

Tennis as a Correlate of Students' Learning Engagement and Cognitive Skills Towards a Training Program



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ABSTRACT: Tennis, as a cognitive and physical endeavor, possesses untapped potential as a conduit for improving learning engagement and cognitive skills among students. Grounded in the Cognitive Information Processing (CIP) and Student Engagement Theory, this study examines the nexus between tennis training and the enhancement of student engagement and cognitive abilities among students at Jiangsu Maritime Institute. Adopting a quantitative research design, the study population comprised first and second-year students from diverse age brackets, an equal gender representation, and varied specializations, ensuring a holistic representation of the broader student community. The breadth of the study sample underscores its representativeness and inclusivity of the diverse student community at Jiangsu Maritime Institute. While tennis elicits robust student engagement, gaps remain, notably in fitness routines, assimilation of feedback, and cultivating strategic thought processes. Self-assessments reveal students perceive their tennis prowess modestly, with pronounced capabilities in generating power and stroke modulation. However, areas like consistent performance under duress and swift shot recovery denote avenues for growth. Pivotal determinants such as age, sex, and academic specialization wield significant influence over the degree of tennis-related engagement. This accentuates the necessity for specialized engagement strategies tailored for distinct demographic profiles. Evaluations of tennis proficiencies delineate discernible variations influenced by age, gender, and academic specialization, cementing the imperative for targeted skill augmentation interventions. A palpable positive association between tennis engagement levels and self-rated skills underscores the hypothesis that escalated engagement potentially bolsters perceived competencies, thereby emphasizing the symbiotic relationship between participation and skill evolution. The findings spotlight the exigency for bespoke coaching blueprints that zero in on distinct facets of engagement and skill amplification. Deploying tailored training modules, attuned to the unique demography of Jiangsu Maritime Institute's student body, can potentiate simultaneous augmentation in student engagement and skill enhancement. Tennis, beyond its recreational purview, can be a strategic instrument in fostering heightened student engagement and cognitive prowess. For institutions like Jiangsu Maritime Institute, weaving in tennis training tailored to the distinctive student profiles can be a game-changer in nurturing both academic and athletic excellence.

KEYWORDS: TENNIS, STUDENT ENGAGEMENT THEORY, COGNITIVE SKILLS

INTRODUCTION

Cognitive skills are mental aptitudes employed in knowledge acquisition, information manipulation, reasoning, and problem-solving. Cognitive functions, cognitive capabilities, and cognitive abilities are synonyms. Cognitive abilities may be viewed as a person's learning resources. One can execute things easily and effectively with the correct equipment. Teachers frequently lament that their students lack the cognitive or brain-based skills necessary to handle a curriculum. Teaching cognitive skills is neglected at all levels of education, even though this is only anecdotal evidence at best. (Plessis, 2023).

Academic ability is affected by a variety of characteristics, including motivation, study habits, organizational skills, tenacity, access to resources, and support networks, in addition to cognitive traits like IQ and memory. It is crucial to understand that other non-academic skills and qualities, such as creativity, emotional intelligence, and interpersonal skills, also significantly contribute to one's personal and professional development. Academic ability is not the only factor that determines an individual's intelligence or likelihood of success in life.

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Since 2008, Chinese official strategy and investment have centered on a select group of "global sports," including tennis. Tennis is at the core of this modern global sport paradigm, despite the fact that other sports like soccer, golf, marathon running, and ultra-sports have all played a comparable role.

The International Tennis Federation research states that Asia has more than 33 million tennis players make up 37.9% of the tennis population worldwide (China contributed 22.5%). Instead of professional and organized participation, the majority of adolescent tennis activity is linked to recreational practice and non-organized patterns. China would make up a large chunk of the worldwide participation numbers if these adolescent participants were counted.

Following the 2008 Beijing Olympics, tennis in China saw a rise in popularity thanks to a number of high-profile victories on the court, such as Li Na winning two grand slam titles and Zheng Jie and Yan Zi winning the Wimbledon Championships doubles and the Australian open doubles titles. According to Sun, "Li Na and tennis has become a new business card for Chinese sports and even China" (p. 113). As a result of these victories and developments, the Chinese audience became more interested in tennis. A wider shift in China's sports growth was also suggested by adjustments to policies implemented by the central party in the run-up to the 2008 Beijing Olympics.

Tennis, on the other hand, is a sensible and efficient strategy to support teenage physical fitness, cognitive and executive function, psychological wellness, and lifelong development. In this way, the issue of how to promote adolescent engagement in PA and sports, such as tennis, is becoming more and more prevalent all over the world. There is, however, limited research on how this process operates in national cultural contexts throughout Asia, such as in China and India, as well as in a particular international sport, like tennis.

Table 1. Demographic profile in terms of Age

Age	Frequency	Percentage
18 years old	54	27.8
19 years old	53	27.3
20 years old	43	22.2
21 years old	44	22.7
Total	194	100

Table 1 shows the age distribution of the survey encompasses a diverse set of participants from various years of college, with a notable concentration of responders falling between the 18 to 21 age brackets. This implies that the research has successfully obtained viewpoints from individuals in various phases of their collegiate experience. The sample has a balanced gender distribution, suggesting that female and male students are adequately represented. This sample characteristic boosts the study's capacity to generate insights relevant to both genders.

The comprehension of the participants' demographic characteristics is crucial in the interpretation of the study's results. The experiences, attitudes, and engagement levels of individuals may differ based on their age groups and genders, thereby impacting the outcomes associated with tennis involvement and cognitive ability. Researchers must take into account these demographic aspects during the analysis of the findings and the formulation of conclusions.

In general, the demographic data supplied serves as a fundamental basis for comprehending the attributes of the participants and establishes a framework for further investigation into the correlation between tennis training, participation, and cognitive ability among students enrolled at Jiangsu Maritime Institute.

Table 2. Demographic profile of the respondents in according to Sex

Sex	Frequency	Percentage
Male	61	59.22
Female	42	40.78
Total	103	100

Table 2 shows the responses exhibit a nearly equal distribution of genders, with 100 participants (51.5%) identifying as female and 94 participants (48.5%) identifying as male. The distribution of participants in this study demonstrates a very balanced representation of both female and male individuals.

The presence of a balanced gender distribution within the study is a favourable attribute, since it guarantees a heterogeneous array of viewpoints and lived encounters. The significance of variation becomes particularly salient when

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examining the effects of tennis training on levels of engagement and cognitive capacity. The study's findings may be influenced by the varying approaches to sports and physical activities exhibited by individuals of different genders.

The inclusion of a nearly equal number of male and female participants enhances the external validity of the study, hence potentially facilitating the derivation of more generalizable results. The study's findings imply the potential generalizability of the results to a wider population outside the specific sample under investigation.

Table 3. Level of students' tennis engagement as to behavioral.

Indicators	Mean	Verbal Interpretation
1. I play tennis regularly (at least once a week).	2.49	Extent
2. I consistently practice tennis outside of scheduled sessions or matches.	2.75	Extent
3. I am highly motivated to improve my tennis skills.	2.78	Extent
4. Tennis is one of my top three favorite physical activities.	2.77	Extent
5. I have invested in personal tennis equipment (racket, shoes, etc.).	2.72	Extent
6. I often seek out new strategies or techniques to enhance my game.	2.73	Extent
7. I participate in tennis matches or tournaments whenever possible.	2.74	Extent
8. I often challenge myself by playing against opponents who are better than me.	2.82	Extent
9. I enjoy discussing tennis strategies and games with friends or peers.	2.76	Extent
10. I often watch tennis matches (live or on TV) to learn and enjoy.	2.86	Extent
11. I frequently ask for feedback on my tennis techniques from coaches or peers.	2.77	Extent
12. I take criticism regarding my tennis game positively and use it as an opportunity to improve.	2.71	Extent
13. I engage in physical training or exercises specifically to improve my tennis game.	2.84	Extent
14. I consider my physical fitness when making decisions about my tennis training.	2.70	Extent
15. Tennis is a significant part of my life.	2.73	Extent
General Assessment	2.74	Extent
Legends: No extent - 0 – 0.99 Extent - 2 – 2.99 Little extent - 1 – 1.99 Very large extent - 3 – 3.99		

The results suggest that, on average, participants display a modest level of engagement in different behavioral dimensions of tennis. Although individuals demonstrate a commendable inclination towards acquiring knowledge and embracing personal growth, there exists potential for enhancement in certain areas, such as including physical fitness as a determinant in training choices and exhibiting a receptive attitude towards constructive feedback.

These insights could be utilized by coaches and educators to develop interventions aimed at promoting more involvement in domains that exhibit comparatively lower ratings. One potential strategy to promote overall involvement in tennis training is to emphasize the significance of physical fitness and provide suggestions on integrating fitness routines. In a similar vein, establishing a conducive atmosphere for the reception and implementation of feedback has the potential to foster heightened levels of involvement and facilitate individual development.

The diversity in reactions observed concerning these behavioral dimensions highlights the distinctiveness of each participant's level of involvement. The potential to enhance the promotion of behavioral engagement in tennis-related activities lies in the implementation of personalized techniques that cater to the unique preferences and requirements of individuals. This approach, which acknowledges and addresses the inherent variety among participants, has the potential to yield a more comprehensive and efficacious outcome.

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In summary, the examination of degrees of behavioral engagement yields significant insights for enhancing tactics aimed at increasing students' participation in different facets of tennis and fostering their comprehensive development as avid followers of the sport.

Table 4. Level of students' tennis engagement as to cognitive

Indicators	Mean	Verbal interpretation
1. I often feel a sense of joy or satisfaction after playing tennis.	2.75	Extent
2. I am well-versed with the rules of tennis.	2.72	Extent
3. I understand the basic techniques and strategies used in tennis.	2.75	Extent
4. I often think about and plan my strategies before a tennis match.	2.73	Extent
5. I adjust my playing strategies based on my opponent's strengths and weaknesses.	2.78	Extent
6. I actively read or watch content related to tennis to improve my understanding.	2.76	Extent
7. I stay updated with new techniques, strategies, or changes in the world of tennis.	2.73	Extent
8. After playing, I frequently reflect on my performance and identify areas of improvement	2.81	Extent
9. I consider my past matches to make informed decisions in current games.	2.83	Extent
10. I engage in detailed discussions about tennis techniques and strategies with peers or coaches	2.72	Extent
11. I think critically and share my perspectives during tennis-related discussions	2.77	Extent
12. Before important matches, I visualize different scenarios to mentally prepare	2.70	Extent
13. I often mentally rehearse challenging shots or movements to improve my game.	2.76	Extent
14. I am familiar with and use standard tennis terminologies during discussions or games.	2.74	Extent
15. I actively seek to learn and understand new tennis terminologies or concepts	2.87	Extent
16. I am always curious to learn more about tennis, even outside of my regular practice sessions	2.71	Extent
17. My desire to understand tennis deeply drives me to seek knowledge continuously	2.75	Extent
18. Tennis is more than just a game to me, it's a passion.	2.72	Extent
General Assessment	2.76	Extent
Legends: No extent-0-0.99 Little extent-1-1.99 Extent-2-2.99 Very large extent-3-3.99		

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The results indicate that, on average, participants exhibit a modest level of cognitive engagement in many facets of tennis. The participants have a strong inclination towards acquiring new knowledge and understanding of concepts and terminology, as well as a capacity to adjust techniques and engage in self-reflection over their own performance. Nevertheless, there exist certain domains where the degree of cognitive involvement could be further augmented.

Educators and coaches may explore the utilization of higher-scoring elements as exemplars to foster more involvement in domains exhibiting lower scores. Strategies aimed at promoting cognitive engagement may include the encouragement of visualization and critical thought before to matches, as well as the facilitation of open debates pertaining to strategies.

The presence of a wide range of standard deviations in responses suggests that there is considerable variety in cognitive engagement profiles among individuals. Customizing coaching and education tactics to accommodate this range of variety can result in a more holistic approach to augmenting cognitive engagement.

In summary, the examination of cognitive engagement levels offers significant insights for formulating techniques that can enhance students' cognitive participation in several facets of tennis. Educators have the ability to foster students' comprehensive development as tennis fans and strategic players through the cultivation of strategic thinking, analysis, and a commitment to continual learning.

Table 5. Level of students' tennis engagement as to Emotional Engagement

Indicators	Mean	Verbal Interpretation
1. I feel a deep connection and love for tennis.	2.72	Extent
2. Playing tennis brings me immense joy and	2.73	Extent
3. Winning or improving in tennis uplifts my mood considerably.	2.74	Extent
4. I am emotionally resilient when facing challenges or losses in tennis.	2.77	Extent
5. Tennis serves as a coping mechanism for me during stressful times.	2.73	Extent
6. I feel a strong sense of belonging when I'm on the tennis court.	2.79	Extent
7. Being part of a tennis community or team gives me a sense of identity	2.77	Extent
8. I feel deep emotions, both positive and negative, after matches, irrespective of the outcome.	2.79	Extent
9. My emotions after a tennis match reflect my level of commitment and involvement in the game.	2.80	Extent
10. I feel emotionally connected to certain tennis players or icons and often draw inspiration from them.	2.86	Extent
11. The success stories of professional tennis players resonate with me on an emotional level.	2.84	Extent
12. My emotional connection with tennis is a significant motivator for me to keep playing and improving.	2.80	Extent
13. The highs and lows I experience in tennis drive my determination to get better.	2.73	Extent
14. Tennis has taught me to handle my emotions better, both on and off the court.	2.73	Extent
15. The emotions I've felt during tennis have contributed to my personal growth and emotional intelligence.	2.70	Extent
General Assessment	2.74	Extent
Legends: No extent - 0 – 0.99 Little extent - 1 – 1.99 Extent - 2 – 2.99 Very large extent - 3 – 3.99		

The results indicate that, on average, participants exhibit a modest level of emotional involvement in many facets of tennis. The participants in the study have a strong emotional attachment to the sport, derive inspiration from professional players, and employ tennis as a coping mechanism. Nevertheless, there exist certain domains where the degree of emotional involvement could be further augmented.

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Educators and coaches have the potential to utilize the higher-scoring components as exemplars in order to foster more involvement in areas that have lower scores. For example, placing emphasis on the cultivation of emotional growth and the enhancement of emotional intelligence through tennis-related experiences may facilitate heightened emotional engagement.

The presence of a wide range of standard deviations in answers highlights the existence of varied emotional involvement profiles among individuals. Adapting coaching and education practices to accommodate this range of variety can result in a more holistic approach to augmenting emotional engagement.

In summary, the examination of emotional engagement levels yields significant findings that might inform the development of tactics aimed at enhancing students' emotional participation in several facets of tennis. Educators have the potential to enhance students' overall development as emotionally linked tennis lovers and players through the cultivation of emotional connection, motivation, and personal growth.

Table 6. Assessment of the respondents' tennis skills in terms of forehand

Indicators	Mean	Verbal Interpretation
1. My grip and stance are appropriate when preparing for a forehand shot.	2.77	Extent
2. I am able to consistently use the correct swing path when hitting a forehand.	2.76	Extent
3. I can generate adequate power on my forehand shots.	2.84	Extent
4. Most of my forehands land deep in the opponent's court, near the baseline.	2.79	Extent
5. I can place my forehand shots effectively to both the cross-court and down-the-line directions.	2.82	Extent
6. I can target and exploit openings in the court with my forehand.	2.75	Extent
7. I am able to impart topspin on my forehand to ensure control and depth.	2.78	Extent
8. When necessary, I can hit a flat forehand or use slice effectively.	2.84	Extent
9. I can adjust my forehand technique based on the incoming ball (e.g., high balls, low balls, etc.).	2.75	Extent
10. I can vary the pace and spin of my forehand to keep my opponent off-balance.	2.78	Extent
11. My footwork allows me to get into the right position to hit an effective forehand.	2.73	Extent
12. I can hit a strong forehand even when on the move or out of position.	2.76	Extent
13. My forehand is a reliable shot, and I can maintain consistency during long rallies.	2.77	Extent
14. I trust my forehand under pressure situations in matches.	2.68	Extent
15. After hitting a forehand, I recover quickly and get ready for the next shot.	2.68	Extent
16. I am proactive in anticipating the next shot, allowing me to set up my forehand effectively.	2.77	Extent
General Assessment	2.77	Extent

Legends:

No extent-0-0.99

Little extent-11.99

Extent-2-2.99

Very large extent - 3-3.99

The table provides an analysis of respondents' self-evaluations on their forehand talents across many dimensions of the sport of tennis. These aspects assess several components of the forehand technique and its efficacy.

The results indicate that, on average, participants possess a moderate level of self-evaluation on their forehand abilities across many dimensions. The participants exhibit a high level of self-assurance in their ability to generate power and manipulate shots. However, there are areas where they may enhance their performance, particularly in terms of keeping confidence in high-pressure situations and quickly recovering from setbacks.

The presence of a wide range of standard deviations highlights the considerable variety in replies, underscoring the fact that people possess distinct self-assessment profiles for forehand skills. By implementing customized coaching tactics, the issue of variability can be effectively addressed, hence facilitating a more holistic approach to enhancing forehand technique.

Table 7. Assessment of the respondents' tennis skills in terms of backhand

Indicators	Mean	Verbal interpretation
1. My grip and stance are appropriate when preparing for a backhand shot.	2.76	Extent
2. I maintain a stable and consistent swing path when executing the backhand.	2.73	Extent
3. I am capable of generating sufficient power on my backhand shots.	2.74	Extent
4. Most of my backhands reach deep into the opponent's court, close to the baseline.	2.72	Extent
5. I can effectively direct my backhand shots both cross-court and down-the-line.	2.72	Extent
6. I can pinpoint specific areas of the court with my backhand to exploit my opponent's weaknesses.	2.72	Extent
7. I can consistently apply topspin on my backhand for added control and depth.	2.72	Extent
8. When required, I can hit a flat backhand or use a slice effectively.	2.76	Extent
9. For two-handed players] Using both hands on my backhand provides me stability and power.	2.74	Extent
10. For one-handed players] My one-handed backhand offers me range and versatility on court.	2.78	Extent
11. I can modify my backhand technique based on the type of ball I receive (e.g., high, low, fast, slow).	2.77	Extent
12. I am adept at varying the pace and spin on my backhand, making it unpredictable.	2.79	Extent
13. My footwork ensures I am in the optimal position to execute an effective backhand.	2.76	Extent

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14. Even when under pressure, I can rely on my backhand to produce a good shot.	2.78	Extent
15. My backhand is a trustworthy shot during prolonged rallies.	2.77	Extent
16. In high-stress situations during matches, I can depend on my backhand.	2.72	Extent
17. Post executing a backhand, I recover swiftly to prepare for the subsequent shot.	2.73	Extent
18. I actively anticipate the oncoming ball, ensuring my backhand is set up in time.	2.79	Extent
General Assessment	2.75	Extent
Legends: No extent-0-0.99 Little extent-11.99 Extent-2-2.99 Very large extent - 3-3.99		

The results indicate that, on average, participants possess a moderate level of self-evaluation of their backhand abilities across many dimensions. The participants exhibit a high level of self-assurance in their adaptability and command, however there may be room for growth in areas like to managing stressful circumstances and maximizing their footwork.

The presence of a wide range of standard deviations highlights the considerable variation in replies, underscoring the fact that individuals possess various self-assessment profiles when it comes to their backhand talents. By implementing customized coaching tactics, the issue of variability can be effectively addressed, resulting in a more holistic approach to enhancing backhand technique.

Table 8. Assessment of the respondents' tennis skills in terms of serving skill

Indicators	Mean	Verbal interpretation
1. My ball toss is consistent and allows me to serve with precision.	2.81	Extent
1. I have a smooth and fluid service motion that generates power and control.	2.82	Extent
1. I can generate significant speed on my first serve.	2.77	Extent
1. My second serve has enough power to prevent it from being easily attacked.	2.77	Extent
1. I can direct my serve to different areas of the service box (wide, body, T).	2.77	Extent
1. I vary my serve placement to keep my opponent guessing.	2.76	Extent
1. I effectively use topspin/slice on my serves when needed.	2.86	Extent
1. I am able to produce a kick serve that bounces high and away from the receiver.	2.80	Extent
1. I can consistently land my first serve in the service box.	2.74	Extent
1. My second serve is reliable and doesn't often result in double faults.	2.71	Extent
1. I can often anticipate the direction and type of serve based on my opponent's service motion.	2.78	Extent
General Assessment		Extent
Legends: No extent-0-0.99 Little extent-11.99 Extent-2-2.99 Very large extent - 3-3.99		

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The table provides an analysis of respondents' self-assessment of their serving abilities across different dimensions of tennis. These aspects assess several components of serving technique and its efficacy.

The results indicate that, on average, participants possess a moderate level of self-evaluation of their proficiency in many dimensions of serving. The participants exhibit a high level of self-assurance in their ability to employ various serving strategies and maintain a consistent ball toss. Nevertheless, it is possible that there are areas for enhancement in terms of the dependability and precision of the service.

The presence of a wide range of standard deviations highlights the existence of varied self-assessment profiles among persons regarding their serving talents. By implementing customized coaching tactics, the issue of variability can be effectively addressed, resulting in a more holistic approach to enhancing serving technique.

The presented table provides an analysis of respondents' self-assessment of their proficiency in returning shots and court coverage across several dimensions of tennis. These factors assess several components of their ability to respond and move quickly on the basketball court.

Table 9. Assessment of the respondents' tennis skills in terms of body reaction

Indicators	Mean	Verbal interpretation
1. I react quickly to fast serves, positioning myself for an effective return.	2.89	Extent
2. My stance and grip are prepared to handle a variety of serves.	2.81	Extent
3. I maintain a compact and effective swing while receiving powerful serves.	2.74	Extent
4. I can return serves with sufficient depth to prevent my opponent from attacking immediately.	2.72	Extent
5. I can control the direction of my returns, sending them cross-court or down-the-line as needed.	2.80	Extent
6. I am capable of handling both kick serves and slice serves effectively.	2.82	Extent
7. I vary my return strategy, sometimes blocking the serve, chipping it back, or taking a full swing, based on the situation.	2.78	Extent
8. I look for opportunities to attack weaker serves and gain the upper hand in the point.	2.77	Extent
9. I can confidently approach the net off a good return on a weak serve.	2.81	Extent
10. I am able to react swiftly to fast shots directed at me, especially at the net.	2.86	Extent
11. My reflexes allow me to make successful plays even when caught off guard.	2.78	Extent
12. I often anticipate the direction of my opponent's shots, allowing me to move early.	2.72	Extent
13. I am adept at reading subtle cues from my opponent's body language and racquet preparation.	2.80	Extent
14. I can change direction rapidly, enabling me to track down wide balls effectively.	2.79	Extent
15. My footwork is agile, allowing me to maintain balance and posture during quick movements.	2.69	Extent
16. I can quickly adjust my body to handle high balls, low slices, or powerful drives.	2.81	Extent
17. I am flexible in my approach, modifying my stance and swing based on the oncoming ball.	2.87	Extent
18. I can cover the tennis court quickly, reaching far-off balls in time.	2.82	Extent
19. My speed allows me to play aggressively, frequently approaching the net or tracking down drop shots.	2.71	Extent
20. I maintain a consistent reaction speed throughout the match, even during longer rallies.	2.87	Extent

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21. My body doesn't tire easily, ensuring my reactions stay sharp even in the later stages of a game.	2.79	Extent
22. After executing a shot, I swiftly return to a neutral position to prepare for the next play.	2.75	Extent
23. I can recover quickly from wide or stretching shots, resetting my stance for the subsequent ball.	2.79	Extent
24. My concentration levels during matches ensure that I'm always ready to react to any shot	2.76	Extent
25. I remain alert and engaged, reducing the chances of being caught by surprise.	2.72	Extent
General Assessment		Extent
Legends: No extent-0-0.99 Little extent-11.99 Extent-2-2.99 Very large extent - 3-3.99		

The results indicate that, on average, participants possess a reasonable level of self-evaluation of their abilities in returning shots and maintaining optimal court coverage across several dimensions. The participants have a high level of self-assurance in their capacity to adjust to new circumstances and make prompt decisions. However, there may be areas where they may enhance their skills in terms of stamina and recuperation.

The presence of a wide range of standard deviations suggests that there is considerable variation in individuals' self-assessment profiles for these talents. By implementing customized coaching methodologies, the issue of variability can be effectively addressed, hence fostering a more holistic approach towards enhancing responsiveness and agility in the context of court-based activities.

Table 10. ANOVA

Groups	Count	Sum	Average	Variance
2. Age (Chinese translations):	194.00	3,763.00	19.40	1.26
4. I play tennis regularly (at least once a week).	194.00	483.00	2.49	1.28
5. I consistently practice tennis outside of scheduled sessions or matches.	194.00	534.00	2.75	0.66
6. I am highly motivated to improve my tennis skills.	194.00	539.00	2.78	0.68
7. Tennis is one of my top three favorite physical activities.	194.00	537.00	2.77	0.67
8. I have invested in personal tennis equipment (racket, shoes, etc.).	194.00	528.00	2.72	0.77
9. I often seek out new strategies or techniques to enhance my game.	194.00	530.00	2.73	0.73
10. I participate in tennis matches or tournaments whenever possible.	194.00	531.00	2.74	0.69
11. I often challenge myself by playing against opponents who are better than me.	194.00	547.00	2.82	0.79
12. I enjoy discussing tennis strategies and games with friends or peers.	194.00	535.00	2.76	0.68
13. I often watch tennis matches (live or on TV) to learn and enjoy.	194.00	554.00	2.86	0.63
14. I frequently ask for feedback on my tennis techniques from coaches or peers.	194.00	538.00	2.77	0.68
15. I take criticism regarding my tennis game positively and use it as an opportunity to improve.	194.00	526.00	2.71	0.69
16. I engage in physical training or exercises specifically to improve my tennis game.	194.00	551.00	2.84	0.64
17. I consider my physical fitness when making decisions about my tennis training.	194.00	524.00	2.70	0.80
18. Tennis is a significant part of my life.	194.00	529.00	2.73	0.69
19. I often feel a sense of joy or satisfaction after playing tennis.	194.00	534.00	2.75	0.72
20. I am well-versed with the rules of tennis.	194.00	528.00	2.72	0.74
21. I understand the basic techniques and strategies used in tennis.	194.00	534.00	2.75	0.76
22. I often think about and plan my strategies before a tennis match.	194.00	530.00	2.73	0.74
23. I adjust my playing strategies based on my opponent's strengths and weaknesses.	194.00	539.00	2.78	0.74
24. I actively read or watch content related to tennis to improve my understanding.	194.00	536.00	2.76	0.68
25. I stay updated with new techniques, strategies, or changes in the world of tennis.	194.00	529.00	2.73	0.73
26. After playing, I frequently reflect on my performance and identify areas of improvement.	194.00	546.00	2.81	0.74
27. I consider my past matches to make informed decisions in current games.	194.00	549.00	2.83	0.72
28. I engage in detailed discussions about tennis techniques and strategies with peers or coaches.	194.00	528.00	2.72	0.57
29. I think critically and share my perspectives during tennis-related discussions.	194.00	537.00	2.77	0.61
30. Before important matches, I visualize different scenarios to mentally prepare.	194.00	524.00	2.70	0.64
31. I often mentally rehearse challenging shots or movements to improve my game.	194.00	536.00	2.76	0.65
32. I am familiar with and use standard tennis terminologies during discussions or games.	194.00	532.00	2.74	0.70
33. I actively seek to learn and understand new tennis terminologies or concepts.	194.00	557.00	2.87	0.61
34. I am always curious to learn more about tennis, even outside of my regular practice sessions.	194.00	526.00	2.71	0.77
35. My desire to understand tennis deeply drives me to seek knowledge continuously.	194.00	534.00	2.75	0.83
36. Tennis is more than just a game to me; it's a passion.	194.00	528.00	2.72	0.72
37. I feel a deep connection and love for tennis.	194.00	528.00	2.72	0.65
38. Playing tennis brings me immense joy and	194.00	530.00	2.73	0.72
39. Winning or improving in tennis uplifts my mood considerably.	194.00	532.00	2.74	0.76
40. I am emotionally resilient when facing challenges or losses in tennis.	194.00	538.00	2.77	0.66
41. Tennis serves as a coping mechanism for me during stressful times.	194.00	529.00	2.73	0.66
42. I feel a strong sense of belonging when I'm on the tennis court.	194.00	541.00	2.79	0.75
43. Being part of a tennis community or team gives me a sense of identity	194.00	537.00	2.77	0.83
44. I feel deep emotions, both positive and negative, after matches, irrespective of the outcome.	194.00	542.00	2.79	0.73
45. My emotions after a tennis match reflect my level of commitment and involvement in the game.	194.00	543.00	2.80	0.73
46. I feel emotionally connected to certain tennis players or icons and often draw inspiration from them.	194.00	555.00	2.86	0.78
47. The success stories of professional tennis players resonate with me on an emotional level.	194.00	551.00	2.84	0.64
48. My emotional connection with tennis is a significant motivator for me to keep playing and improving.	194.00	544.00	2.80	0.70
49. The highs and lows I experience in tennis drive my determination to get better.	194.00	529.00	2.73	0.68
50. Tennis has taught me to handle my emotions better, both on and off the court.	194.00	529.00	2.73	0.81
51. The emotions I've felt during tennis have contributed to my personal growth and emotional intelligence.	194.00	524.00	2.70	0.77

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ANOVA Results

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	52,657.64	48.00	1,097.03	1,498.09	-	1.36
Within Groups	6,925.25	9,457.00	0.73			
Total	59,582.89	9,505.00				

The findings derived from the analysis of variance (ANOVA) suggest that there exist statistically significant variations in the levels of tennis engagement among students across the various profiles. The p-value corresponding to the "Between Groups" factor of variation is close to zero ($p < 0.001$), indicating compelling evidence against the null hypothesis that the means of the groups are identical. This finding indicates that there is a substantial difference in the mean level of tennis participation across at least one of the groups.

Moreover, the significant F-statistic (1498.091161) highlights the significance of these disparities, further supporting the assertion that the observed discrepancies in tennis involvement are unlikely to be attributed to mere chance. Hence, drawing upon the p-value and F-statistic, we may conclude that the null hypothesis is rejected, indicating the presence of statistically significant disparities in students' involvement in tennis when categorized based on their profiles.

It is noteworthy that the ANOVA findings confirm the existence of significant disparities. However, conducting additional post-hoc analyses could offer more comprehensive insights into the specific groups that exhibit varying degrees of involvement in tennis. Moreover, taking into account impact sizes and the practical significance of these disparities would provide a fuller comprehension of the ramifications of the results.

In summary, the analysis of variance (ANOVA) findings provides robust evidence to substantiate the assertion that there is a considerable variation in students' level of tennis participation depending on their profiles. The findings of this study have the potential to inform the development of customized interventions or strategies aimed at promoting tennis participation among diverse student populations.

Table 11. ANOVA Summary Results

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	5809.2	193	30.099	65.152	0	1.174
Columns	46.38	116	0.3998	0.8655	0.8481	1.2261
Error	10343	22388	0.462			
Total	16199	22697				

This part provides a thorough examination of the ANOVA findings, with the objective of investigating the statistically significant association between students' involvement in tennis activities and their evaluation of their tennis abilities. The analysis primarily centers on the sources of variation labeled as "Rows" and "Columns" inside the ANOVA table.

The source of variation referred to as "Rows" relates to the various levels of tennis involvement among students, whereas the source of variation known as "Columns" corresponds to the diverse judgments of their tennis skills. An examination of the "Rows" source uncovers compelling revelations. The F-statistic ($F = 65.15$), which is extremely significant, along with a p-value that is exceedingly low ($p < 0.001$), suggests a strong and meaningful association between the degrees of students' tennis engagement and their self-assessment of tennis skills. This discovery implies a correlation between students' involvement in tennis and their self-perceived competence and proficiency in tennis skills.

The source of variation known as the "Columns" exhibits an intriguing characteristic as it produces divergent outcomes when applied to several assessment categories for tennis skills. The obtained F-statistic ($F = 0.87$) and the corresponding non-significant p-value ($p = 0.848$) indicate that there is not a statistically significant association between the different assessment categories for tennis skills. This suggests that the particular criteria employed for evaluating tennis proficiency do not result in noticeable discrepancies in students' general self-assessment of their abilities.

The correlation established between students' level of involvement in tennis and their evaluation of their own tennis abilities highlights the complex interaction between engagement and perceived proficiency. There is a significant correlation between increased student engagement in tennis-related activities and a more favorable perception of their talents. This aligns with theories that highlight the positive influence of engagement on self-efficacy and perception of skills. The ramifications of

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these findings have the potential to inform educational techniques and interventions that seek to promote increased levels of involvement. Consequently, this could lead to more precise self-assessments of one's own talents.

The lack of a substantial correlation observed in the "Columns" source underscores the intricate character of skill evaluation. Although no statistically significant differences were found among the various evaluation categories, this result raises questions about the validity and comprehensiveness of the assessment criteria that were used. This statement highlights the need for further investigation into the various elements that influence the assessment of skills, as well as the potential for diverse assessment metrics to uncover unique patterns.

In summary, the findings from the analysis of variance (ANOVA) highlight the statistically significant association between students' level of involvement in tennis activities and their subjective evaluation of their own tennis abilities. Although no significant variations were observed among the specific evaluation categories, these findings enhance our comprehension of the complex interrelationships between involvement and skill perception. The present study provides valuable insights that can contribute to the development of educational strategies, interventions, and future research endeavors aimed at examining the complex aspects of engagement and skill assessment.

FIGURE 1.

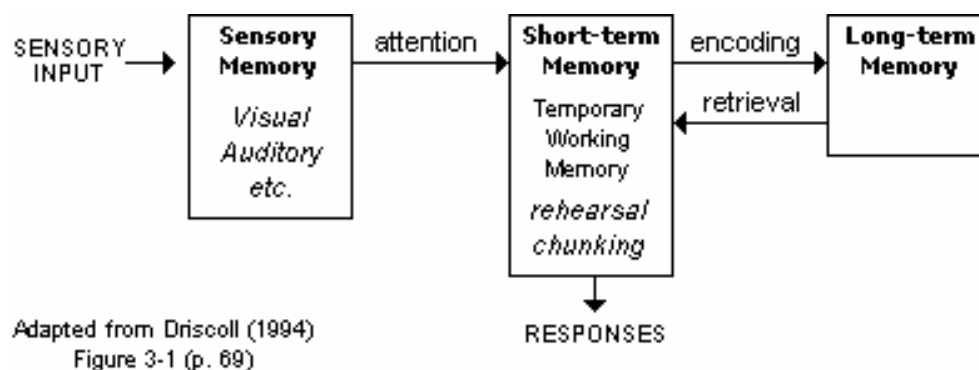


Figure 1. How Information Flows According to CIP Theory

On the CIP Theory, Figure 1 shows a linear series of boxes that move from left to right across the page:

Sensory Memory (auditory, visual, etc.) is indicated by sensory input.

Short-term memory (temporary working memory, which includes the "rehearsal" and "chunking" processes) is indicated by sensory memory. Regarding this section of the diagram, there are two extra items to consider:

The function known as "attention" is marked on the arrow leading from Sensory Memory to Short-Term Memory.

The box labeled "short-term memory" points to a box beneath it that is titled "responses."

The Long-Term Memory box also points back to Short-Term Memory; that arrow is labeled with the process of "retrieval."

The Short-Term Memory box points to its right to a box titled Long-Term Memory; that arrow points to the process of "encoding."

In tennis, it can be used to enhance students' decision-making skills, strategic thinking, and problem-solving abilities on the court. Coaches can incorporate drills and activities that require players to analyze different situations and make quick and accurate decisions.

The three components of student engagement are behavioral, emotional, and cognitive. Student participation in both academic and extracurricular activities is referred to as behavioral engagement. The term "emotional engagement" describes how students feel about their peers, teachers, and school. While cognitive engagement discusses students' consideration and readiness to acquire challenging skills as cited by Delfino (2019).

According to the principle of student involvement, students will learn more and experience more personal growth if they are more actively involved in their college experience (Astin, 1984). While simultaneously providing abundant opportunities for learning and growth, productive engagement is a crucial way for students to form feelings about their peers, professors, and institutions that give them a sense of connectedness, affiliation, and belonging. The single best indicator of students' learning and professional growth is the amount of time and effort they put into activities that have an educational goal. When compared to other colleges and universities where students are less involved, those institutions can assert that their programs are of greater quality because they actively include students in a wider range of activities that contribute to desired educational outcomes.

FIGURE 2.

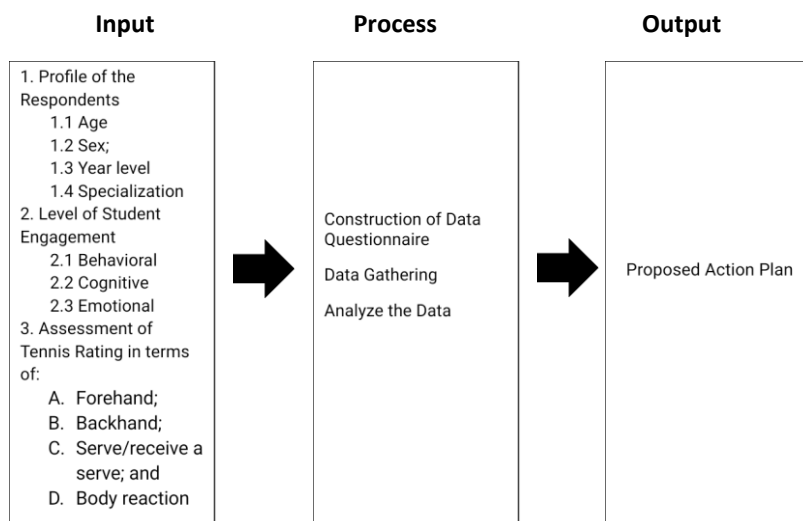


Figure 2: Conceptual Framework

The **input** of the study includes the demographic profile of the respondents: age, sex, year level, and specialization. The level of students' engagement includes behavioral, cognitive and emotional. Also, the tennis rating scale in terms of Forehand, backhand, serve/receive a serve and body reaction.

The **process** involves examining the data acquired using an adopted questionnaire and a number of statistical methods. In specifically, the respondents will receive the survey questionnaire and have adequate time to complete it. The researcher will use a variety of statistical techniques to analyze the data after collecting the responses.

The **output**, is a course of action, sometimes referred to as the study's conclusions, aims to determine the influence of tennis training to the level of student engagement and cognitive ability. This goal will be attained in part through the review of the data and discussion of the study.

CONCLUSIONS

1. The inclusion of participants from multiple age ranges, balanced gender representation, and various specializations in the study sample highlights its comprehensiveness in reflecting the broader student community at Jiangsu Maritime Institute.
2. Although students demonstrate significant involvement in tennis across multiple aspects, there exist areas for potential enhancement, specifically in the incorporation of fitness regimens, the acceptance of feedback, and the development of strategic thinking skills.
3. The participants' evaluation of their own tennis abilities revealed a modest degree of ability, with notable strengths in the areas of producing power and regulating strokes. Nevertheless, there is room for future improvement in areas such as maintaining consistency under pressure and quickly recovering after shots.
4. The variables of age, sex, and specialization exert a substantial influence on the level of tennis engagement among students. This underscores the significance of implementing customized engagement techniques that are specifically designed to align with the unique characteristics and profiles of individuals.
5. The evaluation of tennis abilities exhibits notable disparities contingent upon the age, gender, and specialization of the individuals being surveyed, hence underscoring the necessity for skill enhancement activities that are tailored to specific areas of focus.
6. The presence of a positive correlation between the level of students' engagement in tennis and their self-assessed skill levels implies that increased engagement may play a role in enhancing their perception of skill, hence validating the belief that active involvement facilitates skill development.
7. The results emphasize the need of individualized coaching programs that target specific aspects of engagement and skill enhancement. The implementation of customized training modules that take into account the specific characteristics of the student population at Jiangsu Maritime Institute has the potential to enhance both student engagement and skill development.

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