3: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning. Check the success box when the learner successfully attains the session goal.*				
Session Goal:	**Stance for Control**				
Trial 1	CPA:	o Successful	**Trial 41**	CPA:	o Successful
Trial 2	CPA:	o Successful	**Trial 42**	CPA:	o Successful
Trial 3	CPA:	o Successful	**Trial 43**	CPA:	o Successful
Trial 4	CPA:	o Successful	**Trial 44**	CPA:	o Successful
Trial 5	CPA:	o Successful	**Trial 45**	CPA:	o Successful
Trial 6	CPA:	o Successful	**Trial 46**	CPA:	o Successful
Trial 7	CPA:	o Successful	**Trial 47**	CPA:	o Successful
Trial 8	CPA:	o Successful	**Trial 48**	CPA:	o Successful
Trial 9	CPA:	o Successful	**Trial 49**	CPA:	o Successful
Trial 10	CPA:	o Successful	**Trial 50**	CPA:	o Successful
Trial 11	CPA:	o Successful	**Trial 51**	CPA:	o Successful
Trial 12	CPA:	o Successful	**Trial 52**	CPA:	o Successful
Trial 13	CPA:	o Successful	**Trial 53**	CPA:	o Successful
Trial 14	CPA:	o Successful	**Trial 54**	CPA:	o Successful
Trial 15	CPA:	o Successful	**Trial 55**	CPA:	o Successful
Trial 16	CPA:	o Successful	**Trial 56**	CPA:	o Successful
Trial 17	CPA:	o Successful	**Trial 57**	CPA:	o Successful
Trial 18	CPA:	o Successful	**Trial 58**	CPA:	o Successful
Trial 19	CPA:	o Successful	**Trial 59**	CPA:	o Successful
Trial 20	CPA:	o Successful	**Trial 60**	CPA:	o Successful
Trial 21	CPA:	o Successful	**Trial 61**	CPA:	o Successful
Trial 22	CPA:	o Successful	**Trial 62**	CPA:	o Successful
Trial 23	CPA:	o Successful	**Trial 63**	CPA:	o Successful
Trial 24	CPA:	o Successful	**Trial 64**	CPA:	o Successful
Trial 25	CPA:	o Successful	**Trial 65**	CPA:	o Successful
Trial 26	CPA:	o Successful	**Trial 66**	CPA:	o Successful
Trial 27	CPA:	o Successful	**Trial 67**	CPA:	o Successful
Trial 28	CPA:	o Successful	**Trial 68**	CPA:	o Successful
Trial 29	CPA:	o Successful	**Trial 69**	CPA:	o Successful
Trial 30	CPA:	o Successful	**Trial 70**	CPA:	o Successful
Trial 31	CPA:	o Successful	**Trial 71**	CPA:	o Successful
Trial 32	CPA:	o Successful	**Trial 72**	CPA:	o Successful
Trial 33	CPA:	o Successful	**Trial 73**	CPA:	o Successful
Trial 34	CPA:	o Successful	**Trial 74**	CPA:	o Successful
Trial 35	CPA:	o Successful	**Trial 75**	CPA:	o Successful
Trial 36	CPA:	o Successful	**Trial 76**	CPA:	o Successful
Trial 37	CPA:	o Successful	**Trial 77**	CPA:	o Successful
Trial 38	CPA:	o Successful	**Trial 78**	CPA:	o Successful
Trial 39	CPA:	o Successful	**Trial 79**	CPA:	o Successful
Trial 40	CPA:	o Successful	**Trial 80**	CPA:	o Successful

Trial 81	CPA:	○ Successful	**Trial 125**	CPA:	○ Successful
Trial 82	CPA:	○ Successful	**Trial 126**	CPA:	○ Successful
Trial 83	CPA:	○ Successful	**Trial 127**	CPA:	○ Successful
Trial 84	CPA:	○ Successful	**Trial 128**	CPA:	○ Successful
Trial 85	CPA:	○ Successful	**Trial 129**	CPA:	○ Successful
Trial 86	CPA:	○ Successful	**Trial 130**	CPA:	○ Successful
Trial 87	CPA:	○ Successful	**Trial 131**	CPA:	○ Successful
Trial 88	CPA:	○ Successful	**Trial 132**	CPA:	○ Successful
Trial 89	CPA:	○ Successful	**Trial 133**	CPA:	○ Successful
Trial 90	CPA:	○ Successful	**Trial 134**	CPA:	○ Successful
Trial 91	CPA:	○ Successful	**Trial 135**	CPA:	○ Successful
Trial 92	CPA:	○ Successful	**Trial 136**	CPA:	○ Successful
Trial 93	CPA:	○ Successful	**Trial 137**	CPA:	○ Successful
Trial 94	CPA:	○ Successful	**Trial 138**	CPA:	○ Successful
Trial 95	CPA:	○ Successful	**Trial 139**	CPA:	○ Successful
Trial 96	CPA:	○ Successful	**Trial 140**	CPA:	○ Successful
Trial 97	CPA:	○ Successful	**Trial 141**	CPA:	○ Successful
Trial 98	CPA:	○ Successful	**Trial 142**	CPA:	○ Successful
Trial 99	CPA:	○ Successful	**Trial 143**	CPA:	○ Successful
Trial 100	CPA:	○ Successful	**Trial 144**	CPA:	○ Successful
Trial 101	CPA:	○ Successful	**Trial 145**	CPA:	○ Successful
Trial 102	CPA:	○ Successful	**Trial 146**	CPA:	○ Successful
Trial 103	CPA:	○ Successful	**Trial 147**	CPA:	○ Successful
Trial 104	CPA:	○ Successful	**Trial 148**	CPA:	○ Successful
Trial 105	CPA:	○ Successful	**Trial 149**	CPA:	○ Successful
Trial 106	CPA:	○ Successful	**Trial 150**	CPA:	○ Successful
Trial 107	CPA:	○ Successful	**Time Completed:**		
Trial 108	CPA:	○ Successful			
Trial 109	CPA:	○ Successful	**Notes:**		
Trial 110	CPA:	○ Successful			
Trial 111	CPA:	○ Successful	**Average CPA: _____**		
Trial 112	CPA:	○ Successful			
Trial 113	CPA:	○ Successful	**Goal Attainment:**		
Trial 114	CPA:	○ Successful			
Trial 115	CPA:	○ Successful	**Total: #_____**		
Trial 116	CPA:	○ Successful			
Trial 117	CPA:	○ Successful	**Percent: _____%**		
Trial 118	CPA:	○ Successful			
Trial 119	CPA:	○ Successful			
Trial 120	CPA:	○ Successful			
Trial 121	CPA:	○ Successful			
Trial 122	CPA:	○ Successful			
Trial 123	CPA:	○ Successful			
Trial 124	CPA:	○ Successful			

Session 3: Juggling Learning Guide

Directions	*Use this sheet to help keep track of your learning. Use the space below to assess your progress.*
Session Goal:	**Stance for Control**

The goal for Session 3 is to attain Stance for Control (SC).

SC is a goal that focuses on the timing of the release and the posture of the body.

1. Strategic Cues for SC are shoulder-width stance, arms at 90° from elbow, relaxed shoulders, and throwing the balls on the same plane (frontal plane through hands).
2. Error Cue for SC is throwing the ball outside of shoulders/ off frontal plane.

Trial 1:

Refer to Prompt 1 on the scale:
How often do you think you will attain your goal for the session?

Perceived Goal Attainment: _____

What cues do you plan to use during the session? Check all that apply:

- ☐ shoulder-width stance
- ☐ arms at 90° from elbow
- ☐ relaxed shoulders
- ☐ balls on the same plane
- ☐ other: _____

Trial 75:

Refer to Prompt 1 on the scale:
How often do you think you have attained your goal so far in the session?

Perceived Goal Attainment: _____

What cues have been the most helpful so far in your learning? Check all that apply:

- ☐ shoulder-width stance
- ☐ arms at 90° from elbow
- ☐ relaxed shoulders
- ☐ balls on the same plane
- ☐ other: _____

Trial 150:

Refer to Prompt 1 on the scale:
How often do you think you have attained your goal for the entire session?

Perceived Goal Attainment: _____

What cues were the most helpful during your learning for the entire session? Check all that apply:

- ☐ shoulder-width stance
- ☐ arms at 90° from elbow
- ☐ relaxed shoulders
- ☐ balls on the same plane
- ☐ other: _____

Session 3: Juggling Learning Guide	
Directions	*Carefully read through each question and respond to the best of your ability. There are not right or wrong answers.*

Take a moment to evaluate your goal for this session.
Overall, do you feel like you attained the goal for the session?

Did you set any other goal(s) outside the goal for the session?

Did you change your strategy throughout the session? What did you change?

Take a moment to evaluate your performance for the session.
What went well?

Why do you think you performed well?

Take a moment to evaluate your performance for the session.
What went poorly?

Why do you think you performed poorly?

Refer to Prompt 2 on the scale:
How satisfied are you with your performance for this session?

Perceived Satisfaction: _____

Why?

What would you have done differently during the session?

MID-ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

Session 4: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning. Check the new record box when a CPA for a trial is a new personal record.*				
Session Goal:	**CPA:**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	o New Record	**Trial 125**	CPA:	o New Record
Trial 82	CPA:	o New Record	**Trial 126**	CPA:	o New Record
Trial 83	CPA:	o New Record	**Trial 127**	CPA:	o New Record
Trial 84	CPA:	o New Record	**Trial 128**	CPA:	o New Record
Trial 85	CPA:	o New Record	**Trial 129**	CPA:	o New Record
Trial 86	CPA:	o New Record	**Trial 130**	CPA:	o New Record
Trial 87	CPA:	o New Record	**Trial 131**	CPA:	o New Record
Trial 88	CPA:	o New Record	**Trial 132**	CPA:	o New Record
Trial 89	CPA:	o New Record	**Trial 133**	CPA:	o New Record
Trial 90	CPA:	o New Record	**Trial 134**	CPA:	o New Record
Trial 91	CPA:	o New Record	**Trial 135**	CPA:	o New Record
Trial 92	CPA:	o New Record	**Trial 136**	CPA:	o New Record
Trial 93	CPA:	o New Record	**Trial 137**	CPA:	o New Record
Trial 94	CPA:	o New Record	**Trial 138**	CPA:	o New Record
Trial 95	CPA:	o New Record	**Trial 139**	CPA:	o New Record
Trial 96	CPA:	o New Record	**Trial 140**	CPA:	o New Record
Trial 97	CPA:	o New Record	**Trial 141**	CPA:	o New Record
Trial 98	CPA:	o New Record	**Trial 142**	CPA:	o New Record
Trial 99	CPA:	o New Record	**Trial 143**	CPA:	o New Record
Trial 100	CPA:	o New Record	**Trial 144**	CPA:	o New Record
Trial 101	CPA:	o New Record	**Trial 145**	CPA:	o New Record
Trial 102	CPA:	o New Record	**Trial 146**	CPA:	o New Record
Trial 103	CPA:	o New Record	**Trial 147**	CPA:	o New Record
Trial 104	CPA:	o New Record	**Trial 148**	CPA:	o New Record
Trial 105	CPA:	o New Record	**Trial 149**	CPA:	o New Record
Trial 106	CPA:	o New Record	**Trial 150**	CPA:	o New Record
Trial 107	CPA:	o New Record	**Time Completed:**		
Trial 108	CPA:	o New Record			
Trial 109	CPA:	o New Record	**Notes:**		
Trial 110	CPA:	o New Record			
Trial 111	CPA:	o New Record	**Average CPA:** _____		
Trial 112	CPA:	o New Record			
Trial 113	CPA:	o New Record	**PR Performance:**		
Trial 114	CPA:	o New Record	**Total:** #_____		
Trial 115	CPA:	o New Record			
Trial 116	CPA:	o New Record	**Percent:** _____%		
Trial 117	CPA:	o New Record			
Trial 118	CPA:	o New Record			
Trial 119	CPA:	o New Record			
Trial 120	CPA:	o New Record			
Trial 121	CPA:	o New Record			
Trial 122	CPA:	o New Record			
Trial 123	CPA:	o New Record			
Trial 124	CPA:	o New Record			

Session 4: Juggling Learning Guide

Directions	*Use this sheet to help keep track of your learning. Use the space below as much as you would like to assess your progress.*
Session Goal:	**Highest CPA**

The goal for Session 4 is the get the highest counts per attempt (CPA) as possible.

Trial 1:

Refer to Prompt 2 on the scale:
How well do you think you will perform for this session?

Perceived Performance: _____

What cues do you plan to use during the session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Trial 75:

Refer to Prompt 2 on the scale:
How well do you think you performed so far for this session?

Perceived Performance: _____

What cues have you used so far during the session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Trial 150:

Refer to Prompt 2 on the scale:
How well do you think you performed for the entire session?

Perceived Performance: _____

What cues worked the best for the entire session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Session 4: Juggling Learning Guide	
Directions	*Carefully read through each question and respond to the best of your ability. There are not right or wrong answers.*

Take a moment to evaluate your goal for this session.
Overall, do you feel like you attained the goal for the session?

Did you set any other goal(s) outside the goal for the session?

Did you change your strategy throughout the session? What did you change?

Take a moment to evaluate your performance for the session.
What went well?

Why do you think you performed well?

Take a moment to evaluate your performance for the session.
What went poorly?

Why do you think you performed poorly?

Refer to Prompt 2 on the scale:
How satisfied are you with your performance for this session?

Perceived Satisfaction: _____

Why?

What would you have done differently during the session?

Session 5: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning. Check the new record box when a CPA for a trial is a new personal record.*				
Session Goal:	**CPA:**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	o New Record	**Trial 125**	CPA:	o New Record
Trial 82	CPA:	o New Record	**Trial 126**	CPA:	o New Record
Trial 83	CPA:	o New Record	**Trial 127**	CPA:	o New Record
Trial 84	CPA:	o New Record	**Trial 128**	CPA:	o New Record
Trial 85	CPA:	o New Record	**Trial 129**	CPA:	o New Record
Trial 86	CPA:	o New Record	**Trial 130**	CPA:	o New Record
Trial 87	CPA:	o New Record	**Trial 131**	CPA:	o New Record
Trial 88	CPA:	o New Record	**Trial 132**	CPA:	o New Record
Trial 89	CPA:	o New Record	**Trial 133**	CPA:	o New Record
Trial 90	CPA:	o New Record	**Trial 134**	CPA:	o New Record
Trial 91	CPA:	o New Record	**Trial 135**	CPA:	o New Record
Trial 92	CPA:	o New Record	**Trial 136**	CPA:	o New Record
Trial 93	CPA:	o New Record	**Trial 137**	CPA:	o New Record
Trial 94	CPA:	o New Record	**Trial 138**	CPA:	o New Record
Trial 95	CPA:	o New Record	**Trial 139**	CPA:	o New Record
Trial 96	CPA:	o New Record	**Trial 140**	CPA:	o New Record
Trial 97	CPA:	o New Record	**Trial 141**	CPA:	o New Record
Trial 98	CPA:	o New Record	**Trial 142**	CPA:	o New Record
Trial 99	CPA:	o New Record	**Trial 143**	CPA:	o New Record
Trial 100	CPA:	o New Record	**Trial 144**	CPA:	o New Record
Trial 101	CPA:	o New Record	**Trial 145**	CPA:	o New Record
Trial 102	CPA:	o New Record	**Trial 146**	CPA:	o New Record
Trial 103	CPA:	o New Record	**Trial 147**	CPA:	o New Record
Trial 104	CPA:	o New Record	**Trial 148**	CPA:	o New Record
Trial 105	CPA:	o New Record	**Trial 149**	CPA:	o New Record
Trial 106	CPA:	o New Record	**Trial 150**	CPA:	o New Record
Trial 107	CPA:	o New Record	**Time Completed:**		
Trial 108	CPA:	o New Record			
Trial 109	CPA:	o New Record	**Notes:**		
Trial 110	CPA:	o New Record			
Trial 111	CPA:	o New Record	**Average CPA:** _____		
Trial 112	CPA:	o New Record			
Trial 113	CPA:	o New Record	**PR Performance:**		
Trial 114	CPA:	o New Record			
Trial 115	CPA:	o New Record	**Total:** #_____		
Trial 116	CPA:	o New Record			
Trial 117	CPA:	o New Record	**Percent:** _____%		
Trial 118	CPA:	o New Record			
Trial 119	CPA:	o New Record			
Trial 120	CPA:	o New Record			
Trial 121	CPA:	o New Record			
Trial 122	CPA:	o New Record			
Trial 123	CPA:	o New Record			
Trial 124	CPA:	o New Record			

Session 5: Juggling Learning Guide

Directions	*Use this sheet to help keep track of your learning. Use the space below as much as you would like to assess your progress.*
Session Goal:	**Highest CPA**

The goal for Session 5 is the get the highest counts per attempt (CPA) as possible.

Trial 1:

Refer to Prompt 2 on the scale:
How well do you think you will perform for this session?

Perceived Performance: _____

What cues do you plan to use during the session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Trial 75:

Refer to Prompt 2 on the scale:
How well do you think you performed so far for this session?

Perceived Performance: _____

What cues have you used so far during the session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Trial 150:

Refer to Prompt 2 on the scale:
How well do you think you performed for the entire session?

Perceived Performance: _____

What cues worked the best for the entire session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Session 5: Juggling Learning Guide	
Directions	*Carefully read through each question and respond to the best of your ability. There are not right or wrong answers.*

Take a moment to evaluate your goal for this session.
Overall, do you feel like you attained the goal for the session?

Did you set any other goal(s) outside the goal for the session?

Did you change your strategy throughout the session? What did you change?

Take a moment to evaluate your performance for the session.
What went well?

Why do you think you performed well?

Take a moment to evaluate your performance for the session.
What went poorly?

Why do you think you performed poorly?

Refer to Prompt 2 on the scale:
How satisfied are you with your performance for this session?

Perceived Satisfaction: _____

Why?

What would you have done differently during the session?

Session 6: Juggling Learning Guide					
Directions	*The researcher/observer will use this sheet to keep track of participant learning. Check the new record box when a CPA for a trial is a new personal record.*				
Session Goal:	**CPA:**				
Trial 1	CPA:	o New Record	**Trial 41**	CPA:	o New Record
Trial 2	CPA:	o New Record	**Trial 42**	CPA:	o New Record
Trial 3	CPA:	o New Record	**Trial 43**	CPA:	o New Record
Trial 4	CPA:	o New Record	**Trial 44**	CPA:	o New Record
Trial 5	CPA:	o New Record	**Trial 45**	CPA:	o New Record
Trial 6	CPA:	o New Record	**Trial 46**	CPA:	o New Record
Trial 7	CPA:	o New Record	**Trial 47**	CPA:	o New Record
Trial 8	CPA:	o New Record	**Trial 48**	CPA:	o New Record
Trial 9	CPA:	o New Record	**Trial 49**	CPA:	o New Record
Trial 10	CPA:	o New Record	**Trial 50**	CPA:	o New Record
Trial 11	CPA:	o New Record	**Trial 51**	CPA:	o New Record
Trial 12	CPA:	o New Record	**Trial 52**	CPA:	o New Record
Trial 13	CPA:	o New Record	**Trial 53**	CPA:	o New Record
Trial 14	CPA:	o New Record	**Trial 54**	CPA:	o New Record
Trial 15	CPA:	o New Record	**Trial 55**	CPA:	o New Record
Trial 16	CPA:	o New Record	**Trial 56**	CPA:	o New Record
Trial 17	CPA:	o New Record	**Trial 57**	CPA:	o New Record
Trial 18	CPA:	o New Record	**Trial 58**	CPA:	o New Record
Trial 19	CPA:	o New Record	**Trial 59**	CPA:	o New Record
Trial 20	CPA:	o New Record	**Trial 60**	CPA:	o New Record
Trial 21	CPA:	o New Record	**Trial 61**	CPA:	o New Record
Trial 22	CPA:	o New Record	**Trial 62**	CPA:	o New Record
Trial 23	CPA:	o New Record	**Trial 63**	CPA:	o New Record
Trial 24	CPA:	o New Record	**Trial 64**	CPA:	o New Record
Trial 25	CPA:	o New Record	**Trial 65**	CPA:	o New Record
Trial 26	CPA:	o New Record	**Trial 66**	CPA:	o New Record
Trial 27	CPA:	o New Record	**Trial 67**	CPA:	o New Record
Trial 28	CPA:	o New Record	**Trial 68**	CPA:	o New Record
Trial 29	CPA:	o New Record	**Trial 69**	CPA:	o New Record
Trial 30	CPA:	o New Record	**Trial 70**	CPA:	o New Record
Trial 31	CPA:	o New Record	**Trial 71**	CPA:	o New Record
Trial 32	CPA:	o New Record	**Trial 72**	CPA:	o New Record
Trial 33	CPA:	o New Record	**Trial 73**	CPA:	o New Record
Trial 34	CPA:	o New Record	**Trial 74**	CPA:	o New Record
Trial 35	CPA:	o New Record	**Trial 75**	CPA:	o New Record
Trial 36	CPA:	o New Record	**Trial 76**	CPA:	o New Record
Trial 37	CPA:	o New Record	**Trial 77**	CPA:	o New Record
Trial 38	CPA:	o New Record	**Trial 78**	CPA:	o New Record
Trial 39	CPA:	o New Record	**Trial 79**	CPA:	o New Record
Trial 40	CPA:	o New Record	**Trial 80**	CPA:	o New Record

Trial 81	CPA:	o New Record	**Trial 125**	CPA:	o New Record
Trial 82	CPA:	o New Record	**Trial 126**	CPA:	o New Record
Trial 83	CPA:	o New Record	**Trial 127**	CPA:	o New Record
Trial 84	CPA:	o New Record	**Trial 128**	CPA:	o New Record
Trial 85	CPA:	o New Record	**Trial 129**	CPA:	o New Record
Trial 86	CPA:	o New Record	**Trial 130**	CPA:	o New Record
Trial 87	CPA:	o New Record	**Trial 131**	CPA:	o New Record
Trial 88	CPA:	o New Record	**Trial 132**	CPA:	o New Record
Trial 89	CPA:	o New Record	**Trial 133**	CPA:	o New Record
Trial 90	CPA:	o New Record	**Trial 134**	CPA:	o New Record
Trial 91	CPA:	o New Record	**Trial 135**	CPA:	o New Record
Trial 92	CPA:	o New Record	**Trial 136**	CPA:	o New Record
Trial 93	CPA:	o New Record	**Trial 137**	CPA:	o New Record
Trial 94	CPA:	o New Record	**Trial 138**	CPA:	o New Record
Trial 95	CPA:	o New Record	**Trial 139**	CPA:	o New Record
Trial 96	CPA:	o New Record	**Trial 140**	CPA:	o New Record
Trial 97	CPA:	o New Record	**Trial 141**	CPA:	o New Record
Trial 98	CPA:	o New Record	**Trial 142**	CPA:	o New Record
Trial 99	CPA:	o New Record	**Trial 143**	CPA:	o New Record
Trial 100	CPA:	o New Record	**Trial 144**	CPA:	o New Record
Trial 101	CPA:	o New Record	**Trial 145**	CPA:	o New Record
Trial 102	CPA:	o New Record	**Trial 146**	CPA:	o New Record
Trial 103	CPA:	o New Record	**Trial 147**	CPA:	o New Record
Trial 104	CPA:	o New Record	**Trial 148**	CPA:	o New Record
Trial 105	CPA:	o New Record	**Trial 149**	CPA:	o New Record
Trial 106	CPA:	o New Record	**Trial 150**	CPA:	o New Record
Trial 107	CPA:	o New Record	**Time Completed:**		
Trial 108	CPA:	o New Record			
Trial 109	CPA:	o New Record	**Notes:**		
Trial 110	CPA:	o New Record			
Trial 111	CPA:	o New Record	**Average CPA:** _____		
Trial 112	CPA:	o New Record			
Trial 113	CPA:	o New Record	**PR Performance:**		
Trial 114	CPA:	o New Record			
Trial 115	CPA:	o New Record	**Total: #**_____		
Trial 116	CPA:	o New Record			
Trial 117	CPA:	o New Record	**Percent:** _____**%**		
Trial 118	CPA:	o New Record			
Trial 119	CPA:	o New Record			
Trial 120	CPA:	o New Record			
Trial 121	CPA:	o New Record			
Trial 122	CPA:	o New Record			
Trial 123	CPA:	o New Record			
Trial 124	CPA:	o New Record			

Session 6: Juggling Learning Guide

Directions	*Use this sheet to help keep track of your learning. Use the space below as much as you would like to assess your progress.*
Session Goal:	**Highest CPA**

The goal for Session 6 is the get the highest counts per attempt (CPA) as possible.

Trial 1:

Refer to Prompt 2 on the scale:
How well do you think you will perform for this session?

Perceived Performance: _____

What cues do you plan to use during the session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Trial 75:

Refer to Prompt 2 on the scale:
How well do you think you performed so far for this session?

Perceived Performance: _____

What cues have you used so far during the session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Trial 150:

Refer to Prompt 2 on the scale:
How well do you think you performed for the entire session?

Perceived Performance: _____

What cues worked the best for the entire session?
Check all that apply:

VG	CRP	SC
☐ vision forward	☐ open hand position	☐ shoulder-width stance
☐ look up	☐ circular motion of the hands	☐ arms at 90° from elbow
☐ arc at eye-level	☐ put the ball	☐ relaxed shoulders
☐ consistency of arc height	☐ cushion the ball	☐ balls on the same plane

☐ other:

Session 6: Juggling Learning Guide	
Directions	*Carefully read through each question and respond to the best of your ability. There are not right or wrong answers.*

Take a moment to evaluate your goal for this session.
Overall, do you feel like you attained the goal for the session?

Did you set any other goal(s) outside the goal for the session?

Did you change your strategy throughout the session? What did you change?

Take a moment to evaluate your performance for the session.
What went well?

Why do you think you performed well?

Take a moment to evaluate your performance for the session.
What went poorly?

Why do you think you performed poorly?

Refer to Prompt 2 on the scale:
How satisfied are you with your performance for this session?

Perceived Satisfaction: _____

Why?

What would you have done differently during the session?

TASK PERFORMANCE MICROANALYSIS

Please answer the questions below to the best of your ability. There are no right or wrong answers.

FORETHOUGHT

Refer to Prompt 2 on the scale:

How interesting is the task of juggling to you?

Perceived Interest: _____

Refer to Prompt 2 on the scale:

How important is it to you to perform well on the juggling task?

Perceived Importance: _____

In your own opinion, what are the most important elements to perform well on the juggling task?

_____

_____

Do you have a goal (or goals) in mind as you prepare for the juggling assessment?

_____

_____

Do you have a strategy or strategies you plan to use to help your performance in this assessment?

_____

_____

POST-ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

PERFORMANCE

Did you use any specific strategies to perform well on the juggling task?

Yes: _____

No: _____

What were they?

_____

_____

Did anything happen during performance that changed your plan for performance?

Yes: _____

No: _____

What was it?

_____

_____

Did you keep track of any changes during your performance?

_____

_____

REFLECTION

Refer to Prompt 2 on the scale:

How satisfied are you with your juggling performance?

Perceived Satisfaction: _____

Refer to Prompt 2 on the scale:

How well do you think you performed during the juggling task?

Perceived Performance: _____

[*Refer to perceived performance score above*] Why do you think you performed this way on the juggling task? In other words, why did you score yourself at [*refer to performance score*]?

_____

_____

Did you use any criteria or standards to judge how well you performed?

Yes: _____

No: _____

If yes, what were they?

_____

_____

Do you think your goals or strategies help you perform better on the assessment?

Yes: _____

No: _____

Why or why not?

_____

_____

If you were given the chance to perform the juggling assessment again, what would you do different?

_____

_____

Is there anything else you'd like to share with me regarding your performance?

_____

_____

First Direction:

Take two minutes to practice the 3-ball cascade juggling transfer task to get warmed up for your assessment.

TRANSFER TASK MICROANALYSIS

Please answer the questions below to the best of your ability. There are no right or wrong answers.

FORETHOUGHT

Refer to Prompt 2 on the scale:

How interested are you in performing the transfer task?

Perceived Interest: _____

Refer to Prompt 2 on the scale:

How important is it to perform well on the transfer task?

Perceived Importance: _____

In your own opinion, what are the most important elements to perform well on the transfer task?

_____

_____

Do you have a goal (or goals) in mind as you prepare for the transfer task assessment?

_____

_____

Do you have a strategy or strategies you plan to use to help your performance for the transfer task assessment?

_____

_____

TRANSFER-TASK ASSESSMENT:

TASK PERFORMANCE ASSESSMENT

Complete the tasks and answer the questions to the best of your ability.

TRIAL 1

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 2

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

TRIAL 3

Refer to Prompt 2 on the scale:

How confident are you in your juggling ability?

Perceived Confidence: _____

CPA: _____

Assessment Scores:

Average Confidence: _____

Average CPA: _____

Participant's proficiency classification (CPA ≤ 4 = **low**; 5 – 19 = **moderate**; & ≥ 20 = **high**):

Low – Moderate – High

PERFORMANCE

Did you use any specific strategies to perform well on the transfer task?

Yes: _____

No: _____

What were they?

_____

_____

Did anything happen during performance that changed your plan for performance?

Yes: _____

No: _____

What was it?

_____

_____

Did you keep track of any changes during your performance?

_____

_____

REFLECTION

Refer to Prompt 2 on the scale:

How satisfied are you with your performance on the transfer task?

Perceived Satisfaction: _____

Refer to Prompt 2 on the scale:

How well do you think you performed on the transfer task?

Perceived Performance: _____

[*Refer to perceived performance score above*] Why do you think you performed this way on the juggling task? In other words, why did you score yourself at [*refer to performance score*]?

_____

_____

Did you use any criteria or standards to judge how well you performed on the transfer task?

Yes: _____

No: _____

If yes, what were they?

_____

_____

Do you think your goals or strategies help you perform better on the transfer assessment?

Yes: _____

No: _____

Why or why not?

_____

_____

If you were given the chance to perform the juggling assessment again, what would you do different?

_____

_____

Is there anything else you'd like to share with me regarding your performance?

_____

_____

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Biography

Jordan David Goffena was born and raised in Sidney, Ohio, and graduated from Sidney High School in 2008. Jordan received a Bachelor of Science in Education specializing in life science education from Miami University in 2013. During his time in undergraduate studies Jordan competed as a scholarship decathlete and received university and national level scholar-athlete honors. Professionally, Jordan spent three years as an NCAA D-I collegiate track and field coach where he coached the decathlon, pole vault, and throwing events, and is a USA Track and Field Level II certified coach specializing in the combined events. His athletic and coaching experience led him to explore the world of sport psychology, and in 2015 he received a Master of Science degree in Kinesiology and Health focusing on the psychological and social aspects of sport from Miami University. During his time at George Mason, Jordan taught undergraduate courses focused on the psychological, sociological and cultural aspects of sport in the sport management program and has also taught introductory level sport psychology to coaches and athletes from all over the world in collaboration with the Center for Sport Management.