

The Effect of Skill and Cognitive Development for Improved Early Childhood Training in Tennis

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Abstract:

In line with this, the mentioned background then shows the relevance and timeliness of the current paper. It is important to highlight that the study mainly seeks to examine the influence of both skill and cognitive development on enhancing early childhood training in tennis. This will then include three main variables, namely, the demographic profile of tennis students, skill development, and cognitive development. Hence, the study will solely include the participation and assessment of the perceptions of students. The schools that will be included in the study are Zhonggang English School, Xichang Primary School (in Shiqi District), and Tiyu Road School (also in Shiqi District), which are all located in Zhongshan City, Guangdong Province. Ultimately, the study will gather information to propose a framework for enhanced early childhood training. This will identify key factors that contribute to improved performance and proficiency among young learners for maximizing learning outcomes and improving benefits for health, cognition, and social development.

Introduction:

Despite physical activity and sports currently becoming popular throughout the generations, less than 30% of children and adolescents worldwide meet the recommended standards given by the World Health Organization (WHO) (Sporting & Fitness Industry Association, n.d.). Such statistics reflect a need to further encourage and involve children and the youth in physical activities for improving overall health and well-being. This then leads to the motivation for this study, which centers on tennis as a sport.

To begin with, tennis in China has recently become popular and continues to develop in recent years due to a variety of factors. For instance, government assistance in initiatives and investments have played an important role in promoting the sport at all levels, from early participation to advanced player development (Li et al., 2020). Furthermore, the increase of tennis schools and training programs across the country has provided aspiring young athletes with access to world-class coaching and facilities, nurturing a new generation of talent

(Wang & Deng, 2021). Importantly, the success of Chinese tennis stars like Li Na has served as an inspiration for young players and has significantly raised the sport's profile within the nation (Li & Chen, 2019). This combination of efforts to cultivate tennis talent and foster a thriving tennis culture indicates China's growing influence and presence in the global tennis community.

In relation to this, the growing popularity of tennis is also linked to its numerous benefits for children's physical, cognitive, and social development. Firstly, engaging in tennis helps children enhance their motor skills, agility, and coordination while also promoting their overall physical fitness, as stated in a paper by Hulteen et al (2022). In addition to this, tennis requires strategic thinking, problem-solving, and decision-making, which contribute to cognitive development and mental sharpness (Grazina et al., 2020). Beyond the physical and cognitive aspects mentioned, tennis also contributes to the development of important social skills such as communication, teamwork, and sportsmanship, as children interact with peers, coaches, and even opponents (Ferguson et al., 2019). These benefits then emphasize the importance of tennis as an activity for children's holistic development, promoting not only physical health but also cognitive abilities and social competence.

With understanding these benefits, teaching and learning tennis have also been a center of focus to maximize these advantages while also training students in the best possible way. Hence, various pedagogical approaches have been used in teaching tennis, each with its unique focus and methodologies. Johnson et al. (2023) stated that one popular approach is the Game-Based Approach (GBA). This particularly emphasizes learning through game-like activities and situational drills, providing a dynamic and engaging learning experience for students. Another widely-used approach is the Technique-Based Approach (TBA), which

specifically prioritizes the systematic teaching of fundamental strokes and techniques, often through isolated drills and repetitive practice (Reid & Harvey, 2021). Additionally, the Constraints-Led Approach (CLA) has also been gaining recognition recently. This type of teaching emphasizes the manipulation of task constraints to encourage adaptive problem-solving and skill development in a more learner-centered environment (Burgess et al., 2020). Subsequently, it can be seen that these mentioned pedagogical approaches all offer diverse perspectives on teaching tennis, catering to the individual needs and preferences of learners while striving to enhance skill development and the overall enjoyment of the sport.

Furthermore, it is also important to understand the situation of tennis in modern times for this study. Tennis has currently undergone significant evolution, such as changes in playing styles, shifts in the global view of the sport, and especially with the onset of technological advancements. One noticeable trend is the increasing use of data analytics and technology in player development and game strategies (Veale et al., 2023). Some examples of this is through the integration of technological tools like Hawkeye and wearable sensors into training and performance analysis (Veale et al., 2023). In addition to this, Chalip et al. (2022) also stated that there is a growing emphasis on sustainability and eco-friendly practices within the tennis industry, brought by the increasing attention and effort to protect and conserve the environment. Some initiatives implemented in table tennis include reducing carbon footprint, minimizing waste, and promoting environmental stewardship in tournaments and facility management. Lastly, as tennis continues to expand globally, there is also emerging talent from diverse regions that enrich the sport's cultural diversity and global appeal (Barker & Thibault, 2021). These contemporary developments highlight the continuously changing nature of tennis, reflecting both its rich

traditions and its adaptation to modern challenges and opportunities.

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To give further information to important concepts explored in the study, the following sections discuss pertinent literature and other sources:

Tennis as a Sport:

Tennis is currently one of the most famous sports in the world especially relating to viewer engagement and media attention. There are tennis courts in almost every nation on earth, as well as in every region. Tennis has a rich and lengthy history. Its history provides fascinating insights into various aspects of general sport history, including politics, economic status, gender, ethnicity, paganism, and celebrity culture. Additionally, media coverage and commercialization are significant influences (Lake, 2019). Northern France is often referred to as where tennis first emerged as a sport. Before rackets were invented, players played the

original game, *jeu de paume*, which translates to "game of the palm," by striking the ball with the palm of their hand. The game which would ultimately become known as tennis was a favorite past time of the French royal court, and Louis X in particular. Because Louis X (1289–1316) loved to play so much, it is said that he was the first to build an indoor court so he could play in private and not be stopped by bad weather. The notion made its way through European royal palaces (Beckford, 2019). In recent years, the tennis industry has undergone a progressive process of globalization, professionalization, and commercialization to better address the growing problems posed by a quickly changing environment. The sport has incorporated some developments as a result of this process (Crespo et al., 2021). The Women's Sports Foundation (WSF) carried up a study in 2012 to compare the health and educational backgrounds of young tennis players with those of participants in other sports, in addition to students who don't play any sports. The findings of the study indicated that tennis players generally had some of the lowest rates of smoking, drug use, and binge drinking among the fifteen distinct sports: second-lowest for the second-lowest rate of marijuana use, binge drinking, and third-least in terms of smoking habit. The rates of prevalence for using marijuana, drinking excessively, and smoking decreased over the course of the two study periods among male and female tennis players. Additionally, tennis performed better than average in terms of psychological health (self-worth, feelings of isolation and self-deprecation), with the exception of social support, where boys who played tennis performed worse than other athletes (Veliz, 2019).

Tennis and other lifetime sports offer participation chances for people of all ages and have been associated with a lower incidence of anxiety, weight gain, and cardiovascular disease (SPRING et al., 2020). Fluetsch et al., (2019) employed the 2015 BRFSS data to investigate

the correlation between physical activity and mental well-being. Their findings indicated that those with higher physical activity levels also reported fewer days with poor mental health. According to a different meta-analysis, high-intensity training regimens are linked to a number of health advantages over the long term, including reduced risk of anxiety and depression (Martland et al., 2019).

Excellent technical abilities are thought to be necessary for athletic performance. According to the majority of the research in a recent systematic review, technical skills can differentiate between performance levels, explain previous performance, or forecast future performance (Koopmann et al., 2020). Tennis players with greater performance levels outperform those with a lower level of performance on metrics including ball speed, accuracy, and percentage errors, according to studies on the technical skills particular to the game (Kolman et al., 2019). The study by Triolet et al., (2022) looked at the ability of both experienced and inexperienced tennis players to predict shots by using dynamic contextual information, such as player positions relative to one another on the court, and opponent kinematics. The results demonstrate that while both experts and novices can predict using dynamic contextual information, only experts are able to do so with limited contextual information.

Tennis in China:

Almost 130 years ago, tennis was brought to China, beginning a lengthy history in the sport. Still, Chinese tennis did not develop as quickly as other concurrently introduced sports. This issue is primarily caused by the current tennis atmosphere and system's shortcomings (Zhou, 2023). However, tennis is becoming more and more popular in Asian nations like China and India (Hong & Zhouxiang, 2021). Asia is home to over 33 million tennis players, making up 37.9% of the global tennis population (of which 22.5% are from China), according to a survey by

the International Tennis Federation. The majority of teenage tennis players are linked to non-organizational, leisure practices as opposed to professional, structured tennis players (ITF - ITF Global Tennis Report 2019: Overview, 2019). A study by Li et al., (2022) sought to gain a deeper understanding of the self-reported motivations behind teenage tennis practice in modern-day China, whether it be unplanned or spontaneous. In order to obtain detailed descriptions of their ongoing tennis engagement behaviors, twenty-six informants and teenagers were gathered from throughout the Chinese mainland and engaged in semi-structured interviews. The results indicated that the effects of numerous ecological factors were noticed on each individual and their tennis experiences, rather than a single factor influencing the patterns of tennis engagement among adolescents. China has also made some notable achievements in the tennis sports. According to Chen et al., (2023), the Chinese tennis player Zhang Zhizhen reached a historic high on October 24, 2022, when he was rated 97th in the new Association of Tennis Professionals (ATP) rankings. Given how few Chinese players have made it to the top 100 in the ATP rankings, this is a noteworthy accomplishment for the country. Wu Yibing, another Chinese player, also broke into the top 100 rankings and even won China's first-ever ATP Tour Championship on February 23, 2023. In comparison with data from the preceding two decades, there has been a significant improvement in the total number of top 100 players in China and the United States. The increase in incidents occurring in these countries is a significant contributing factor to this phenomenon. Studies reveal a stronger relationship between the quantity of national events and the competitiveness of a country (Premkumar et al., 2019). China has been the venue of several elite tennis tournaments since 2004, including the Shanghai Masters, Wuhan Open, and China Open. These tournaments have raised the bar for tennis in China by giving local players plenty of chances to face elite players.

Participating in these local events has allowed players like Wu Yibing, Zhang Zhizhen, and Zheng Qinwen to flourish at an astounding rate, which has helped the nation's sports success tremendously. With the help of several professional competitions, players from the United States have also been getting better recently, in addition to those from China (Chen et al., 2023). However, concerns regarding the Chinese player Peng Shuai led the Women Tennis Association (WTA) to halt events in China in late 2021. In a social media post from November 2021, Peng, one of the most well-known tennis players in China, accused a former senior Chinese government official of sexual assault. Chinese events were suspended by the WTA, however this move was more symbolic than practical. In 2021 and 2022, China responded to the coronavirus pandemic by calling off almost all international sporting events. Tour events in the nation in 2022 most likely would not have occurred even in the absence of the WTA suspension. Nonetheless, the WTA's decision in 2021 sent a clear message in a world where international sports leaders have frequently submitted to China and its economic might (Clarey, 2023).

Pedagogical Approaches in Teaching Tennis:

Although studies show the advantages of a more modern, ecological dynamics-led approach in sport coaching, conventional practice design techniques continue to be used. Research on performance tennis coaches' goals when they create practices has been scarce (Anderson et al., 2021). Anderson et al., (2021) in their study looked at practice design strategies and the mindsets of performance tennis coaches. Ten elite tennis coaches who were part of a nationwide network for tennis performance were interviewed. The results of the study indicates that, although while performance tennis coaches are aware of modern practices for practice design, their practice task designs are dominated by a conventional, information-processing method for skill development. Theory of

ecological dynamics serves as the foundation for one such modern method. Since learning is a nonlinear process, an ecologically-led approach believes that nonlinear practice design and instruction should be implemented (Renshaw et al., 2019). The popularity of tennis sports is generally rising. But in some nations, including those in Asia and Latin America, there is a declining propensity to learn. According to a poll, 70 million people have attempted to learn tennis continually, and 97% of them at a stage will lose interest in learning further. This explains the reason behind the drop in the number of persons who are interested in and decide to participate in tennis (Hari et al., 2019). As such, a solution to this issue is required. The World Tennis Organization, or WTO, is one of the organizations that promotes innovation in tennis sports. International Tennis Federation (ITF). ITF sends out a message and offers guidance to coaches and teachers, encouraging them to use cutting-edge teaching strategies and streamlined learning processes that adapt the sport to the requirements of new pupils (Hari et al., 2019). One popular method that instructors or lecturers employ to teach novice students tennis abilities is teacher command, where each learning stage is characterized by the usage of technique for each portion and movement repetition that follows directions. This technique spreads like wildfire and becomes the accepted traditional way to go through the phases of acquiring a skill (Hari et al., 2019). Since acquiring sports abilities using a modern technique is a part of the cognitive learning phase, its impact is greater than learning sports skills through a conventional strategy. It offers the chance for the person learning the game for the first time to gain a deeper comprehension of every facet of it, as well as to improve basic technical abilities, increase participation in skill-learning processes, and boost motivation and excitement (Hari et al., 2019). For teachers and sports coaches, the advancements in digital technology have brought up both tremendous new opportunities and difficulties. Still, the

focus has mostly been on how to allow access up until now. Whatever the usage of technology in schools, policymakers continue to believe that it will inevitably benefit them (Lengkana et al., 2019). Many educators and trainers oppose the use of technology in the classroom or lack even rudimentary IT knowledge, frequently for good reasons. They think there is little evidence to support the claim that technology raises student achievement (R Amalia et al., 2021). Multimedia can have many different definitions. It is dependent upon the viewpoints from which it is viewed. Multimedia, as a term, refers to the presentation of information using multiple media types. Computer-based training is being delivered through multimedia more and more. The idea that multimedia content aids in learning could be one factor driving this trend. Compared to typical classroom lectures, multimedia learning may speed up people's acquisition of knowledge. Nevertheless, learning does not always get better when multimedia is used excessively (Anmarkrud et al., 2019). This is usually the case when students with minimal past experience or skill in the field are exposed to multimedia materials. However, there is also empirical evidence in favor of determining that specific multimedia can aid in learning specific categories of data. Text, graphics, animation, pictures, video, and music are all considered forms of multimedia when it comes to information presentation. There has been a virtual explosion of computer-based media integration since these media can now be merged via computers into multimodal educational programs (Yi et al., 2019). These programs include anything from kid-friendly items to adult computer-based training. This incredibly versatile application appears to distribute broad multimedia content that aids in learning (Mutlu-Bayraktar et al., 2019). People think that multimedia can improve children's learning results, they prefer multimedia to traditional learning tools, and they enjoy multimedia. Similarly, in the realm of sports achievement, particularly tennis, technology is

anticipated to serve as an auxiliary tool for athletes while they prepare to reach their peak performance (Suherman et al., 2019). To play tennis, one must correctly learn the fundamental moves. But how can these fundamental methods be effectively taught to participants without boring them and meet their age-appropriate demands in the circumstances of today? Bearing in mind that these are young athletes, categorized as primary school age, who are between the ages of 10 and 11. They might be playing tennis for the first time. They enjoy being involved. shifted around, but they must understand the significance of good principles in their actions (Mulya & Lengkana, 2020). A study by tested TennBasTech, an android design derived on the earlier beginner tennis teaching model, using an experimental approach (Gumilar Mulya et al., 2021).

The Importance of Skill Development for Teaching Tennis:

Understanding the fundamentals of the game is necessary to develop into a great tennis player. In order to advance to become a professional or elite player, these fundamental skills serve as the cornerstones. Some of the basic of the game includes ball feeling, Footwork and body balance, Ready position and Grip (Mulya & Lengkana, 2020). In order to get better outcomes in modern athletic training, which rely on science as a foundation, instructors must stay up to date on all training-related developments in order to offer their students the finest instruction possible and elevate their performance standards. Since there are so many different exercises that target strengthening the core muscles, core strength exercises are thought to be the finest training method. Girls who have developed a strong core are better able to perform exercises that correspond to the source of motion (Afifi, 2019). The core muscles were responsible for transferring the entire force generated by the lower limbs through the trunk and, occasionally, the tool held in the hand. If these muscles were weak, the dynamic power

would not be fully transferred from the bottom to the top, which would negatively impact athletic performance and increase the risk of injury. Because of this, it is hypothesized that strengthening one's core will inevitably result in enhanced athletic performance. Therefore, in every sporting event, coaches employ core strength workouts (Zemková, 2022). Due to the characteristic of a joint's dynamic range being distinct from another's, flexibility is very important in preventing multiple injuries. Each muscle or group of muscles has a distinct capacity for extension when compared to other muscles or groups. Since the degree of flexibility deficiency can cause injuries, motor performance becomes more challenging, and the rate at which abilities get perfected slows down, it is crucial to cultivate this attribute. This is where flexibility differs from other physical fitness components (Afifi, 2019). Tennis is the most popular sport in developed nations because it is exciting, enjoyable, and appropriate for players of all ages. Additionally, attacking strokes in tennis have a unique quality because they require coordination between the arms and legs as well as the tools used; as a result, performance strength is correlated with position-specific velocity and agility in performing necessary skills during a match (Afifi, 2019).

Teamwork and Communication:

The benefit of collaboration and teamwork has long been recognized; the significance of cooperation has been highlighted frequently in the key areas of education and is represented in fitness ability indicators. It is evident that physical education may foster the perfect environment for group projects. Children do not naturally acquire action skills in physical education as they develop and mature, but external variables like practice, direction, and encouragement can help. These opportunities are offered via cooperative learning, an efficient teaching strategy that is supported by professionals and academics. It can influence

collaborative scenarios, and in the process, students can learn how to collaborate, communicate, and plan with others (Chen et al., 2019). Research indicates that cooperative learning is more beneficial than standard solo learning approaches in terms of increasing learning efficacy, physical activity, and motivation. Promising findings from earlier studies on the use of cooperative learning in physical education classrooms indicate that this method is more effective than learning alone or in a competitive setting. A tried-and-true teaching technique, cooperative learning is frequently used in both teaching and research. Since the majority of research demonstrate the benefits of cooperative learning, a thorough discussion of how to maximize these benefits using this learning technique is warranted (Chen et al., 2021). Concurrently, peer interactions such as teaching, clarifying, and encouraging one another can help to improve social skills. Cooperative learning has the power to increase people's intrinsic motivation, enhance attitudes toward learning, increase the efficacy of learning, and support young people in achieving important learning objectives. Cooperative learning has been shown in numerous research to increase learning effectiveness while also making the process more pleasurable (Chen et al., 2019).

Physical Fitness and Mental Toughness:

In a game of tennis, the player with greater mental toughness is going to prevail. In a single interview, former world champion Serena Williams claims that mental strength will decide up to 70% of tennis matches between players (Gbadamosi, 2020). Cowden et al., (2020) indicated that psychological traits such as mental toughness give athletes the ability to assimilate and sustain high levels of effort in order to perform at their best. As was already noted, despite the pressure that athlete faces to perform at a high level. Mental toughness is a crucial component linked to a number of sports success metrics; it can enhance athletic

performance and advance athletes' welfare. A study by Harris et al., (2021) looked into how Grand Slam tennis players deal with psychological pressure. In order to determine the correlation between mental toughness during a match and unintentional errors, over 650,000 tennis points were analyzed between 2016 and 2019. The study's conclusions demonstrate a strong link between pressed postures and simple errors. This suggests that a tennis player competing in the world's most prestigious tournaments needs to be mentally strong. Furthermore, the analysis demonstrates that psychological strain has an impact on both "successful" and "unsuccessful" athletes. However, some athletes are able to handle this, and some experience what the report refers to as "mental breakdowns."

Enthusiasm and Attitude:

Grand Slam champions stressed that tennis was not their sole sport and that their early tennis days were marked by few training sessions each week (Mario Oršolić et al., 2023). A study by Li et al., (2020) supported the assertions of certain coaches that a significant number of elite professional tennis players began playing as early as age four and that early initiation is crucial for developing technical tennis abilities. According to Roetert et al. (2019), coaches have a significant role in terms of introducing young children into tennis and teaching the skills required for enjoying the game for the duration of one's lifetime. Coaches can surely play an important role in achieving a healthy, positive and educational surrounding which is suitable for proper skill development.

The Role of Cognitive Development for Teaching Tennis:

According to Demetriou et al., (2022) the relationship between cognitive growth and academic learning is covered in detail in a theory presented by the study. The objective of this theory is to facilitate the improvement of cognitive growth and the achievement of learning objectives linked to each school year.

Schools make use of cognitive competence to help kids learn new concepts and abilities over time, from reading and numeracy to more sophisticated concepts and abilities in science, math, and the arts. Everything at school starts out quite hard. The surroundings in school classrooms are complicated. The abilities, learning interests, personalities, and family backgrounds of the students in each classroom vary. Different teachers have different backgrounds, pedagogical approaches, and persistence in motivating children to learn. Different school disciplines have different conceptual requirements; for example, learning a language calls for a different set of cognitive processes than learning arithmetic or physics. It is commendable that pupils do learn in schools despite these distinctions (Demetriou et al., 2022). The goal of cognitive development theory is to align educational goals from early childhood through adolescence with cognitive developmental priorities. It seeks to enhance each student's cognitive development at each school year so they can realize their full potential. Unmet developmental goals in subsequent school years frequently deprive students of the knowledge and skills they need to master the cognitive abilities associated with a particular year and advance effectively. In order to optimize learning in every academic subject, it also seeks to expand on the opportunities provided by developmental priorities at succeeding school grades. Ignoring these criteria could make it more difficult and take longer for students to understand and integrate the relevant concepts and abilities (Demetriou et al., 2022). In recent years, there has been a lot of research focused on the connection between cognitive performance and physical exercise (Moran et al., 2019). Athletes might vary greatly in subtle ways when competing in professional sports. Researchers and technical personnel have attempted to examine and discover factors influencing this outcome, despite the fact that it is challenging to remove all uncertainty from their performance.

It follows that the abundance of research on physical readiness, tactical and technical details, or psychological effects is not surprising (Henriksen et al., 2019).

Reasoning and Strategic Thinking:

Research suggests that athletes are becoming more aware of their performances, thus it's important to provide coping mechanisms that can help them feel less stressed and arousable both before and during the game. Coping is an essential process that involves self-control and the deliberate choice of ideas and behaviors to deal with emotionally and physically taxing circumstances. It entails successfully adjusting to the sports environment using behavioral, emotional, and cognitive abilities (Wang et al., 2023). On assessments of perceptual-cognitive abilities like anticipation, decision-making, and pattern memory, great athletes often outperform beginners in their respective games. That being said, not much research has been done on how these perceptual-cognitive abilities evolve (De Waelle et al., 2021). A study by Liu et al., (2023) indicated that John Millman, then ranked No. 55, faced 20-time Grand Slam winner and world No. 2 Roger Federer two days prior to the US Open's fourth round competition. Millman had a 0-10 record against the top 10 and Federer had a 40-0 record against players ranked lower than No. 50, leading the media to believe Millman had little chance. An analytics profile that highlighted Federer's strengths, limitations, and preferred playing style was forwarded to Millman. It included information on Federer's serving and returning habits in critical, high-pressure scenarios such as breakpoints. Millman defeated all odds to win 3-1 and make his first-ever Grand Slam quarterfinal. Mastering the art of extracting meaningful insights from sparse historical data in order to increase winning probabilities is the main challenge in sports analytics. Particularly in racquet sports like tennis, where opponent-specific tactics are essential, this is particularly important. Modifying playing patterns and honing

particular subskills are two aspects of sports strategies. Players can defeat more powerful opponents with the use of a successful strategy, which is a combination of methods used to obtain an advantage in a match (Liu et al., 2023).

Memory:

Through an increase in hippocampal neuronal plasticity, acute physical exercise enhances memory functions. Anandamide, an endocannabinoid known to support hippocampus plasticity, has been demonstrated to increase in animals after just one exercise session. Motor sequence learning can benefit from the encoding of episodic memory representations by hippocampal neural networks, which also include the temporal organization of elements (Marin Bosch et al., 2020). Researchers studying neuroscientific processes at the University of Geneva (UNIGE) have shown that even a brief, intense exercise session of 15 minutes can enhance memory and facilitate the learning of new motor abilities. What? By use of endocannabinoids, which are compounds that have been shown to enhance synaptic plasticity (Université de Genève, 2020). Researchers administered a memory test to fifteen young, healthy men who were not sportsmen to examine sports' impact on motor learning. The men were asked to cycle for thirty minutes at a moderate pace, for fifteen minutes at an intense pace (i.e., 80% of their maximum heart rate), or for a shorter amount of time after resting. Researchers at the same lab, Blanca Marin Bosch, describe the activity as follows: "The participant had to quickly press the corresponding button each time one of the dots changed into a star." The screen showed four points positioned close to each other. It evaluated the precise learning process of motions by following a predetermined and repeated pattern (Marin Bosch et al., 2020).

In other words, the more you practice hitting well in tennis, the more probable it is that you will build long-term modifications that will enable you to continue hitting well, particularly when you need it. The majority of your practice

and time is dedicated to conditioning your muscle memory to hit the "better than usual" forehand, which means you are preparing yourself to perform better during a match. Through transient performance improvement, you are learning the skill. You are now creating neural circuits and motor pathways, which will increase the likelihood that you will remember the skill if you continue to strike it successfully. Better than your average stroke, you are developing persistent muscle motor memory for good strokes. Your chances of hitting it well later on increase with each successful hit (Smith, 2019).

Problem-Solving:

One teaching strategy that educators and trainers employ is problem-solving. A coach-teacher assigns issues for the students to solve using the problem-solving method, which inspires them to consider their sport and use creativity when addressing challenges (Senduran & Amman, 2019). According to Senduran & Amman, (2019), the athletes' ability to focus and pay attention, as well as their ability to develop these skills over time, can be assessed. It also helps them focus throughout the problem-solving portion of an activity. Research suggests that an athletes' emotional and psychological well-being is positively impacted by participating in regular sports. Furthermore, their study looked into how high school students' ability to solve problems during the transition from adolescent to adulthood can be impacted by engaging in regular physical exercise. Alongside previous research, it is anticipated that students' problem-solving techniques will be positively impacted by the perception, understanding, decision-making, and problem-solving abilities they acquire from regular physical activity and competition engagement (Senduran & Amman, 2019).

Early Childhood Training in Tennis and Other Sports:

Regardless of working memory demands, research shows that lengthier training experiences were linked to reaction time rather than accuracy. Youngsters who had trained in

tennis for a longer period of time—between the ages of 8 and 12—responded more quickly and performed better on working memory tests than those who had only recently begun. This could be because consistent tennis training improves players' ability to make decisions and shortens reaction times (Xu et al., 2022). There has been much research done on how different forms of long-term exercise affect children's cognitive abilities. It has been demonstrated that cognitively demanding sports like basketball, football, and the like improve executive functioning in kids going through developmental transitions (James et al., 2023).

Synthesis:

Physical education fosters cognitive growth by activating the brain circuits required for learning and sociability. Engaging in physical activities increases blood flow and oxygenation to the brain, hence improving memory, attention, and cognitive performance. Various studies demonstrate how the development of motor skills brought about by regular engagement in physical education or exercise can enhance cognitive abilities, academic performance, attention, memory, visual-perceptual abilities, and problem-solving abilities (Shi & Feng, 2022). For a beginner who wishes to understand the foundations of tennis sports or an accomplished player who wishes to enhance their performance, changes take time to become noticeable. Trying something new could be one approach to encourage improvement progressively via trial-and-error education. Additional methods of training would include hiring a coach or learning via video recordings and other multi-media programs (Martínez-Gallego & Antonio Fonseca Morales, 2022).

Theoretical Framework:

As important literature sources have been discussed, the following section further explains the variables included in the study through theories. The current concepts used are anchored in the listed theories below:

1. Ecological Systems Theory

This first theory, proposed by Urie Bronfenbrenner, emphasizes the importance of understanding the various environmental

systems that influence a child's development in different ways (Bronfenbrenner, 1979). More specifically, these include the microsystem, which is the immediate surroundings of a child such as family and peers. Another system is the mesosystem, which refers to the interactions between different microsystems or the direct surroundings of a child. Then, there is also the exosystem or the external environments that indirectly influence a child's development. Lastly, the theory also considers the wider cultural contexts that influence children, which is known as the macrosystem (Bronfenbrenner, 1979). In the context of the study and tennis training, this theory is important as it suggests that a child's skill and cognitive development are influenced not only by individual factors but also by the interactions between the child and their environment. This can be possible through the quality of coaching, parental involvement, peer relationships, and access to resources that children are exposed to during learning this sport.

2. Social Cognitive Theory:

The second theory related to the study is the Social Cognitive Theory. This was developed and proposed by Albert Bandura and it uniquely emphasizes the role of observational learning, imitation, and modeling in shaping human behavior (Bandura, 1986). This theory also includes the interaction between factors such as people, their behavior, and the environment, in a principle known as reciprocal determinism (Bandura, 1986). In simple terms, this refers to the way that a person's behavior is significantly influenced by both other people and the environment that they are exposed to. In relation to the variables of the study, the Social Cognitive Theory has useful concepts in helping understand how children can possibly learn by observing players, coaches, and peers, and by imitating their behaviors. Moreover, this theory also mentions self-efficacy, or an individual's belief in their ability to succeed, and that this plays a crucial role in skill development.

Therefore, it is worthy to mention that effective training programs, which will be highlighted in the main output of the study, should not only focus on developing physical skills but also on enhancing children's self-efficacy beliefs. Such can be done through positive reinforcement, goal-setting, and providing opportunities for mastery experiences, which are also important areas to focus on when teaching sports.

3. Dynamic Systems Theory:

The final theory that is relevant to the current study is the Dynamic Systems Theory. Specifically, this theory proposes that development is a complex, dynamic process influenced by multiple interacting factors, rather than being solely predetermined by genetic or environmental aspects of children (Thelen & Smith, 1994). In other words, the theory includes external factors, which are referred to as "perturbations" (i.e., outside influences), when analyzing changing and developing behaviors. As the study focuses on early childhood tennis training, the Dynamic Systems Theory is relevant as this suggests that skill development emerges from a multitude of interactions. For instance, this can be influenced by a child's biological characteristics (e.g., motor skills, cognitive abilities), task demands (e.g., complexity of tennis techniques), and environmental contexts (e.g., coaching style, practice facilities). Furthermore, developmental progress in one area, such as motor skills, can influence progress in other areas, such as cognitive abilities. Ultimately, this theory is useful as a guideline for formulating effective training programs that are tailored to the individual needs of children. This serves as a reference for taking into account the unique characteristics of children and the dynamic interactions between various factors influencing their development.

Conceptual Framework:

With the relevant concepts and theories presented in detail, the research is more clearly understood and represented through the research paradigm below. This was constructed by the researcher and includes the main variables of the study, the relationships between these, and the final output of the study.

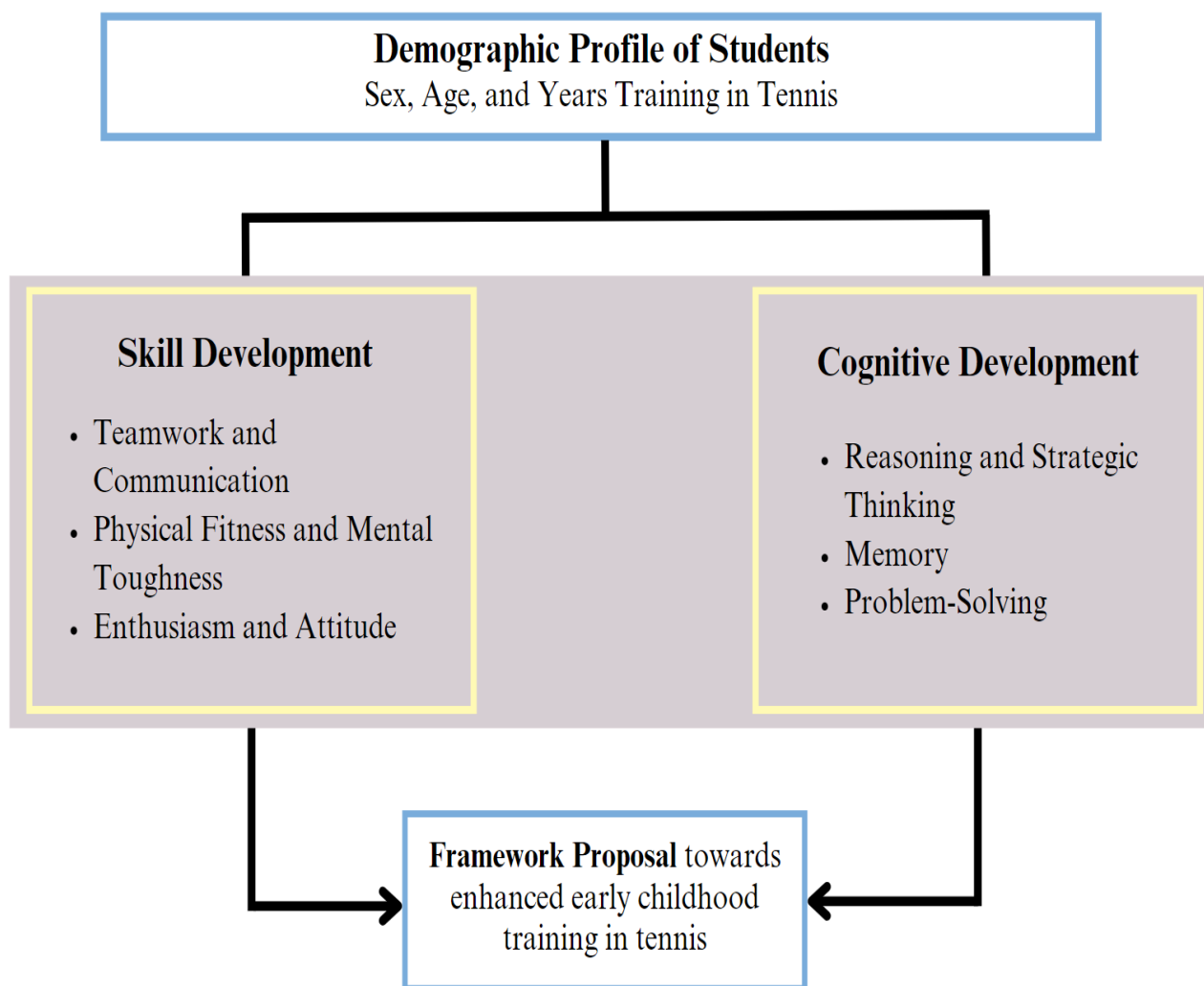


Figure 1. Research Paradigm

As shown in Figure 1 above, the study includes three main variables, which are the demographic profile of students, and their respective perceptions on their skill and cognitive development when learning tennis. In more detail, the demographic profile of the respondents will be the independent variable and this will include their sex, age, and years training in tennis. Then, skill and cognitive development will both be dependent variables. The former will be investigated in terms of teamwork and communication, physical fitness and mental toughness, and enthusiasm and attitude. On the other hand, the latter-mentioned variable on cognitive development will be studied in terms of reasoning and strategic thinking, memory, and problem-solving. It is also important to mention that the study will answer its research questions and collect data

through utilizing a quantitative research design. Hence, the study will include a questionnaire with gathered information that will be subjected to statistical treatment and analyses. Lastly, Figure 1 above also indicates that the study will utilize the findings as a basis for formulating an enhanced early childhood training plan that can be used as a reference for improved pedagogical approaches in teaching tennis.

Statement of the Problem

The general objective of the study is to examine the influence of both skill and cognitive development on enhancing early childhood training in tennis, with the goal of identifying key factors that contribute to improved performance and proficiency among young learners.

More specifically, the study seeks to answer the following questions:

1. What is the demographic profile of the respondents in terms of:
 - 1.1. Sex,
 - 1.2. Age, and
 - 1.3. Years training in tennis?
2. What are the perceptions of students in their skill development in terms of:
 - 2.1. Teamwork and Communication,
 - 2.2. Physical Fitness and Mental Toughness, and
 - 2.3. Enthusiasm and Attitude?
3. Is there a significant difference in skill development when the demographic profile of students is taken as a test factor?
4. What are the perceptions of students in their cognitive development in terms of:
 - 4.1. Reasoning and Strategic Thinking,
 - 4.2. Memory, and
 - 4.3. Problem-Solving?
5. Is there a significant difference in cognitive development when the demographic profile of students is taken as a test factor?
6. Is there a relationship between skill and cognitive development in students learning tennis?
7. What framework for enhanced early childhood training can be proposed from the results of the study?

Research Hypothesis:

Parallel to the research questions listed, the following hypotheses will be tested in the study:

Ho1: There is no significant difference in the assessment of skill development in tennis students when demographic profile is taken as a test factor

Ho2: There is no significant difference in the assessment of cognitive development in tennis

students when demographic profile is taken as a test factor

Ho3: There is no significant relationship between skill and cognitive development in students learning tennis.

Significance of the Study:

Based on the general objective of the study, which is to investigate the effect of both skill and cognitive development on enhancing early childhood training in tennis towards producing an enhanced training framework, the study will have significant benefits to the educational sector. More specifically, the following are beneficiaries to the findings and output of the study:

Teachers:

Firstly, teachers would significantly benefit from the study through the proposed training framework, which will provide guidance on novel pedagogical approaches in teaching tennis in children. Teachers can further gain insights into effective instructional strategies and techniques for improving their teaching quality and improve the learning outcomes of their students. Furthermore, understanding the role of skill and cognitive development in children's tennis education can enable teachers to design uniquely tailored training programs that enhance the achievement of learning goals and promote holistic development.

School Administrators:

Next, school administrators can also benefit through the findings of the study as the results can provide reference when proposing and applying new reforms related to sports. Particularly, school administrators can use the findings of this study to design updated curricula and when deciding resource allocation for tennis programs within schools, making the results direct practical reference for this initiative. Investing in early childhood tennis training aligned with skill and cognitive development can contribute to the overall educational objectives of the institution and

enhance the sports offerings for students. Such an initiative would then help schools foster the holistic learning and development of their students, which can improve the quality of schools as learning institutions.

Tennis Students:

As students are the main respondents of the study, the findings will also benefit them mainly through improving the teaching strategies and quality of their instructors. The study would be able to improve the teaching approaches of teachers, which would directly benefit students through also being taught better and tailored to their needs. In addition to this, tennis students, particularly those in their early childhood years, benefit by understanding how skill and cognitive development influence their progress in tennis. Students can then use the findings as reference to adopt more effective learning techniques, set realistic goals, and actively engage in their own development as tennis players.

Local Ministry of Education:

In relation to the benefits of school administrators, the local ministry of education also benefits from the results of the study. In more detailed terms, the local ministry of education can utilize the findings of this study to inform policy decisions related to physical education and sports curriculum in schools. Recognizing the importance of early childhood tennis training for skill and cognitive development may lead to initiatives aimed at integrating structured tennis programs into school curricula or providing better support for extracurricular tennis activities.

Future Researchers:

Lastly, the study will also be beneficial to future researchers aiming to investigate similar topics in tennis or other related sports. This study may ultimately provide a foundation for future research endeavors that specifically target the field of early childhood tennis training and child development. Researchers can build upon the

findings of this study to explore specific aspects in greater depth, investigate new interventions, and evaluate other factors and variables that extend the scope of this study. Hence, the findings will serve as a useful reference to future researchers.

Scope and Delimitation of the Study:

To repeat, the study will solely focus on investigating the influence of both skill and cognitive development on enhancing early childhood training in tennis, to formulate an enhanced training framework for improved learning outcomes. In order to do so, the researcher will use a quantitative research design where data will be collected through a questionnaire and later be subjected to thorough statistical analysis. It is also important to mention that the study will only include the variables of demographic profile, skill development, and cognitive development, with their respective dimensions. For the respondents, the study will only include young students participating in learning tennis from three schools in China. These educational institutions are Zhonggang English School, Xichang Primary School, and Tiyu Road School, which are all located in Zhongshan City, Guangdong Province. In gathering data, the study will ensure to follow ethical codes and first seek approval from important governing bodies.

Furthermore, with regards to the time frame of the study, this will take place during the second semester of the academic year 2023-2024. The study will then take place in four research locales. First, the researcher is affiliated with Emilio Aguinaldo College; hence, the study will mainly take place here for writing, data processing, interpretation, and final presentation. Then, for data collection, this will take place in China, in the three mentioned academic institutions. With these details explained, it can then be understood that the researcher may face limitations and challenges with time, financial resources, and language.

Traveling to multiple research settings may require careful time and budget allocation. Then, as the respondents are young Chinese learners, the data collected will be in the native language of these study participants. Thus, the researcher will ensure that proper translation is done to maintain correctness and accuracy of collected data.

Definition of Terms:

To further clarify on the important terms used in the study, these are described in detail below with their respective operational definitions:

Cognitive Development - This term refers to the growth and improvement of one's mental abilities and processes, which further enhance their performance for a certain task. In the study, this is a main variable that will be studied in terms of reasoning and strategic thinking, memory, and problem-solving.

Demographic Profile - This variable refers to the different attributes of a population, which are used to comprehend their composition and structure. Within the study, data on students' sex, age, and years training in tennis will be collected to understand the sample population.

Enthusiasm and Attitude - This refers to the eagerness to participate in a certain task and as well as having the appropriate attitudes to improve one's skill and performance. In the study, this is a dimension under skill development and will be studied alongside physical fitness and mental toughness and teamwork and communication.

Memory - This refers to the ability to retain information and properly recall and apply this when needed. In the study, this is a dimension under cognitive development and will be studied alongside reasoning and strategic thinking and problem-solving.

Physical Fitness and Mental Toughness - This generally refers to the appropriate physical and mental conditions needed for an individual to effectively perform for a certain task. In the study, this is a dimension under skill

development and will be studied alongside teamwork and communication and enthusiasm and attitude.

Problem-Solving - This refers to the ability to effectively find solutions to presented problems and challenges. In the study, this is a dimension under cognitive development and will be studied alongside memory and reasoning and strategic thinking.

Reasoning and Strategic Thinking - This refers to the cognitive abilities of an individual to logically process information and reason effectively. In the study, this is a dimension under cognitive development and will be studied alongside memory and problem-solving.

Skill Development - This refers to the advancement of one's skills to improve their performance or execution in a certain field. In the study, this is a main variable that will be studied in terms of teamwork and communication, physical fitness and mental toughness, and enthusiasm and attitude.

Teamwork and Communication - This refers to skills related to effective collaboration and interpersonal communication. In the study, this is a dimension under skill development and will be studied alongside physical fitness and mental toughness and enthusiasm and attitude.

Young Learners - This refers to students who fall under a younger age bracket, such as three to 12 years old. In the study, these are the main respondents of the study who are learning how to play tennis.

Methodology:

The first chapter presented the concepts, relevant literature, and objectives of the study. The following chapter then further explains the detailed methodology that will be undertaken in the study. This includes individual sections for the research design, research locale, sample and sampling technique, research instrument, data gathering procedure, statistical treatment, and ethical considerations of the study. These are all explained in the subsequent sections:

Research Design:

For the research design of the study, the researcher will make use of a quantitative research approach. This means that the study will utilize quantitative and numerical means to answer its research questions. This is appropriate to the objectives of the study as the researcher aims to quantify and measure the variables on the demographic profile, skill development, and cognitive development of students learning tennis. Using a quantitative approach will best gather the needed data to assess these variables.

Furthermore, it is also important to mention that a questionnaire will be used to gather the data. In this research instrument, items will be evaluated through ranked data that will use a Likert Scale. The findings will then be processed through statistical methods and presented through tabular means, respectively. Data will be presented through mean values, percentages, frequency counts, and significance values (p-values). Hence, the study will only make use of quantitative methods; no qualitative or descriptive means will be used to process the data that will be gathered.

Research Locale:

As mentioned in the first chapter, the study will have four research locales. These are divided into two main categories, the academic affiliation of the researcher and the data gathering locales. For the former, the researcher is affiliated with Emilio Aguinaldo College in Manila, Philippines. Here, the main writing, data processing, interpretation, and presentation of findings will be conducted. Then, for the data gathering locales, this consists of three schools in Zhongshan City, Guangdong Province, China. The names and general details of these schools are discussed below:

1. Zhonggang English School:

The China Hong Kong English School, situated in Zhongshan City, Guangdong Province, established its roots in 1994. This was

recognized as a municipal-level school in 2002 and among the top ten private schools in the province by 2003 and its educational mission revolves around promoting quality educational practices from both regional and international areas. Through the provision of high-quality modern education, the school aims to nurture well-rounded, culturally perceptive individuals proficient in both Chinese and Western traditions. The school boasts exceptional facilities, including a well-equipped cafeteria, accommodation, and a highly qualified teaching staff, particularly renowned for its English language instruction. Collaborating with the esteemed University of Huntington in the United States, the school recruits exceptional foreign educators to facilitate active English language learning among students, while simultaneously emphasizing the importance of Chinese language education. As an international bilingual institution, the China Hong Kong English School proudly celebrates the combination of Chinese and Western cultures, fostering a rich academic heritage.

2. Xichang Primary School:

Xichang Primary School, situated in the Shiqi District of Zhongshan City, Guangdong Province, is known as a top educational institution within the city. This is found along Fengyuan Commercial Street in Shiqi and it enjoys convenient transportation, adjacent to the Information Center and Teaching and Research Office of the Municipal Education Bureau. Covering an expansive area of 8,858 square meters, with a building area of 7,538 square meters, the school boasts a comprehensive infrastructure comprising a teaching building, office building, comprehensive building, and activity building. Equipped with 33 functional rooms featuring advanced teaching facilities, including independent classroom access and

computer networking capabilities, the school prides itself on its multimedia facilities, electronic resources, library, and specialized laboratories, such as the pioneering computer robot laboratory. With recreational amenities like plastic basketball courts, sports fields, and a biopark exceeding 500 square meters, Xichang Primary School is thus, an ecological garden school. Guided by the educational philosophy of fostering vibrant education and nurturing the foundation for students' lifelong development, the school endeavors to cultivate resilient, well-rounded individuals characterized by sound personality and boldness. It is then also recognized for its commitment to quality education. The school has garnered numerous accolades, including being designated as a "National Youth Science and Technology Innovation Education Demonstration Base" and achieving various provincial and municipal educational research achievements.

3. Tiyu Road School

Established in February 1997, Tiyu Road School in Shiqi District, Zhongshan City, Guangdong Province, is a distinguished public institution known for its innovative educational framework. This school integrates novel concepts, operational methodologies, curriculum integration, staffing structures, and management systems. With a commitment to fostering holistic development, fostering excellence in arts and sports, and striving for distinction, the school has garnered recognition as an exemplary organization for Double Civilization Construction by the district government multiple times and holds the

esteemed title of "Standardized School." Furthermore, the school also spans over 20 acres, with the campus spanning 5,436 square meters. This then provides students with a blend of garden, amusement park, and school park styles that accommodate 24 teaching classes and over 1,200 students and staff members. Moreover, the school has a dynamic, knowledgeable, and united leadership team and is supported by highly educated and proficient educators. The school then prides itself on its state-of-the-art teaching facilities and equipment that shows its commitment to modernization. Lastly, the school also emphasizes continuous educational reform initiatives such as open Chinese language instruction, instrumental music integration, and curriculum enhancements. With this, the school has garnered respective recognition, including provincial and municipal awards for outstanding courses and in prestigious competitions like the Mathematical Olympiad. In June 2023, it was recognized as one of the top national health school construction units, highlighting its commitment to holistic student well-being and development.

Sample and Sampling Technique

As the study will include three different schools as its data gathering locales, this will then mean that the study will use three different student populations. For this reason, the study will make use of a sampling technique that will randomly select 50% of each school population. This will mean that each school will have proper representations of each of the populations and

these will be the largest sizes for each. It is also important to mention that the sample populations are determined following a 95% confidence level with a 5% margin of error. The exact sample population is shown through Table 1 below. Here, it can be seen that there are a total

of 125 students and the study will have a sample size of 115 derived from this. 33 students will be taken from Zhonggang English School, 45, will be taken from Xichang Primary School, while 37 will be taken from Tiyu Road School.

Table 1. Sample and population sizes for the three research locales involved in the study.

School	Population	Sample Size
<i>Zhonggang English School</i>	35	33
<i>Xichang Primary School</i>	50	45
<i>Tiyu Road School</i>	40	37
Total:	125	115

Furthermore, the study also has specific inclusion and exclusion criteria to determine the respondents of the study. For the inclusion criteria, respondents must be currently enrolled students at the three schools, must be participating in tennis learning sessions and classes, must be between the ages of three to 12, and must have willingness to participate in the study. Then, the exclusion criteria are students who are not currently in any of the three schools, are not learning how to play tennis, are not in the mentioned age bracket, and do not have the willingness to participate in the study. Only students who fit the inclusion criteria will be included as a respondent in the study.

Research Instrument

The study will make use of a self-made questionnaire that will be designed to answer the respective research questions of this study. It will generally have three sections, namely, for the assessments of the demographic profile of the students, their skill development, and cognitive development.

For the first section, this will gather data on the different characteristics of the student population. More specifically, it will gather data on the sex, age, and years training in tennis. This will then be followed by the second section covering the assessment for the skill development of the students. This will include three dimensions, which are: teamwork and communication, physical fitness and mental toughness, and enthusiasm and attitude. Each of these dimensions will have five statements each, which total to 15 statements. Lastly, the third section will be for the assessment on the cognitive development of the students. This will also have three dimensions, which are: reasoning and strategic thinking, memory, and problem-solving. Similar to skill development, each of these dimensions will also have five statements, totaling to 15. All in all, the questionnaire will have three main parts and will comprise 30 statements.

Finally, it is also important to mention that since the questionnaire is designed by the researcher,

it would first require review and approval from experts. To supplement its validity, it will also be subjected to a test of reliability using Cronbach Alpha.

Data Gathering Procedure

In preparation for the data collection part of the study, several preliminary and necessary steps will be done by the researcher. First, the researcher will draft and submit a letter of approval to the Dean of the Graduate School of Emilio Aguinaldo College to seek official permission to conduct the study. Then, upon receiving approval from the Dean, a second letter will be composed and sent to the Ethics Committee of the College to ensure strict adherence to ethical standards throughout the study. As the third step, three letters requesting permission to conduct data collection will be prepared and sent to the three schools located in Zhongshan City, Guangdong Province, China. These letters are important for requesting approval and consent from the schools, allowing data collection from their students as respondents. These steps are necessary for formally obtaining permission to conduct the study while maintaining effective communication with the different governing bodies and individuals involved.

Upon approval from all involved organizations, the data collection process will begin and take place within the second semester of the academic year 2023-2024. Furthermore, it is crucial for the researcher to first obtain the informed consent of the respondents before any data collection procedures are done. This will be done through a prepared document that explains the study's approaches and objectives. Only individuals who agree and provide their consent by signing this document will be included in the study, as this will confirm their voluntary participation and contribution to its findings. After obtaining the informed consent of students, the researcher will proceed to administer the questionnaires. This is estimated

to take around 10 to 15 minutes for the respondents to complete. Finally, the gathered data will be subjected to different appropriate statistical analyses, which are further explained in the following section of this chapter.

Statistical Treatment of Data

As the research questions of the study are varying, the data will also be subjected to the appropriate statistical test to address each question correctly. It is also important to note that the primary statistical software that will be used in this study is the Statistical Package for the Social Sciences (SPSS). The specific statistical treatments employed are further elaborated below:

1. Frequency Count and Percentage

This will be used to analyze and process the data regarding the demographic profile of the respondents. The data for the age, sex, and years training in tennis will be presented through a table with calculated percentages and frequency counts. This is a suitable way to see the structure and characteristics of the sample population.

2. Weighted Mean

Next, the study will also make use of weighted mean values to understand and quantify the assessments for the skill and cognitive development of the students. This will also be a suitable test to compare and identify patterns in the data. Specifically, this will be done through a Likert Scale, where each value will be interpreted from. This will make use of a scale ranging from 1 to 5, where 1 is the lowest value and 5 is the highest value. Each of these ranks also have interpretations that are: Strongly Disagree (SD = 1); Disagree (D = 2); Neutral (N=3); Agree (A=4); to Strongly Agree (SA = 5). Table 2 below shows this in detail:

Table 2. Likert Scale weighted values with the description and textual interpretations.

Point	Scale/Range	Description	Interpretation
5	4.51-5.00	Strongly Agree	<i>Very High Level</i>
4	3.51-4.00	Agree	<i>High Level</i>
3	2.51-3.50	Neutral	<i>Moderate Level</i>
2	1.51-2.50	Disagree	<i>Low Level</i>
1	1.00-1.50	Strongly Disagree	<i>Very Low Level</i>

3. T-test and ANOVA

Furthermore, to test for the significant differences between variables, t-tests and ANOVAs will be used. T-tests will be used for calculating differences between sex and skill and cognitive development. Meanwhile, ANOVAs will be used testing differences between age and years training tennis with skill and cognitive development. Data will be analyzed through p-values or significance values.

4. Pearson's r

The final statistical test that will be used will be Pearson's r, which will be used to find any significant relationship between skill and cognitive development for learning tennis. Similar to t-tests and ANOVAs, this test will also be analyzed through calculated p-values.

As a final note to the statistical tests done in the study, the hypotheses mentioned in the first chapter will have a decision criteria of 0.05. This means that statements will be accepted with values above 0.05. Values below this would mean otherwise, i.e., that the hypothesis will be rejected.

Ethical Considerations

The final section of this chapter addresses the ethical considerations necessary to conduct the study. Prior to any data collection procedures, approval from the Ethics Review Committee of Emilio Aguinaldo College is important to ensure adherence to ethical standards. Specific emphasis will be given to informed consent, anonymity, and results communication protocols within the study. In relation to this, participants will first be asked to provide informed consent before data collection, confirming their voluntary participation and explaining their freedom to withdraw without consequences at any point in the study. Then, to safeguard participant privacy, measures will also be implemented to maintain anonymity and confidentiality throughout the study. Particularly, data will be secured by the researcher and will only be used for the purpose of the study and during its time frame. Lastly, results communication will involve participant verification of collected data through feedback and corrections, which will ensure accuracy and reliability.

References:

1. Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Prentice-Hall, Inc.
2. Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Harvard University Press.
3. Hong, F., & Zhouxiang, L. (2021). The Routledge handbook of sport in Asia.
4. Thelen, E., & Smith, L. B. (1994). A dynamic systems approach to the development of cognition and action. MIT press.
5. Afifi, M. T. (2019). Effect of Developing Core Strength and Dynamic Flexibility on Accuracy and Velocity of Performance of some Essential Skills in Tennis. *International Journal of Sports Science and Arts*, 010(010), 21–45. <https://doi.org/10.21608/eijssa.2019.72919>
6. Anderson, E., Stone, J. A., Dunn, M., & Heller, B. (2021). Coach approaches to practice design in performance tennis. *International Journal of Sports Science & Coaching*, 174795412110272. <https://doi.org/10.1177/17479541211027294>
7. Anmarkrud, Ø., Andresen, A., & Bråten, I. (2019). Cognitive Load and Working Memory in Multimedia Learning: Conceptual and Measurement Issues. *Educational Psychologist*, 54(2), 61–83. <https://doi.org/10.1080/00461520.2018.1554484>
8. Barker, D., & Thibault, L. (2021). Globalization and Diversity in Modern Tennis: Implications for Talent Development and International Competition. *Journal of Sport & Tourism*, 25(2), 131-146.
9. Burgess, D., & Naughton, L. (2020). Constraints-Led Approach in Tennis: A Systematic Review of Current Research. *Journal of Sports Science & Medicine*, 19(2), 234-245.
10. Chalip, L., & Smith, A. (2022). Sustainability in Tennis: Current Trends and Future Directions. *Journal of Sustainable Tourism*, 30(4), 589-604.
11. Chen, H., Li, C., Meng Xian-lu, Chmura, P., & Wei, X. (2023). Development of youth tennis players: A study based on the ranking history of top ATP/WTA players worldwide and China. *PLOS ONE*, 18(11), e0289848–e0289848. <https://doi.org/10.1371/journal.pone.0289848>
12. Chen, R., Chen, X., & Yang, C. (2021). Using a task dependency job-scheduling method to make energy savings in a cloud computing environment. *The Journal of Supercomputing*, 78(3), 4550–4573. <https://doi.org/10.1007/s11227-021-04035-5>
13. Chen, X., Lin, J., Ma, Y., Lin, B., Wang, H., & Huang, G. (2019). Self-adaptive resource allocation for cloud-based software services based on progressive QoS prediction model. *Science China Information Sciences*, 62(11). <https://doi.org/10.1007/s11432-018-9750-2>
14. Cowden, R. G., Crust, L., Tibbert, S. J., & Jackman, P. C. (2020). Mental toughness development and training in sport. *Advancements in Mental Skills Training*, 28–43. <https://doi.org/10.4324/9780429025112-4>
15. Crespo, M., Botella-Carrubí, D., & Jabaloyes, J. (2021). Innovation in tennis: An overview of research. *ITF Coaching & Sport Science Review*, 29(83), 28–30. <https://doi.org/10.52383/itfcoaching.v29i83.53>
16. De Waelle, S., Warlop, G., Lenoir, M., Bennett, S. J., & Deconinck, F. J. A. (2021). The development of perceptual-cognitive skills in youth volleyball players. *Journal of Sports Sciences*,

- 39(17), 1911–1925.
<https://doi.org/10.1080/02640414.2021.1907903>
18. Demetriou, A., Spanoudis, G. C., Greiff, S., Makris, N., Panaoura, R., & Kazi, S. (2022). Changing priorities in the development of cognitive competence and school learning: A general theory. *Frontiers in Psychology*, 13, 954971. <https://doi.org/10.3389/fpsyg.2022.954971>
19. Ferguson, L., Patterson, S. D., & MacMaster, M. J. (2019). Social Development and Learning through Tennis: A Case Study. *Journal of Physical Education, Recreation & Dance*, 90(6), 30-36.
20. Fluetsch, N., Levy, C., & Tallon, L. (2019). The relationship of physical activity to mental health: A 2015 behavioral risk factor surveillance system data analysis. *Journal of Affective Disorders*, 253, 96–101. <https://doi.org/10.1016/j.jad.2019.04.086>
21. Gbadamosi, R. (2020). Serena Williams: A research method and psychological perspective study. *Researchgate*. <https://doi.org/10.13140/RG.2.2.28716.62086>
22. Grazina, R., Cid, L., Marques, A., & Santos, C. A. (2020). The Effect of a Tennis Intervention Program on Executive Functioning in School-aged Children. *Journal of Human Kinetics*, 71(1), 73-82.
23. Gumilar Mulya, Anggi Setia Lengkana, & Resty Agustriyani. (2021). TennBasTech: A Scientific Approach to Teach Tennis. 9(6), 1371–1382. <https://doi.org/10.13189/saj.2021.090633>
24. Hari, T., Nining Widyah Kusnanik, & Hari Setijono. (2019). Conventional and Modern Learning with Different Motor Abilities Towards Increasing Consistency of Groundstroke Forehand Drive in Tennis. <https://doi.org/10.2991/icssh-18.2019.2>
25. Harris, D. J., Vine, S. J., Eysenck, M. W., & Wilson, M. R. (2021). Psychological pressure and compounded errors during elite-level tennis. *Psychology of Sport and Exercise*, 56, 101987. <https://doi.org/10.1016/j.psychsport.2021.101987>
26. Henriksen, K., Storm, L. K., Stambulova, N., Pyrdol, N., & Larsen, C. H. (2019). Successful and Less Successful Interventions With Youth and Senior Athletes: Insights From Expert Sport Psychology Practitioners. *Journal of Clinical Sport Psychology*, 13(1), 72–94. <https://doi.org/10.1123/jcsp.2017-0005>
27. Hulteen, R. M., Smith, J. J., & Morgan, P. J. (2022). Tennis for Physical Literacy: A Systematic Review. *Research Quarterly for Exercise and Sport*, 1-16.
28. James, J., Pringle, A., Mourton, S., & Roscoe, C. M. P. (2023). The Effects of Physical Activity on Academic Performance in School-Aged Children: A Systematic Review. *Children*, 10(6), 1019. <https://doi.org/10.3390/children10061019>
29. Johnson, L., & Jones, R. (2023). Exploring the Game-Based Approach in Tennis Coaching: Perspectives and Practices. *Journal of Physical Education, Recreation & Dance*, 94(1), 45-50.
30. Kolman, N. S., Kramer, T., Elferink-Gemser, M. T., Huijgen, B. C. H., & Visscher, C. (2019). Technical and tactical skills related to performance levels in tennis: A systematic review. *Journal of Sports Sciences*, 37(1), 108–121. <https://doi.org/10.1080/02640414.2018.1483699>

32. Koopmann, T., Faber, I., Baker, J., & Schorer, J. (2020). Assessing Technical Skills in Talented Youth Athletes: a Systematic Review. *Sports Medicine*, 50. <https://doi.org/10.1007/s40279-020-01299-4>
33. Lake, R. (2019). *Routledge Handbook of Tennis: History, Culture and Politics*. In idrottsforum.org. Routledge International Handbooks. https://idrottsforum.org/wijjoh_lake201202/
34. Lengkana, A. S., Tangkudung, J., & Asmawi, A. (2019). The Effect Of Core Stability Exercise (CSE) On Balance In Primary School Students. *Journal of Education, Health and Sport*, 9(4), 160–167. <https://apcz.umk.pl/JEHS/article/view/6772>
35. Li, L., Rick, O. J. C., Mullin, E. M., & Moosbrugger, M. E. (2022). Examining Adolescent Tennis Participation in Contemporary China Using an Ecological Framework. *International Journal of Environmental Research and Public Health*, 19(10), 5989. <https://doi.org/10.3390/ijerph19105989>
36. Li, P., Weissensteiner, J. R., Pion, J., & Bosscher, V. D. (2020). Predicting elite success: Evidence comparing the career pathways of top 10 to 300 professional tennis players. *International Journal of Sports Science & Coaching*, 15(5-6), 793–802. <https://doi.org/10.1177/1747954120935828>
37. Li, X., & Chen, S. (2019). Analysis of the Development Status of China's Tennis Industry. *Contemporary Sports Science and Technology*, 9(1), 166-167.
38. Li, Y., Zhang, Y., & Wei, J. (2020). The Current Situation and Development Countermeasures of Chinese Tennis. *Journal of Chemical and Pharmaceutical Research*, 12(7), 6-9.
39. Liu, Z., Jiang, K., Hou, Z., Lin, Y., & Dong, J. S. (2023). Insight Analysis for Tennis Strategy and Tactics. *IEEE International Conference on Data Mining (ICDM)*.
40. Marin Bosch, B., Bringard, A., Logrieco, M. G., Lauer, E., Imobersteg, N., Thomas, A., Ferretti, G., Schwartz, S., & Igloi, K. (2020). Effect of acute physical exercise on motor sequence memory. *Scientific Reports*, 10(1), 15322. <https://doi.org/10.1038/s41598-020-72108-1>
41. Mario Oršolić, Petar Barbaros, & Dario Novak. (2023). What makes a Grand Slam champion? Early engagement, late specialization and timely transition from having fun to dedication. *Frontiers in Sports and Active Living*, 5. <https://doi.org/10.3389/fspor.2023.1213317>
42. Martínez-Gallego, R., & Antonio Fonseca Morales. (2022). Feedback y aprendizaje en el tenis: conceptualización, clasificación e implicaciones prácticas. *ITF Coaching & Sport Science Review (English Ed.)*, 30(88), 49–52. <https://doi.org/10.52383/itfcoaching.v30i88.368>
43. Martland, R., Mondelli, V., Gaughran, F., & Stubbs, B. (2019). Can high intensity interval training improve health outcomes among people with mental illness? A systematic review and preliminary meta-analysis of intervention studies across a range of mental illnesses. *Journal of Affective Disorders*. <https://doi.org/10.1016/j.jad.2019.11.039>
44. Moran, A., Campbell, M., & Toner, J. (2019). Exploring the cognitive mechanisms of expertise in sport: Progress and prospects. *Psychology of Sport and Exercise*, 42, 8–15.

- <https://doi.org/10.1016/j.psychsport.2018.12.019>
45. Mulya, G., & Lengkana, A. S. (2020). Pengaruh Kepercayaan Diri, Motivasi Belajar Terhadap Prestasi Belajar Pendidikan Jasmani. *COMPETITOR: Jurnal Pendidikan Kepelatihan Olahraga*, 12(2), 83. <https://doi.org/10.26858/cjpko.v12i2.13781>
46. Mutlu-Bayraktar, D., Cosgun, V., & Altan, T. (2019). Cognitive load in multimedia learning environments: A systematic review. *Computers & Education*, 141, 103618. <https://doi.org/10.1016/j.compedu.2019.103618>
47. Premkumar, P., Chakrabarty, J. B., & Chowdhury, S. (2019). Key Performance Indicators for Factor Score based Ranking in ODI Cricket. *IIMB Management Review*. <https://doi.org/10.1016/j.iimb.2019.07.008>
48. R Amalia, M Zaiyar, F Fadilah, & Santoso, E. (2021). Android-Based Learning Environment To Enhance Creative Thinking Mathematics and Self-Efficacy. *Journal of Physics: Conference Series*, 1764(1), 012133–012133. <https://doi.org/10.1088/1742-6596/1764/1/012133>
49. Reid, M., & Harvey, S. (2021). Understanding the Technique-Based Approach in Tennis: Perspectives from Coaches and Players. *Journal of Sports Science & Medicine*, 20(1), 101-108.
50. Renshaw, I., Davids, K., Newcombe, D., & Roberts, W. (2019). *The Constraints-Led Approach*. Routledge. <https://doi.org/10.4324/9781315102351>
51. Roetert, E., Woods, R., & Jayanthi, N. (2019). The benefits of multi-sport participation for youth tennis players. *ITF Coaching and Sport Science Review* 2019; 75 (26): 14 - 17.
52. Senduran, F., & Amman, T. (2019). Problem-Solving Skills of High School Students Exercising Regularly in Sport Teams. *Physical Culture and Sport. Studies and Research*, 67(1), 42–52. <https://doi.org/10.1515/pccsr-2015-0021>
53. Shi, P., & Feng, X. (2022). Motor skills and cognitive benefits in children and adolescents: Relationship, mechanism and perspectives. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.1017825>
54. Smith, A. D. (2019). Muscle Memory Application to Tennis. *Researchgate*. <https://doi.org/10.13140/RG.2.2.12047.69287>
55. SPRING, K. E., HOLMES, M. E., & SMITH, J. W. (2020). Long-term Tennis Participation and Health Outcomes: An Investigation of “Lifetime” Activities. *International Journal of Exercise Science*, 13(7), 1251–1261. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7523898/>
56. Suherman, A., Saptani, E., Setialengkana, A., & Nugraha, R. G. (2019). Understanding the teaching style of physical education teacher in primary school through audio visual media. *Journal of Physics: Conference Series*, 1318, 012122. <https://doi.org/10.1088/1742-6596/1318/1/012122>
57. Triolet, C., Teulier, C., & Benguigui, N. (2022). A pilot study on the use of dynamic-contextual and kinematic information in the anticipation of tennis shots. *Movement & Sport Sciences - Science & Motricité*. <https://doi.org/10.1051/sm/2022006>
58. Veale, J. P., & Velasco, M. J. (2023). The Role of Technology and Data Analytics in Modern Tennis: Perspectives and Practices. *Journal of Sports Sciences*, 41(3), 321-330.

59. Veliz, P. (2019). HOW TENNIS INFLUENCES YOUTH DEVELOPMENT. t. New York, NY: Women's Sports Foundation. <https://files.eric.ed.gov/fulltext/ED598618.pdf>
60. Wang, Y., & Deng, S. (2021). The Development of Tennis in China and Its Enlightenment to the Popularization of Tennis in Colleges and Universities. *Journal of Physical Education*, 28(1), 81-84.
61. Wang, Y., Tan, L. T., & Kuan, G. (2023). Tennis Player's Coping Strategies at Duta International Tennis Academy During Their Different Career Phases: A Narrative Review.
62. Xu, Y., Zhang, W., Zhang, H., Wang, L., Luo, Y., & Ni, G. (2022). Association between tennis training experience and executive function in children aged 8–12. *Frontiers in Human Neuroscience*, 16. <https://doi.org/10.3389/fnhum.2022.924809>
63. Yi, G., Yang, D., Abdelhak Bentaleb, Li, W., Li, Y., Zheng, K., Liu, J., Wei Tsang Ooi, & Cui, Y. (2019). The ACM Multimedia 2019 Live Video Streaming Grand Challenge. <https://doi.org/10.1145/3343031.3356083>
64. Zemková, E. (2022). Strength and Power-Related Measures in Assessing Core Muscle Performance in Sport and Rehabilitation. *Frontiers in Physiology*, 13. <https://doi.org/10.3389/fphys.2022.861582>
65. Zhou, D. (2023). Analysis on UTR system in China by Communication, Psychological, and Sociological Factors. *SHS Web of Conferences*, 171, 01020–01020. <https://doi.org/10.1051/shsconf/202317101020>
66. Sporting & Fitness Industry Association (n.d.). Retrieved from https://www.sfia.org/reports/707_2019-Sports%2CFit-ness%2C-and-Leisure-Activities-ToplineParticipation-Report on April 3, 2024.
67. Beckford, C. (2019, July 5). A Brief History of Tennis and the Wimbledon Championships. *The Gale Review*. <https://review.gale.com/2019/07/05/a-brief-history-of-tennis-wimbledon-championships/>
68. Clarey, C. (2023, April 13). WTA Returns to China, Lifting Suspension on Tournaments. *The New York Times*. <https://www.nytimes.com/2023/04/13/sports/tennis/wta-china-peng-shuai.html>

Appendices:

Appendix A

Research Instrument

Survey Questionnaire (English Version)

The Effect of Skill and Cognitive Development for Improved Early Childhood Training In Tennis

Hello! I am a researcher from Emilio Aguinaldo College and I am currently conducting a study on the impacts of skill and cognitive development of young tennis students from different schools in Zhongshan City, Guangdong Province. This has the goal of formulating a framework that identifies key factors that contribute to improved performance and proficiency among young learners.

Hence, your participation and insights hold significant importance in assessing and understanding the current status of this research topic. Your contributions to this study will be treated with the utmost confidentiality and will only be used for the purpose of the study. Your cooperation and genuine responses in completing the questionnaire are greatly valued and appreciated!

Part I: Demographic Profile of Students

Name (Optional):

- 4 to 5 years
- More than 6 years

Directions: This part of the survey will collect important personal details, kindly check the items that best apply to you.

1. What is your sex?
 - Male
 - Female
2. In which of the following age groups do you belong to?
 - 7 years old
 - 8 – 12 years old
3. How many years have you been learning and playing tennis?
 - Less than 1 year
 - 2 to 3 years
- 6.

Part II: Skill Development

Directions: This part of the survey focuses on assessing your current perception on your skill development in learning tennis in your school. Please rate each of the presented statements according to your level of perception by placing a check (✓) mark on the box opposite the description shown.

Note: Please use the following Likert Scale for your reference while answering:

1. Strongly Disagree (SD) (very low level)
2. Disagree (D) (low level)
3. Neutral (N) (moderate level)
4. Agree (A) (high level)
5. Strongly Agree (SA) (very high level)

Teamwork and Communication	5	4	3	2	1
There is effective teamwork that enhances the quality of my tennis training.					
Clear communication among coaches and staff positively impacts my skill development.					
There are collaborative efforts between trainers and educators which are crucial for optimizing my skill development during my training.					
There is strong teamwork that fosters a supportive environment, aiding in my overall growth and progress.					
There are open communication channels between all teachers and students that contribute to a holistic approach to training.					
B. Physical Fitness and Mental Toughness	5	4	3	2	1
My physical fitness plays a vital role in enhancing my performance and endurance during training.					
Developing my mental toughness is essential to overcome challenges and stay focused during practice and matches.					

Both physical fitness and mental toughness greatly influences the success of my training.					
A balanced approach to physical and mental conditioning is used by my school and this is key to fostering resilience and determination in tennis.					
My school understands the interaction between physical fitness and mental toughness and uses this for designing effective training programs.					
C. Enthusiasm and Attitude	5	4	3	2	1
My enthusiasm positively impacts my engagement and enjoyment in tennis training sessions.					
I have a positive attitude that fosters resilience and perseverance and contributes to my overall development.					
The attitude of coaches and parents significantly influences my motivation and enthusiasm in participating in training.					
I think that maintaining a positive attitude is essential for creating a supportive and encouraging environment for my skill development.					
I think that enthusiasm and a positive attitude are key factors in shaping my overall experience and success of my tennis training journey.					

Part III: Cognitive Development

Directions: This final part of the survey focuses on assessing your current perception on your cognitive development in learning tennis in your school. Please rate each statement according to your

perception by putting a check (✓) mark on the box opposite the description shown.

Note: Please use the same Likert Scale as used in the previous section of this questionnaire.

Reasoning and Strategic Thinking	5	4	3	2	1
My school enhances reasoning abilities that aid players in making strategic decisions during matches.					
Teachers incorporate strategic thinking skills to foster a deeper understanding of the game.					

Students are taught reasoning skills that are crucial for anticipating opponents' moves and adjusting their gameplay.					
Students have the ability to think strategically which enhances problem-solving skills and adaptability on the court.					
I think that understanding the impact of reasoning and strategic thinking on performance is essential for optimizing tennis training programs.					
B. Memory	5	4	3	2	1
I think that memory retention improves the ability to recall and apply tennis techniques learned during training sessions.					
I think that enhancing memory skills enables players to better remember opponents' playing patterns and adjust their strategies accordingly.					
I think that effective memory development contributes to better retention of tennis tactics and game plans taught by coaches.					
I think that memory plays a crucial role in reinforcing muscle memory, leading to improved execution of tennis strokes and movements.					
My school understands the relationship between memory and skill acquisition for designing effective tennis training programs.					
C. Problem-Solving	5	4	3	2	1
I think that problem-solving skills in tennis training empower players to overcome obstacles and adapt to various game situations.					
My coaches focus on enhancing the problem-solving abilities of students to analyze challenges on the court and formulate effective strategies to overcome them.					
My school focuses on problem-solving and fosters creativity and critical thinking in learning tennis.					
I think that effective problem-solving skills contribute to improved decision-making and confidence during tennis matches.					
My school understands the impact of problem-solving on cognitive development for optimizing tennis training programs.					

Appendix B
Respondents and Data Collection





