The Flow Experience of Adults Age 50 and Older in Recreational Doubles Pickleball

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The Flow Experience of Adults Age 50 and Older

in Recreational Doubles Pickleball

A Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of Doctor of Education

Glynis Worthington

University of Northern Iowa

May 2023

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Abstract

Pickleball, often described as a combination of tennis, badminton, and ping-pong, is America’s fastest-growing sport. An estimated 4.8 million players enjoyed the game in 2021, 40% greater than in 2019 (Sports & Fitness Industry [SFIA], 2022). The game is especially popular with older players when played recreationally (for fun rather than prepare for or participate in competitions) in a doubles format (four players per court) (USA Pickleball Association [USAPA], 2022). This study identifies the degree adults age 50 and older experience flow (Csikszentmihalyi, 1990) while playing recreational doubles pickleball.

The Long Dispositional Flow Scale – Physical (DFS-2) was used to determine if and to what degree players experience flow (Jackson et al., 2010). The DFS-2 consists of 36 questions and is designed to define and collect a respondent’s self-reported recollection of measure of the flow experience in the nine dimensions of flow in quantitative terms relative to an activity in general, rather than specific moment or event. Two hundred thirty-one recreational doubles pickleball players (111 males, 119 females, 1 no response) age 50 and older completed the DFS-2 questionnaire, answered five player characteristics, and responded to five demographic questions via an online survey. Two-sample t-tests, analysis of variance (ANOVA), Pearson correlation coefficients, and linear regression were used for data analysis. Analysis was completed using SPSS 28.0 with a statistical significance level of .01. Flow data from sports and other activities from The FLOW Manual: The Manual for the Flow Scales (Jackson et al., 2010) were used for comparative analysis.
The data collected for this study reveals that adult recreational doubles pickleball players experience flow in all nine dimensions (Challenge/Skill Balance, Merging of Action and Awareness, Clear Goals, Unambiguous Feedback, Total Concentration, Sense of Control, Loss of Self-Consciousness, Time Transformation, and Autotelic Experience) (Csikszentmihalyi, 1990). The data also revealed adult recreational doubles pickleball players report flow subdimension experience at levels higher on average than flow measures collected from participants in collegiate and professional sports and other activities in previous studies (Jackson et al., 2010; Özdemir & Durhan, 2020). The variables of the average number of days played per week, tournament participation, marital status, and years of pickleball play were significantly related to flow. Gender, age, education, and location were not related to player flow.
This Study by: Glynis Worthington

Entitled: The Flow Experience of Adults Age 50 and Older in Recreational Doubles Pickleball

has been approved as meeting the dissertation requirements for the Degree of Doctor of Education

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Dedication

I dedicate this dissertation to my late father, Dr. Larry B. Houser, DVM, whose struggle in retirement inspired me to undertake this doctoral degree. Dad, I remember the afternoon I knew this study area would someday be part of my life. You were there. I was home from Christmas Break from my MBA at Wharton in 1987. You returned from a run with tiny sweat icicles frozen to the tips of your ears. I remember being grateful you had discovered the value of physical rigor. However, I was saddened that you had no way to enjoy it with other people as I had while participating in sports. The shift from leading a legion of USDA professionals to life on the farm for you and mom was too much, and terribly lonely.

Sports programs for older adults would have been a perfect answer, yet few programs exist today (four decades later), and the number of aging Americans with similar needs continues to grow. Sadly, your loneliness took you from us less than a year later. The memory of this experience has stayed with me for decades and has constantly called upon me to “do something about it someday.” Now it is time to do so. I hope this research will help leisure professionals understand the incredible impact sports participation can have on our lives as we age. I hope it inspires the proactive development of sports programs for older adults. I hope thousands of adults participate and enjoy happier, healthier, and longer lives.

Dad, this one’s for you.
Acknowledgements

This study was completed with the community’s constant support and encouragement. I thank my husband, family, and friends for listening for months about my efforts and encouraging me to graduate. None of you laughed or questioned why I would pursue a doctoral degree instead of retiring. I thank my committee chair Dr. Oksana Grybovych for her guidance and constant support. Dr. Gute, I am grateful you have been a part of this process, as your flow experience and willingness to meet with me when I have questions have been critical to the completion of this project. Dr. Radunzel, digging through the data with you has been a thrill. Dr. Scholl and Dr. Dieser, thank you as well for your insights and support as members of my committee.

I chuckle to myself as I write this remembering the many times you have acknowledged my ideas along the way yet continued to navigate me toward completing the project. Thank you, dear committee members, for being steadfast. I would not have made it through this proceeding without you. I also extend special thanks and gratitude to Dr. Christopher Edginton, who inspired me to earn this degree and served as a much-appreciated source of extra encouragement throughout the process.

Finally, thank you, COVID, for waiting until March 2020 to erupt. Your timing allowed me to complete all but one course requirement in the classroom. I am not a Zoom fan and will likely never be. Had you invaded our lives before I completed the coursework, I most likely would have become a pickleball player and not finished this degree.

Thank you all for your encouragement and support.
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Chapter 1: Introduction

Pickleball is becoming increasingly popular and often played by older adults. In 2019, the Sports & Fitness Industry Association’s Pickleball Report estimated that 3.46 million persons played pickleball nationally, with participation increasing by 9.7% per year in the previous three years (Sports & Fitness Industry Association [SFIA], 2019).

The number of pickleball players continued to increase during COVID, with player numbers increasing 21.3% from 2019 to 2020 and 14.8% from 2020 to 2021. More than 4.8 million players enjoyed the game by the end of 2021, with 52% of its core players playing eight or more times per year over age 55 (SFIA, 2022). The Association of Pickleball Professionals 2023 Pickleball Report reported that 14% of Americans age 18 and older had played pickleball in the prior 12 months, creating a total national market of 36.5 million pickleball players (Association of Pickleball Professionals [APP], 2023). The Association estimated that participation rates would continue to grow, as 45% of those having played at least once in the last 12 months planned to play more in the next six months (APP, 2023).

National media reports include players referring to themselves as pickleball addicts (Brown, 2022; Conlin, 2022). In a recent study of 1,487 pickleball players, 4.7% exhibited exercise addiction characteristics during pickleball play (Oms & Medina, 2020). The current growth in pickleball play and player enthusiasm appears similar to the running craze of the 1970s and 1980s in the United States when the National Running Data Center estimated the nation had 10 million runners, and conversations began regarding the "runner's high" (Carmack & Martens, 1979). Subsequent studies have examined this experience in neuroscience (Stoll, 2019). According to the Encyclopedia of
Sport and Exercise Psychology (Eklund & Tenenbaum, 2013), this “high” is possibly a combination of psychological factors, such as one’s flow state (Csikszentmihalyi, 1990) and biological factors. However, a recent systemic analysis of studies that measured or manipulated participant flow state and recorded brain activity with various technologies found the dynamics inconsistent across the studies (Alameda et al., 2022).

Data collected from competitors at sanctioned pickleball tournaments (Heo, Ryu, Yang, & Kim, 2018; Heo, Ryu, Yang, Kim, & Rhee, 2018; Ryu et al., 2020; Ryu et al., 2018) have led researchers to conclude that pickleball participation can improve self-esteem and life satisfaction in older adults. Recent studies have found that pickleball may decelerate cognitive decline more than traditional aerobic exercise (Hutton, 2021). The physical rigor of doubles pickleball has recently been measured and found to be moderately rigorous (Webber et al., 2022). While the cognitive and physical investigation has occurred, literature has yet to explore older players’ personal and psychological experiences while playing recreational doubles pickleball.

This study aims to understand the flow dimension experiences (Csikszentmihalyi, 1990) of adults age 50 and older participating in recreation doubles pickleball, playing for entertainment rather than competition, with two players on each side of the court. This study also determines whether this flow experience varies across the identified demographics or player characteristics. Data were also used to understand if this unique demographic group experienced flow similar to participants in other activities and sports (Jackson et al., 2010).
Theoretical Framework

Flow, the mental state in which a person is completely immersed in an activity and in which the participant experiences intense focus on task, a sense of total involvement, and enjoyment, was first described and named by psychologist Mihaly Csikszentmihalyi in 1975. Csikszentmihalyi’s research in this concentrated state in a great variety of activities internationally led him to identify standard components of this experience, the nine dimensions of flow (Csikszentmihalyi, 1990).

These nine dimensions include (1) a balance between the challenge needed and the skill required to complete the task, (2) total absorption in the activity, (3) having a clear understanding of the task objectives and expectations, (4) unambiguous feedback, (5) total concentration on the task, (6) a sense of control, (7) loss of self-consciousness during the activity, (8) a change in the perception of time, and (9) an intense feeling of pleasure while participating in a task. These dimensions have been documented in varying degrees across various tasks using various research methods. Flow research expanded beyond Csikszentmihalyi’s original observation of flow experience in art to understanding flow in the workplace, sports, and education. Several books on flow have been published, including Flow (1990), Creativity: Flow and the Discovery of Psychology of Discovery and Innovation (1996), Finding Flow (1997), Flow in Sports (1999), Good Work (2001), and Good Business (2003). The recently published second edition of Advances in Flow Research (2021) reflects continued interest in and development of flow concepts.
This study uses the theoretical framework of Csikszentmihalyi’s flow concepts to determine if and to what degree adults age 50 and older experience flow while playing recreational doubles pickleball.

**Purpose of the Study**

This quantitative study aims to determine the flow dimension experience (Csikszentmihalyi, 1990) of adults age 50 and older while participating in recreational doubles pickleball. Recreational doubles pickleball is played for fun rather than competition, with two players on each side of the court. This study also determines if the flow experience varies across demographic characteristics or player groups. Data was also collected to understand how this unique group of players experiences the flow compared to data reflecting the flow dimension experience of participants in other activities and sports collected in previous studies (Jackson et al., 2010).

The Dispositional Flow Scale - 2 (DFS-2), a validated flow study collection instrument (Jackson et al., 2010), was used to collect data reflecting this group’s experience of the nine dimensions of flow during pickleball play. This instrument has been used in studies of other sports and activities. It collects self-reported responses from participants and is designed to inquire about the dispositional nature of the experience, capturing the reflection of the general nature of the experience rather than the influence of any particular event, game, or score.

The DFS-2 has been previously used to explore flow in tourism (da Silva deMatos et al., 2021), education (Heutte et al., 2016; Heutte et al., 2021), marathon racing (Schüler & Brunner, 2009), adventure recreation (Boudreau et al., 2020), music (Fritz & Avsec, 2007), and video games (Hamari & Koivisto, 2014), yet was not found to have been
administered to older recreational sports participants. This study contributes to understanding the experience of adults age 50 and older recreational doubles pickleball players and provide insight into the player experience of flow dimensions.

**Research Questions**

This study answers three research questions:

1. Do adults age 50 and older report having flow experience based on the nine dimensions of flow model when they play recreational doubles pickleball (Csikszentmihalyi, 1990; Jackson et al., 2010)?

2. What are participant characteristics associated with adults age 50 and older recreational doubles pickleball players experiencing higher levels of flow experience based on the nine dimensions of flow model? More specifically, the following participant characteristics were examined: gender, age, education, marital status, number of years playing pickleball, the average number of days per week playing pickleball, and participation in pickleball tournaments.

3. Do adults age 50 and older recreational pickleball players experience flow based on the nine dimensions of flow model at levels similar to participants in other sports and activities (Jackson et al., 2010)?

**Assumptions**

Assumptions of this study include:

1. Survey participants responded to the questionnaire honestly and accurately.

2. Survey participant identity is representative of the study survey population (adult age 50 and older recreational doubles pickleball players) and does not include imposters.

3. Survey questions were appropriately understood and interpreted by the respondents.


**Study Limitations**

Limitations to this study include:

1. This study is limited by the respondent’s ability to comprehend and respond to the DFS-2 questions. While the survey questions have been carefully crafted, tested, validated, and used in several previous studies, execution of the survey and serious consideration of the responses assumes respondents understood the survey questions as intended. It also assumes respondents understood the intended application of the response scale. The design of this study also assumes that respondents answered the questions honestly and accurately (Beusenberg et al., 1994).

2. Respondent answers could vary depending on respondents' emotional, social, and physical intelligence. Participants can only report the emotions and conditions they are aware of and can articulate (Pirsoul et al., 2019).

3. This study is limited to the unilateral nature of, access to, and respondent familiarity with the digital technology employed in this research project.

4. Data collected in this study may be influenced by self-selection bias. The data collected was limited to players who received and responded to an electronic invitation to participate in the study. It was limited to respondents who determined themselves eligible participants for the study and to participants who opted to participate by clicking the invitation button. It was also limited to participants who answered affirmatively to the Consent Agreement for the study.

5. This study is also possibly limited by the respondent’s ability to understand he/she was to answer the DFS-2 questions based on his/her dispositional experience while playing recreational doubles pickleball and not respond to the questions based on the outcome of
a particular game or experience of gameplay. This study assumes a respondent's ability to recall and assess dispositional states in the context of the questions.

6. A respondent's self-reported score may be influenced by a desire for social acceptance (Pekruna, 2020). This study assumes players answer the survey questions without the influence of others.

7. This study is limited to the researcher's understanding of the historical use of the DFS-2 in sports research and the demographic and player participation characteristics significant to adults age 50 and older playing recreational doubles pickleball. While this study size is appropriate to answer the research questions, the sample size of 231 was not large enough to thoroughly examine alternative factorial calculations of the DFS-2 data, player characteristics information, and demographics like Hamari and Koivisto (2014), as a data set 5-10 times the number of variables tested is recommended for a sound analysis. Additionally, participant characteristics in this study explained only a slight variation in flow measures. Although the survey collected demographic and player characteristic data (gender, marital status, age, days of play, years of play, tournaments) to answer the exploratory research questions, these variables did not statistically predict player flow. Future studies should include larger sample size and more predictor variables.

8. This study is limited by the researcher’s expertise and researcher biases which may influence the researcher’s ability to interpret the data collected in the research process (Willig, 2001).

Several efforts were undertaken to reduce the impact of study limitations. This study included a pre-test phase in which the survey was shared with demographic and player group members before the study to ensure question comprehension. Pre-test
respondents read the instructions on a computer, then completed the survey. Upon completing the survey, the researcher discussed the study with the test group. No issues or concerns for comprehension were found. The survey was online and likely taken at home, an environment where a person may be alone or on a cell phone. Either interface is difficult to share and most likely experienced alone. Responding to the survey questions in confidence helped shield respondents from social pressure to respond to survey questions in ways other than personal experience.

The researcher undertook extra care in writing the instructions for the survey to ensure respondents understood to respond to the survey questions based on their general (dispositional) experience playing recreational doubles pickleball, not based on any particular game, experience, or event.

Additionally, the researcher repeatedly consulted expert resources in the statistical analysis offered to doctoral candidates on campus to reduce potential interpretation bias of the results.

**Study Delimitations**

Delimitations of this study include:

1. This study is delimited to respondents age 50 and older who represent themselves as 50 and older and consider themselves recreational doubles pickleball players.

2. This study is delimited to respondents willing to accept an invitation to an online survey.

3. This study is delimited to the data collection timeframe of July 20, 2022 to August 24, 2022.
Significance of the Study

Pickleball, a court-based game similar to badminton, tennis, and ping pong, has become popular nationwide. Over 2.0 million individuals found the path to a court and enjoyed the game as new players in 2020 and 2021 (USA Pickleball Association [USAPA], 2022). Over 30% of this group comprises of older adult players (Sport & Fitness Industry Association [SFIA], 2022). Much of this demographic group’s play occurs in doubles format at recreational centers and court facilities. This study seeks to identify if flow experience may be part of the play experience with this demographic group in this format.

This study expands the understanding of the adult pickleball experience, as data collected by researchers YTD has been collected at pickleball tournaments, most likely from players competing in the tournament rather than collecting player experience data from those who play to enjoy the game recreationally (just for fun). Professional associations estimate that competitive players may be just 20% of the adult pickleball playing population (USAPA, 2022). Competitive player experience may differ significantly from the experience of recreational players, as recreational players in this sport play the game in a recreational "for fun rather than for competition" format at neighborhood recreational facilities. Additionally, this study expands our knowledge of adult recreational doubles pickleball, as researchers had also not yet compared the adult recreational doubles pickleball flow experience to the participant flow experience in other sports or activities collected in previous studies.
Pickleball’s Growth in Popularity

Pickleball participation is exploding in the United States and worldwide, particularly among older persons. The 2019 Sports & Fitness Industry Association (SFIA) Pickleball Report reported that 3.46 million persons played pickleball nationally, with participation increasing by 9.7% per year in the previous three years (SFIA, 2019). In 2020, the Association estimated that the number of pickleball players in the United States jumped 21.3% to 4.2 million (SFIA, 2020), an increase of 1.4 million players in a single year. Pickleball in the United States grew in 2021 by an additional 0.6 million to a total of 4.8 million players in 2021, reflecting an incredible 39.3% two-year growth rate in participation in the sport (SFIA, 2022).

Research undertaken by the United States Pickleball Association (USAPA), the sport’s governing body, found that one-third (1.4 million) of America’s pickleball players reported playing eight or more times a year, with 39% of the sport’s participants being female and 61% male. Other sources say participation growth by over 10% each year over the past decade (Lockwood, 2018).

The number of places to play pickleball is also increasing. In 2021 the USAPA listed 9,524 places to play pickleball on its playtoplace.org website (USAPA, 2019), an increase of 1,016 locations (nearly 20%) from 2017. The known places to play continued to climb to 9,524 locations at the end of 2021, an increase of 789 locations at 66 per month during the twelve months (USAPA, 2022). Many locations consisted of several courts. More than 30,000 indoor and outdoor pickleball courts had been built in North America by 2019. Private court construction was also booming (USAPA, 2020).
The game is growing internationally, with 37 countries holding membership in the International Pickleball Federation in 2020, more than double the 2018 roster. The organization expanded to 69-member countries by the year-end of 2021 (International Pickleball Federation, 2022). While participation in many group events and activities was reduced during the COVID pandemic, the game grew as new and established players continued to learn and play outdoors during warmer months (Economist, 2021; Casper et al., 2021). USAPA’s National Championships attracted just 400 competitors in 2009, over 2,200 in 2020 and 4,158 in 2022 and were first broadcast on ESPN in 2018 (USAPA, 2020, 2022).

While the game is exploding on the aggregate, what may be even more significant is the age of players drawn to the game and the frequency of play. According to the SFIA (2021), more than a third (33.7%) of America’s core pickleball players were over the age of 65, and one in five (20.3%) were between ages 55 and 64. With more than half of the nation’s active (play eight games per year or more) pickleball players over the age of 55 and the average age of core players at 47.5 years of age and less-frequent casual players on average 33.6 years old, pickleball has been proclaimed the “oldest” of the nation’s sports by its player association (USAPA, 2022).

**Competitive vs. Recreational Pickleball Play**

Two formats have evolved with regard to pickleball play. Players may prefer to play competitively (with a motive to win), drill, or play to increase playing skill and compete in tournaments. Others play recreationally (with a motive to participate rather than compete), playing for the experience, usually locally, with a club or group of players. While resources have estimated that 20% of adult pickleball players enjoy this
format, the percentage of competitive players may be smaller. The 2022 Pickleball Fact Sheet (USAPA, 2022) reports 4.8 million pickleball players nationally, but just over 1% of the total had registered as USAPA members in 2022 (total membership of 53,122). Membership is required to participate in regional and national tournaments and is also necessary to participate in many local tournaments.

Much of recreational play occurs in a community recreational club construct, wherein players meet at a common (often public) facility on designated days/times to play pickleball in doubles (for a total of four on the court) in a “pick-up” format (taking turns to play by lining up racquets courtside). If courts are available, the players also loosely sort themselves by skill level (typically self-determined, possibly with the input of fellow players) among the courts. Players in the club environment hold firm to the commitment of playing doubles even when only two players are present, frequently opting to play “skinny doubles” (two players play on only half the court) rather than a game in a singles format when only two remain for play. “Open Play” is the term commonly used to describe this format.

**Other Influences**

Growth in the game has been orchestrated by the American Pickleball Association (APA), which created a central resource for game rules, tournament schedules, and player rating information (American Pickleball Association [APA], 2021a). The APA propagated the expansion of play in the game by establishing a “Pickleball Ambassador” program consisting of volunteers familiar with the doubles club format, which was able to provide playing time for twice as many players as the singles format and delivers a rich play experience (APA, 2021b). A list of 2,225 certified USAPA pickleball Ambassadors,
all with a job and interest in helping to bring players to the game, were identified in the 2022 roster (USAPA, 2022). The game is currently most popular in the South Atlantic region of the United States (Florida, Georgia, South Carolina, North Carolina, Virginia, West Virginia, District of Columbia) (SFIA, 2022) and is prevalent in retirement communities in Arizona, Texas, and Florida (Ryu et al., 2018).

Interest in the potential of physical activity and its influence on health has emerged as the world’s population ages, with multiple studies undertaken to understand why adults participate in activities. A systematic review of 1,732 studies of the reasons adults participate in sports by Stenner et al. (2020) found that adults participate in sports to (1) maintain health, (2) to be part of a community and take advantage of opportunities to develop relationships, (3) compete and attain a feeling of achievement, (4) travel, and (5) be part of a team. The study authors recommended that research is needed to "dive deeper" beyond these general descriptions and better understand the adult experience in sports at the psychological, social, and physical levels.
Chapter 2: Literature Review

This study aims to identify if adults age 50 and older recreational doubles pickleball players experience flow dimensions (Csikszentmihalyi, 1975, 1990). This study also investigates if any single, set, or sets of gameplay or demographic characteristics influence this group's experience of flow dimensions. This study also examines how the data reflecting the adult recreational doubles pickleball flow experience compares to flow dimension data gathered from participants in other activities and sports. This study also helps develop an understanding of the player experiences of adults age 50 and older in recreational play. It also provides insight into individuals’ first-hand experience playing doubles pickleball.

This chapter reviews the development of flow theory and the application of flow theory in sports. Research focusing on pickleball and pickleball players is also reviewed. Gaps in current knowledge are identified, and how this research addresses these gaps is discussed.

Positive Psychology

The concept of flow emerged with the advent of positive psychology. Positive psychology approaches science on subjective, individual, and group levels. Studies of positive experiences like joy, contentment, happiness, satisfaction, and flow occur at the subjective personal level. At the individual level, the focus is an attempt to define the contents of a good life. At the group level, contributors to developing and maintaining citizenship and communities are of great interest (Positive Psychology, 2018).

Those doing research in positive psychology investigate sources of happiness and well-being as we age. Combined with neuroscience, studies in positive psychology
expand knowledge into the positive realm, similar to recent insights into depression, schizophrenia, anxiety, substance abuse, and other disorders that have shed light on negative factors.

Humankind uses positive psychology to understand life. In *Psychological Well-Being of Adult Life (1995)*, American psychologist Ryff theorized that human well-being occurred in the presence of six factors and encouraged living with these factors in mind. These six factors have been investigated using the Ryff Scale, a survey instrument developed to measure the presence of these factors (Ryff, 1989). Research investigating these six factors (1) feelings of positive self-regard and mastery, (2) autonomy, (3) positive relationships with others, (4) a sense of life purpose/meaning, (5) ability to manage one’s environment, and (6) feelings of growth/development have helped expand psychological theories and concepts, including Csikszentmihalyi's conceptualization of flow. Csikszentmihalyi’s work helped to establish the flow state as a defined component in positive psychology at the personal level and captured evidence that flow universally applies across domains and cultures (Positive Psychology, 2018).

**Flow**

Flow is the good feeling one gets when one is wholly absorbed in an activity to the point where one forgets the original purpose of the activity, “loses track” of time, and forgets about oneself. It is a pleasant state of mind in which one works at total capacity in a task in which one finds it pleasant to be immersed. It is an experience where nothing else seems to matter. It is one people pursue simply for the opportunity to do it, possibly at a high cost and regardless of potential negative consequences.
Defined less than 50 years ago by psychologist Mihaly Csikszentmihalyi (Csikszentmihalyi, 1975), flow is a “great feeling” people experience in a wide variety of contexts. Flow has been explored theoretically and investigated scientifically by scientists wanting to develop an understanding of this positive high state of consciousness.

**Development of Flow Theory**

A review of the development of flow theory provides a greater appreciation and understanding of the concept of flow. In the 1960s, psychology primarily focused on extrinsic consequences as a precursor to behaviors. The research focused on extrinsic motivators and motivator influence on human behavior. Falko Rheinberg began investigating motivations for participating in tasks simply for the sake of participation in Germany in the 1970s. A study that found students’ participation in learning could not be explained in terms of external factors inspired Rheinberg to investigate internal motivators. Simultaneously in the United States, Mihaly Csikszentmihalyi began observing children at play and artistic processes as they reflected a limited response to extrinsic motivators and developed the flow concept. Since then, Csikszentmihalyi and others have worked tirelessly for over 50 years to continue to develop and expand understanding of this concept.

**Original Flow Models.** Original research, including the theoretical modeling of flow as an experience, was first introduced in America in *Beyond Boredom and Anxiety* (Csikszentmihalyi, 1975). The work was based on thorough research and investigation across many years of inquiry into play activities and observation of the artistic process. Csikszentmihalyi referred to the experience as an “Autotelic Experience,” based on the
Greek word “auto” for self and “telos” for goal or purpose. It was reintroduced as “flow” in 1990 (Csikszentmihalyi, 1990).

Csikszentmihalyi’s strong phenomenological research and reporting contrasted sharply with the practice of data-driven experimental psychology common at that time (Engeser et al., 2021). The title greatly resembled Beyond Freedom and Dignity, a 1971 book by American psychologist B. F. Skinner. Skinner argued against the autonomous man and instead believed behaviors were based on determinism and positive reinforcement, commonly known as positive and negative rewards, as the basis of human behavior. This thinking contrasted sharply with Csikszentmihalyi’s approach to emotional experience and intrinsic reward-driving behaviors. Csikszentmihalyi’s book generated little fanfare at its release but is credited with significantly contributing to the early development of positive psychology (Engeser et al., 2021) and contributed to the shift from behaviorism to cognitive psychology.

Csikszentmihalyi’s work (1975) described six components of the flow experience. The first three components reflect total absorption – (1) merging of action and awareness, (2) centered attention, and (3) loss of self-consciousness. Additionally, those experiencing flow were found to have (4) a strong feeling of control, (5) a clear, non-contradictory understanding of task demands and thereby a path for clear, unambiguous feedback, and (6) undertook the task with little effort or nearly free will, with the act experienced as enjoyable or rewarding in itself and autotelic in nature.

According to Csikszentmihalyi at this time, flow occurred when the skill needed to accomplish a task met with the task at hand, anxiety was present if the challenge
exceeded an individual’s skill, and boredom was experienced when one's skill surpassed the skill needed for the task at hand (Figure 1).

Csikszentmihalyi continued to advance flow understanding and research. After considerable study, he added a seventh flow component to the flow model “distortion of temporal experience of time.” He also expanded the concept to a quadrant of theorized states of consciousness (apathy, anxiety, boredom/relaxation, and flow) depending on the dynamics of the skill/challenge environment (Csikszentmihalyi & Csikszentmihalyi, 1988) (Figure 2).

**Figure 1**

*Original Flow Model*

Note. Source: Csikszentmihalyi (1975).
The Nine Dimensions of Flow. Csikszentmihalyi and Csikszentmihalyi continued to pursue flow research. As a result, they fine-tuned the previously identified six dimensions. They added three additional dimensions to flow: (7) the occurrence of a balance between the individual’s skill and demands of the task at hand, (8) the presence of ubiquitous feedback within the experience, and (9) the change of the perception of time (perceived either faster or slower than fact) by the individual during flow. This list of nine dimensions of flow (Table 1) became widely known as it was central to the literature presented in the pair’s best-selling self-help classic *Flow: The Psychology of Optimal Experience* (Csikszentmihalyi, 1990). These criteria are the basis of several research instruments used to measure flow.
### Table 1

**The Nine Dimensions of Flow**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge-Skill Balance</td>
<td>The activity level of the challenge must match the individual’s ability. If it is too hard, frustration happens. If it is too easy, boredom.</td>
</tr>
<tr>
<td>Action-Awareness Merge</td>
<td>Individual becomes wholly absorbed. Who they are and what they are doing converge.</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>The participant is fully versed in task objectives and expectations.</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>The individual has clear feedback as to how their performance is helping them meet their goals.</td>
</tr>
<tr>
<td>Total Concentration on Task</td>
<td>The stage seems effortless. The individual is entirely focused and tunes out all distractions.</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>The individual feels infallible and empowered with no thought of failure.</td>
</tr>
<tr>
<td>Loss of Self-Consciousness</td>
<td>The individual is not aware, nor concerned, of what others think of them.</td>
</tr>
<tr>
<td>Transformation of Time</td>
<td>Time seems to go more quickly or more slowly than actual.</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>An intense feeling of pleasure/&quot;out of self&quot; experience brought on by the presence of multiple flow factors.</td>
</tr>
</tbody>
</table>

Source: Csikszentmihalyi, 1990.

**Transactional Stress Model of Flow.** Flow has been recognized as a factor in human response to stress. Lazarus and Folkman (1984) developed the Transactional Stress Model (Figure 3) where psychological stress is a person-environment transaction. This is a particular relationship between the person and the environment based on a personal appraisal process. The individual experiences stress when one finds situations taxing, exceeding one’s resources, or endangering one’s well-being.

Lazarus and Folkman (1984) noted that Csikszentmihalyi included mention of stress in the flow environment in his work, but Csikszentmihalyi did not directly address it in the challenge/skills assessment process. The pair theorized that individuals assess
their ability to undertake a task, thereby determining an optimal “demand” skill balance (how much the activity does/do not demand of the individual) versus an optimal “challenge” skill balance as a part of the flow process. They also suggested changing the terminology of the y-axis in Csikszentmihalyi’s model to “demand” rather than “challenge” to reflect the individual’s assessment process.

**Figure 3**

*The Transactional Stress Model of Flow*

![Transactional Stress Model](image)


Later work by Lazarus and Folkman (1987) continued to explore the process of cognitive appraisal and coping. In the conclusions of the latter study, the two suggested that when optimal demand-skill-balance assessment occurs, “stress” is appropriate to add to the flow model as a high-demand lesser-skills state may first be the first onset in contrast to anxiety, as stress may occur before anxiety sets in. The duo also recommended including “relaxation” as a conscious state when skills outpace, but are not yet forced
into, flow-inducing engagement with task demands. Recent research has explored the possible influence of individual perceptions in the model (Obbarius et al., 2021).

Other researchers have explored influencing factors. Engeser and Rheinberg (2008) contrasted flow experience in learning statistics and playing video games. The duo also found that flow was influenced by the perceived importance of the activity and the achievement motive of the individual rather than purely a skill/balance tradeoff. In other research, individuals were found to assess situations differently and vary in assessments of personal competence (Hogarth et al., 2007).

**Revised Flow Model.** The recently developed Revised Flow Model (Barthelms & Keller, 2021) uses the individual’s perspective of the experience as the axis criterion. Rather than a frank assessment of skills and abilities as axes, the new approach finds the perceived fit of the subjective value of the activity (the value the individual puts on the activity) and the individual (self-assessed) perceived fit of skills and task demands as the critical components of flow.

The two theorized that rather than occurring at a perfect balance between actual skill and task demands, flow occurs at the interchange of a participant's highest levels of the perceived value of the experience and task. This balance creates a greater possibility of flow in participation settings, with the highest levels of flow potential in areas of high perceived value (assuming humans enjoy interacting with others) and perceived skill across scenarios (rather than specific measures of abilities) without the particular balance requirement of previous models.

While mapped on an x/y axis similar to the earlier model, the Revised Flow Model reflects a participant’s greater propensity to experience flow at higher levels of
both criteria, with the highest potential for experiencing flow when both challenge and skill perceptions are at the highest levels. Unlike the previous balance concept, it predicts no likelihood of flow when both are at low levels. This approach has a greater capacity to explain flow intensity, as it explains how individuals who find an activity relevant and have a positive assessment of skills based on the task have a greater propensity to experience flow and a richer flow state experience. Conversely, situations where perceived skills and challenges are low do not likely produce flow.

The Revised Flow Model further expands flow theory. It identifies three of the nine flow factors as antecedent conditions that must exist for flow to occur: (1) clear goals, (2) immediate and unambiguous feedback, and (3) a balance of perceived skills and task demands. In the Revised Flow Model, flow is a subjective experience characterized by a combination of distinct (experiential) states that can co-occur during a skill-related activity. It identifies six conditions needed but not required for flow to occur at any particular time: (1) reduced reflective self-consciousness, (2) a modified experience of time, (3) involvement and enjoyment, (4) focused concentration, (5) a strong feeling of control, and (6) the activity perceived as rewarding in and of itself.

Flow Concepts

Though decades have passed and the collective body of research has expanded, Csikszentmihalyi's nine flow dimensions remain the basis of flow concepts. Flow application has become popularized and has been applied to daily living. Several books by authors other than Csikszentmihalyi exploring the effects and possible influence of flow in business, art, sport, and life have been published, such as "Achieving Peak Performance in Music: Psychological Strategies for Optimal Flow" by Sarah Sinnamon.
and “Signposts for Living Book 3, Mindfulness and State of Flow - Living with Purpose and Passion: A Psychological Manual for Being” by Dr. Kirsten Hunter. Websites such as flowchannel.com and flowresearchcollective.com provide flow information.

**Flow Antecedents.** Concepts regarding flow dynamics, flow impact, and types of flow have also been developed. For example, flow dimensions challenge/skill balance, clear goals, sense of control, and unambiguous feedback have been identified as flow antecedents and the dimensions loss of self-consciousness, time, concentration, and merging of action and awareness have been identified as flow outcomes (Csikszentmihalyi, 1990; Nakamura & Csikszentmihalyi, 2002).

Although data analysis instructions in *The FLOW Manual: The Manual for the Flow Scales* focus on mean calculations and comparisons (pp. 16-17), researchers have expanded the analysis of data collected using the DFS-2 to include correlation analysis between dimension variables to find statistical evidence that might support these theories. Correlation analysis completed by Marsh and Jackson (1999) of a collection of DFS-2 data and other variables collected from Australian Masters athletes demonstrated meaningful relationships between flow variables, yet found slightly less experience of time transformation. The results also reflected relationships between perceived ability, intrinsic motivation to experience stimulation, and anxiety subscales with flow by combining DFS-2 data with other data.

Correlation analysis of flow variable DFS-2 data completed in video games (Procci et al., 2012) found inter-correlation between the challenge skill balance, clear goals, and sense of control variables. A similar analysis in video gamification, using game design in non-game contexts, found challenge skill balance, clear goals,
unambiguous feedback, and autotelic experience variables strongly correlated with flow experience (Hamari & Koivisto, 2014).

**Flow and Performance.** Flow has been reported to be associated with high performance in sports (Jackson & Roberts, 1992); however, researchers have begun to question this assumption. A marathon study by Schüler and Brunner (2009) found that athletes experienced flow during practice but did not experience flow during the competition and a period of higher performance. Others have begun to question whether flow might be more beneficial as a state of fluctuating consciousness rather than to have "on" or "off" during competitions. Suppose flow is a pleasant state of consciousness. Theorists are considering whether flow may be a more vital ingredient to practice, as it encourages athletes to prepare for competitions more willingly.

This new postulate goes well with this study, as adult recreational pickleball players only sometimes compete in tournaments or other formally arranged competitive events. Instead, they gather 2-3 times per week or more to play 2-3 hours in a self-regulated environment where a coach or officiant is not present and play, taking turns in a pick-up format. Even though players keep score, the game's score may be used primarily to identify the game's progress. This configuration more resembles a practice experience than a competitive one.

**Flow and Happiness.** Csikszentmihalyi identified early on that flow is not equivalent to happiness and often pointed out that there was a difference in flow and happiness by pointing out, “if a rock climber takes time out to be happy while negotiating a difficult move, he might fall to the bottom of the mountain” (Csikszentmihalyi, 1997a, p. 32). Data collected by Csikszentmihalyi (1997a) showed climbers experienced flow,
then later experienced happiness after the climb, as did data collected by others (Tsaur et al., 2013; Engeser & Rheinberg, 2008). Collins et al. (2009) researched flow and happiness in later life in a published study but investigated the two separately. Csikszentmihalyi further discussed the difference in *Learning, Flow, and Happiness* (2014). Additional research reflects that happiness may result from a flow experience, not a flow component (Barthelmä & Keller, 2021).

**Flow in Education, Medicine and Human-Computer Interaction.** Flow research can also be found in fields beyond sports. In a recent meta-analysis regarding flow and time perception, over a third of the studies had occurred in sports and educational settings (Hancock et al., 2019). Human-computer interaction, where flow in video games and online interactions are studied, is a growing field. Human consumer behavior, especially in digital settings, has been an emerging area of interest in a quest to reduce expenses and increase sales in the digital marketplace. Flow studies have also been administered in work settings and education to identify ways in which increases in efficiency and effectiveness in either setting might occur more frequently with flow.

With the ever-increasing popularity of personal fitness devices, the ever-increasing ability to collect bio-medical data, and virtual reality innovations used to create interactive digitally-based environments are more commonplace. As the populace’s interest shifts to general wellness and the link between flow and optimal performance come into question, flow research may shift from an achievement focus to a more general well-being perspective. Should this shift toward wellness occur, research will likely be undertaken to determine the influence of flow in patient care and therapeutic settings.
**Group Flow.** The term "team flow" was first coined by Cosma (1999) in a retrospective study of soccer team performance. Nakamura and Csikszentmihalyi (2002) referred to it as "shared flow" but recognized that nothing was known about it then. Researchers have begun to study group flow. Theorists are beginning to consider relationships of demand and are finding that ability may apply to groups of individuals, such as teams. Researchers are also beginning to examine and determine the influences of group flow.

Studies of physical training in groups have recently led researchers to conclude that group exercise might stimulate opioid production (Cohen et al., 2010). Results of another study indicate group polarization, the tendency of a group to make more extreme decisions than the initial position of its members, brings about greater risk-taking (Stoner, 1968). This additional risk-taking may increase the demand/skill balance and produce greater flow. Another study reflected how people sometimes reflect on a companion's emotions and encouraged more research in this field, as emotional contagion may be a factor in team and group flow (Hatfield et al., 1994).

**Social Flow.** Recent developments in flow theory include the expansion of group flow into social flow and the occurrence of flow experience in social situations (Walker, 2010). Walker identified three types of flow: (1) alone flow, a flow experience in a solitary environment; (2) co-active flow, a flow experience during a unitary task concurrently with one or more people; and (3) interactive flow (Steiner, 1978), a flow experience during a conjunctive divisible task requiring cooperation from one or more people. Interactive flow is best done by a group and impossible to do alone, as is playing recreational doubles pickleball.
Social flow is gaining attention. In a recent study, interactive flow was rated significantly more enjoyable than solitary flow (Walker, 2010). Studies have found that people experience flow slightly more often with a co-participant (Decloe et al., 2009) and while undertaking interdependent tasks such as playing music in an ensemble (Bloom & Skutnick-Henley, 2005) or participating in group sport (Pineau et al., 2014). During group tasks, individuals may experience flow regardless of whether others partaking in the activity experience flow (Pels et al., 2018). Additionally, Walker (2011) conducted psychological research and found that variables in the social group experience may cause an individual to feel, think, or act differently than they would alone.

**Residual Flow.** Researchers have recently recognized that flow experience may continue following a flow activity. Theoretical reasoning has been recently developed that expects a person to continue to have the ability to concentrate after a flow experience (Christandl et al., 2018). Another study found that flow during work was associated with vigor and low exhaustion after work at the end of the day (Demerouti et al., 2012). Flow has also been found to be motivational in a PTSD-therapeutic setting (Ley et al., 2017).

**Flow Research Methods**

In order to investigate flow in adult recreational doubles pickleball it is essential to understand how flow has been captured in previous studies. While the concept of flow has remained largely stable since its inception (Nakamura & Csikszentmihalyi, 2014), models and research methods regarding flow have evolved to capture and assess this rich subjective experience. Countless hours over decades have been spent reviewing research approaches (Kimiecik & Stein, 1992), developing/validating new measurement tools, and
improving and re-validating existing ones. This continuous process leads some to believe that a standard measurement for flow is yet to be developed (Moneta, 2021).

The passion with which players pursue adult recreational doubles pickleball may be because particular game dynamics arouse and may simultaneously orchestrate several phenomenological factors. These factors may be both known and unknown. Developing a greater understanding of team flow, the influences of group flow, the emerging concept of social flow, and new thinking on flow outcomes will help us to identify and understand why adult recreational pickleball players experience flow. Eyes, ears, and minds that remain open in this investigative process may establish new ways to understand the cognitive and psychological appeals, and the influence of flow in this popular new game.

**Experimental Qualitative Research.** Csikszentmihalyi used interviews consisting of open-ended questions to understand and develop the concept of flow in the artistic process (Csikszentmihalyi, 1975).

Syntheses of these descriptions became the basis of the Flow Questionnaire (Csikszentmihalyi & Csikszentmihalyi, 1988), describing the flow state, and respondents provide insight as to their subjective experience. Data collected from this data collection instrument inspired Csikszentmihalyi to add time distortion to the description of flow (Csikszentmihalyi & Csikszentmihalyi, 1992).

Csikszentmihalyi developed the Experience Sampling Method (ESM) to explore flow in everyday life (Larson & Csikszentmihalyi, 1983). In ESM, the researcher randomly contacts participants using a beeper and asks them to record their activity, the context of the activity, and subjective feelings. ESM was used to explore flow experiences in learning, home, and work environments. Regression models were used to
identify and understand the expected influence of the skill and challenge dynamic (Moneta & Csikszentmihalyi, 1996, 1999). These tools gather significant data; however, neither measure flow intensity.

Jackson (1992,1995) used interviews to investigate flow in sports settings. Decades later, interviews are still primarily used to collect athlete data in sports settings (Swann, 2016; Janson et al., 2005; Yamada & Heo, 2016). Interviews are found to help gain a greater understanding of sport and flow.

Jackson and Marsh (1996) studied flow in sports and found it essential to divide the task understanding component into two components, (1) clear goals and (2) unambiguous (specific) feedback. The two also included "challenge-skill balance" as a flow requirement. Jackson and Marsh continued work in the field, later developing and validating two questionnaires, the Flow State Scale (FSS-2), which measures flow in a specific state, and the Dispositional Flow Scale-2 (DFS-2) measures flow in a general state. Both have been determined to have a good statistical fit (Jackson & Eklund, 2002) and construct validity (Jackson et al., 2008; Marsh & Jackson, 1999).

Other scales have been developed to explore flow-related components in various settings. The Utrecht Work Engagement Scale (UWES) (Schaufeli & Bakker, 2003) and WOLF Flow Scale (Bakker, 2008) measure flow in work. EduFlow (Heutte et al., 2016, Heutte et al., 2021) examines flow in education. The Immersive Tendencies Questionnaire (ITQ) measures flow occurrence in deep engagement activities such as media use (Witmer & Singer, 1998). Other scales explore flow in human-computer interaction in customer service scenarios (Novak et al., 1999) and online learning (Fu et
al., 2009). A recent review of flow studies found over 20 assessment tools that measure flow in various settings (Lonczak, 2019).

Special interests have expanded the inquiry into the impact of the flow experience beyond sport, work, and education. Studies have provided a basis for theoretical reasoning regarding flow in recovery, creativity, performance, community/collaboration, learning behaviors, procrastination, coping, well-being, and positive emotions (Table 2). Empirical evidence supports these rationales though many studies indicate correlative rather than causal relationships.

**Table 2**

*Psychological Research Areas Affiliated with Flow*

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Vigor</th>
<th>Creativity</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>Learning Behaviors</td>
<td>Procrastination</td>
<td>Coping with Stress</td>
</tr>
<tr>
<td>Positive Behaviors</td>
<td>Recovery</td>
<td>Collaboration</td>
<td>Motivation</td>
</tr>
</tbody>
</table>

*Note.* Data collected by author (December 2021).

**Experimental Research Methods.** Experimental methods in flow research have become increasingly possible due to technological innovations. Only recently, researchers likely thought it was too challenging to create situations to induce flow or manipulate conditions to develop it as they had yet to well identify under what conditions it tended to appear. Flow-related activities included high physical activity levels, risk, and danger. Now that research has confirmed the presence of flow in computer games, game-based learning, and digital environments, digital devices are emerging as tools
researchers can use to identify causal relationships (Van Schaik & Ling, 2011) and trauma survivors (Ley et al., 2017). Training equipment is also beginning to create specific challenges that may induce flow and facilitate research (Reinhardt et al., 2008).

**Psychophysiological Research Methods.** While flow research has been primarily based on interviews and surveys, flow can now be examined using technology in psychophysiology, the relationship between psychological phenomena and bodily processes (Tozman & Peifer, 2016).

Hamilton et al. (1984) are believed to be the first to undertake electroencephalography (EEG) experiments that generated psychophysical insight into the flow experience. Data generated by the study showed that individuals vary in ability and attention control, which influence flow. Goleman (1995) described flow as a state of effortlessness and suggested it was linked to decreased frontal cortex activation. Marr (2001) proposed that a reduction in brain metabolism occurred during flow and suggested dopamine, a neuromodulatory molecule that functions as a neurotransmitter in the brain, may be involved in the process. Shortly after that, a Dietrich (2003) study included Transient Hypo frontality Theory (THT), where the prefrontal cortex deregulates during flow so that the brain might focus on conscious control during flow. Later, electroencephalography recorded hypo frontality but did not correlate with flow (Wollseiffen et al., 2016). A study using functional near-infrared spectroscopy (fNIRS) also did not find hypo frontality and argued that the concept might be too simple to explain flow (Harmat et al., 2015).

Psychophysiological flow research is of great interest to the video gaming industry, as players are believed to experience flow while playing video games (Cowley
et al., 2008). Research using EEG and Near-Infrared Spectroscopy (fNIRS) has been used to investigate neural tendencies of flow. These studies have had mixed results but already suggest that actual brain activity varies from the well-known Hypo Frontality Hypothesis in which the frontal cortex is thought to function less during flow (Dietrich, 2003). fNIRS data collected while playing Tetris showed no correlation between flow and frontal cortical oxygenation (Harmat et al., 2015). Studies monitoring blood flow have begun to help identify activity in other regions (Goldberg et al., 2006). Meditation studies have shown that increased (rather than decreased) activity in the frontal lobes during meditation is similar to flow (Herzog et al., 1990).

**Physiological Research Methods.** Flow state has been furthered with extensive research in the physical realm. Marr (2001) suggested dopamine, a neurotransmitter used by the human nervous system to communicate messages between nerve cells and flow could be related, as both are considered components of the human reward system. Since then, several research studies have indicated a relationship between dopamine and the flow experience. A study of humans playing a video game found dopamine levels correlated with performance (Koepp et al., 1998). Brailovskaia et al. (2018) explored dopamine’s role in flow and its possible role in flow addiction. Another study found a slight correlation between flow experience and levels of gray matter in the dopaminergic system (Niksirat et al., 2019).

The stress hormone cortisol has also been investigated by flow researchers, as stress has been considered a flow component (Lazarus & Folkman, 1984) and thought to be identified as anxiety by Csikszentmihalyi (1990). Several studies have found higher cortisol levels with higher flow levels in physical activity (Sabzaligol & Nojavan, 2017;
Peifer et al., 2014) and video game players (Keller et al., 2011). Additional research revealed that while cortisol levels increase in times of stress, high levels hinder performance in tasks where participants place importance (Tozman & Peifer, 2016), conclusions similar to Barthelmä and Keller’s Revised Flow Model (2021). Future research will likely identify if increased cortisol levels are a flow requirement.

Flow and its relationship to the heart organ is the study of cardiovascular psychophysiology. Interestingly, researchers in this field have associated higher mental effort with lower heart rate variability that invokes relaxed alertness (Beh, 1990; Thayer et al., 2009). Other studies indicate a possible sympathetic-parasympathetic co-activation of cardiac systems while a person is experiencing flow. Further research is required to establish this link. Meanwhile, flow has been associated with wellness, demand adaptation, positive emotions, and improved coping (Bassi et al., 2014; Backs et al., 1999; Kok & Fredrickson, 2010).

Electromyography, measuring facial muscle activity, has also been used to understand flow, as many believe facial expressions might reflect the state of consciousness. Results, however, have been inconclusive in this area (Peifer & Tan, 2021).

**Observational Research Methods.** While flow research has historically been limited to interviews and questionnaires, social scientists have recently introduced observation as a third way to research flow in the social sciences. Tordet et al. (2021) developed and validated the Flow Observation Grid (FOG). Based on the analysis of coded recordings of 450 video game sessions, FOG helps researchers collect observational-based data about participants’ physical movements, facial expressions, and
exclamations that have been found to provide evidence of flow. Tordet et al. expanded their inquiry in the same study and found convergent validity with this new observational tool, the short version of FSS (Jackson & Eklund, 2002). Observation has been used previously in other flow research. Swann, Keegan, Piggott, Crust, and Smith (2012) determined that elite golfers could identify other elite golfers experiencing flow by appearance.

**Meta-Analyses and Systematic Reviews.** Interest in flow and the size of the growing body of flow research has inspired researchers to undertake several meta-analyses in the field of flow. Swann, Keegan, Piggott, Crust, and Smith (2012) examined elite sports' flow experience, occurrence, and controllability studies. The team reviewed 17 studies and concluded that "a relatively in-depth description of flow" (p. 818) had been developed, and ten factors were found to influence flow. The group recommended that research move from describing flow to researching to explain the phenomena.

A meta-analysis examining the literature on challenge-skill balance, intrinsic motivation, and flow antecedents was completed similarly (Fong et al., 2014). The group concluded, "the relationship between challenge-skill balance was moderate, and smaller with intrinsic motivation" (p. 425) however, "compared to other theorized antecedents, the challenge-skill balance was a robust contributor to flow along with clear goals and sense of control" (p. 425).

Flow in exercise was systemically reviewed by Jackman et al. (2019). The group found that 26 studies had investigated flow in this field, with 24 of the 26 being quantitative studies. While the group shared hope and enthusiasm for learning from the collection en masse, the study led to three primary concerns. First, although the studies
were primarily based on the nine-dimensions framework, multiple different models were employed, making it difficult to compare study data. The review was concerned with the level of conceptualization of flow. The researchers felt the dimensions of flow needed a measurable definition, even after years of study, and recommended that more robust concepts be developed for the flow dimensions. Finally, the group recommended specific tools be developed and validated to measure flow in exercise, as the results using established tools designed to capture flow in sport have generated inconclusive results.

A systematic review and meta-analysis of flow and performance have recently been completed (Harris et al., 2021) and included examining 22 articles on the subject. The study concluded that performance-enhancing effects of flow are highly likely, yet cautioned that current evidence does not define the nature of the relationship nor the mechanisms which may influence this effect. The study concluded that future research might benefit from examining performance feedback and its influence on flow and more closely examining the influence of positive outcomes (and the perception of performance) on player flow.

**Future Flow Research**

Flow research will likely continue to expand in the video game and electronic digital device interaction arena as participants are typically indoors and more local in their physical location and movement, allowing more connectivity, observation, and interaction opportunities for research. Innovations in digital technological advances in the medical field will likely combine with new ways to digitally control experimental settings to more greatly understand not only video games but social media interaction and lead to more significant insights into the physiology of flow, including the possible development
of definitive neuropsychological and physiological markers that indicate the phenomena in both group and individual settings. Digital environments, as well as advances in digital medical technology, will provide the opportunity for flow research to expand to causal research rather than be limited to descriptions of situational factors.

Future flow research can be expected to understand possible consequences or after-effects of the flow experience. Work will be undertaken to define further and understand the range of possible circumstances of, and possible relationships between, the nine flow dimensions. The direct impact of flow on performance should also be seriously reviewed. It may include the development of an understanding of the indirect influence of the flow state on physical performance and cognitive processes.

While flow has historically been studied as the dependent variable, it may be wise to study flow as an independent variable in the future. Doing so may provide valuable insights concerning human health. Given growing concern for life-long cognitive function (rather than decline), the aging of the American population, and the ever-increasing public interest in wellness and health, flow research can be expected to expand in the psychological, social, and physiological realms. Simultaneously, while flow may have wellness benefits, a recent review of 42 flow research studies resulted in the author cautioning that flow should be more precisely defined and maintained as an "optimal" state so that it not be confused with or generalized with simple goal-directed experiences (Abuhamdeh, 2020).

Flow in Sports

Csikszentmihalyi’s discovery of flow began with studies of the creative process in art (Csikszentmihalyi, 1975) and extended to its possible implications of excellence in the
artistic process. Later it was popularized with the publication of the researcher's book

*Flow: The Psychology of the Optimal Experience* in 1990. Researchers began to apply the concept to the sports realm immediately thereafter.

**History of Flow Research in Sports**

The first (and very well-known) published study regarding flow in sports was Jackson's qualitative interviews with 16 elite figure skaters. In this study, every participant recalled having experienced flow (Jackson, 1992). The study identified ingredients for flow, including a positive mental attitude, positive pre-competitive and competitive effect, maintaining appropriate focus, physical readiness, and unity with a partner. Factors disrupting flow in the study were physical problems or mistakes, an inability to maintain focus, a negative mental attitude, or a lack of audience response (Jackson, 1992).

Other sports were also studied. A study of professional golfers confirmed that optimal experience (aka flow) occurred, yet no pattern of antecedents was found (Stein et al., 1995). Another study found evidence of automaticity in 13 elite golfers, similarly equating to flow (Swann, Keegan, Piggott, Crust, & Smith, 2012). Swann, Keegan, Piggott, and Crust (2012) released a comprehensive review of 12 empirical studies on the topic. As of that time, flow research had focused on understanding the flow experience from the athlete's perspective, exploring the factors influencing the occurrence of flow, investigating the potential of manipulating and controlling flow, and understanding the relationship of flow to other mental constructs. The study called for more research concerning the causal explanation of flow and developing a better understanding of how athletes experience it.
Flow research has been undertaken to determine ways to improve sports performance. A systemic review of the experience, occurrence, and controllability of flow states in elite sports found 17 studies between 1992 and 2011 (Swann, Keegan, Piggott, & Crust, 2012). Study conclusions included that some flow dimensions may be more consistently experienced than others, the lack or presence of critical factors may induce or inhibit flow, and those study participants felt they could control flow to some extent. Research has revealed that certain sports may be more conducive to flow than others. The controllability of flow was found to vary in elite sports (Swann, Keegan, Piggott & Crust, 2016). Stop-start games are believed to be less conducive to flow (Jackson et al., 2001), and flow has been found to occur more often in fast-paced, externally-paced team sports in several studies (Jackson, 1995; Jackson & Roberts, 1992; Chavez, 2008).

Flow antecedents were explicitly examined in a study by several scientists (Stein et al., 1995) with exciting results. The study examined basketball players at a college activity class, tennis players at a weekend tournament, and golf regulars. In the learning basketball environment, students in flow experienced greater enjoyment, satisfaction, concentration, and control than participants in golf and tennis competitive environments. Players of all three sports formats enjoyed the flow experience more frequently than the inactive control group. Researchers concluded that contextual differences influence how athletes perceive situations as appropriate conditions for flow. Goals, competence, and confidence were not predictors of flow in the study.
Measuring Flow in Sports

Qualitative and quantitative research methodologies have been developed to measure the experience of flow in sports. Jackson and Marsh (1996) developed The Flow State Scale (FSS), a Likert-based scale tool to measure flow in sports and physical activity settings. The short version included just one question per each of the nine dimensions of flow. The FSS was later validated and enhanced by Jackson and Eklund (2002). In the new, more extended version, an understanding of the nine scales was collected in a 36-item instrument that gathered more perspective concerning the dimensions of flow described by Csikszentmihalyi (1990). Years later, Brockmeyer et al. (2009) created a Game Engagement Questionnaire to measure the player’s presence and flow experience during gameplay. Researchers have also turned to qualitative methods to gain insight into flow, as flow is a subjective experience. Semi-structured interviews have contributed significantly to this understanding (Seifert & Hedderson, 2009). To increase the validity of the results, the same pair used interviews and observations to capture individual experiences in skateboarder flow as accurately as possible.

Measuring Flow in Recreational Sports. Flow occurrence has been investigated in golf and skateboarding with recreational participants. Data from a paper survey collected from 163 amateur golfers by Catley and Duda (1997) suggested skill level and pre-round readiness were significantly related to flow. A study of teenage skateboarders reported links between intrinsic motivation to flow. The skateboarders recalled feeling satisfaction/accomplishment, enjoying the challenge/ability continuum, and feeling freedom upon skill accomplishment. The study found subjective, transcendental, concentration, and peak performance components of flow experience in skateboarding
(Seifert & Hedderson, 2009). Both studies found that peak performance and high concentration levels were essential for recreational sports.

Other studies have found other factors more significant in recreational sports. An analysis of college-age amateur tennis, basketball, and golf players investigated the impact of goals, perceived competence, and player confidence influence on flow (Stein et al., 1995). Although learning-based participants experienced greater enjoyment, satisfaction, concentration, and control than their counterparts, goals, competence, and confidence were not found to be dimensions of the flow experience in recreational sports. A study of dancers found flow to be an intrinsic experience. Participants danced for sheer joy for themselves rather than for others (Hefferon & Ollis, 2006) and were wholly absorbed in the dance when experiencing flow. A study of amateur actors hinted that self-confidence increases the experience's positivity (Martin & Cutler, 2002).

**Measuring Flow in Multi-Sports.** Several research studies regarding flow in sports have combined individuals from various sports into one sample. Jackson (1992) interviewed 28 participants in seven sports. She found that positive factors contributing to flow were positive mental attitude, positive pre-competitive and competitive effect, maintaining flow occurrence, physical readiness, and unity with a partner (if pair). Factors disrupting flow were physical problems or mistakes, an inability to maintain focus, a negative mental attitude, or a lack of audience response.

Jackson et al. (2001) combined interviews across three sports. The three found positive relationships between flow and self-concept measures, including challenge/skill balance, concentration, and sense of control. Russell (2001) combined the results of college athletes participating in nine sports seeking similar factors and concluded gender
nor sport type appeared to influence flow occurrence. Stavrou et al. (2007) used a multi-regression analysis of data from athletes from six different sports to demonstrate a significant prediction of athlete performance based on flow during competition. Young and Pain (1999) interviewed elite athletes from multiple sports. The two concluded that the zone or flow state is a universal sports phenomenon, yet intra-sport and intra-athlete variations of complexity and intensity exist.

**Pickleball Studies**

Pickleball, a game of elements similar to tennis, ping-pong, and badminton, is currently enjoyed by more than 4.8 million players in the United States in 2021, including approximately 500,000 older adults (USAPA, 2022). The game is especially popular with older players when played in a recreational doubles format. Opportunities exist to evaluate and understand the pickleball experience. A recent publication found that “research papers that take the leisure behavior of pickleball players as the subject are relatively scarce” (Chen et al., 2021, p. 2). Limitations in research design, participant selection, and methodology can be noted in the small pool of current studies. While studies completed thus far provide exciting insights, many opportunities to expand research in this area exist.

Team-based programs, enjoyed by American youth, are offered to adults at some facilities, but programs of this type are in decline (Steinbach, 2011; Stastica, 2022). The 2015 *Sports and Health in America Study* issued by NPR, the Robert Wood Johnson Foundation, and Harvard’s T.H. Chan School of Public Health recorded a sharp decline in sports participation among adults as they age. While 40% of 18 to 21 year-olds and
41% of 22 to 25 year-olds currently play sports, only 26% of 26 to 49 year-olds and just 20% of adults aged 50+ play sports.

Outcomes of sports participation for youth in America are thought positive (Neely & Holt, 2014) and children are encouraged to participate in them (Wintergreen Research, 2023). Simultaneously, adults need to be physically active to maintain health like young people (CDC, 2022). Research is therefore necessary to identify adult sports participation's positive and negative outcomes, including the possibility that adult participants may experience flow. Recreation and community service professionals may use these insights to improve current programs or inspire adults to be more physically, socially, or/and cognitively active.

As identified in the study, authors Jenkin et al. (2017) undertook "the first systematic literature review to explore the determinants and trends regarding older adults' sports participation" (p. 16). The team completed two parallel systematic searches of nine electronic databases to explore the determinants and the trends of sports participation among community-dwelling older adults. Of the 10,171 studies initially identified, only 18 provided insight into determinants and eight into trends. This paltry portion of just .18% of total sports participation studies that focus on older adults pales compared to the nearly one-third of the US population over 50.

The study recommended that sporting (rather than health) organizations examine the results of the analysis and "provide both social play and competitive opportunities" (p. 18). It also cautions "that organizations ensure that these opportunities also cater for older adults who may have potential health limitations, to ensure older adults who enjoy sport can continue to participate as they age (p.18). This simultaneous "throttle
(encourage sport) and brake (but be careful to accommodate aging declines)" approach, common in the aging industry and aging science, neglects the opportunity to segment this enormous population into groups based on capacity. Addressing this group with segmentation (rather than as a whole) may be appropriate at this time, as the United Nations reported numbered 78.4 million adults over age 60 in North America and 962 million worldwide in 2017 and estimates this group to grow to 122.8 million in North America and 2.080 billion worldwide by 2050 (United Nations, 2017).

A large sector of the American population is aging, the proportion of older persons is increasing, and sports participation positively impacts physical and emotional health. Therefore, it is crucial to investigate the determinants of initiating and continuing sports participation for this age group. Identifying the physical, mental, and emotional benefits derived by adults currently participating in sports may be valuable inputs to designing new sports and future recreation programs for this growing demographic sector.

Additionally, an investigation is worthwhile as to what psychological or social benefits occur when adults play pickleball, as they may differ from those experienced in general physical activity or other sports. Understanding the perceived risks or possible negative factors of participating in pickleball specifically, in addition to participation in other sports, should also be explored.

Recently, a large portion of research in older adult pickleball has consisted of quantitative studies designed to understand why older adults participate in pickleball and investigate the benefits older adults experience from pickleball play. Ryu et al. (2018) reported evidence that playing pickleball positively impacted life satisfaction. Heo, Ryu,
Yang, and Kim (2018) reported finding an inverse relationship between serious leisure playing pickleball and depression. Heo, Ryu, Yang, Kim, and Rhee (2018) explored the relationship between financial status, loneliness, serious leisure/pickleball play, and subjective well-being. Casper and Jeon (2018) found that fitness and socialization were the primary motivators for older adult pickleball players. The two researchers made statements such as "It is social" and "It is good exercise" and captured respondent levels of agreement with these and similar statements to understand how players view the game. Ryu et al. (2020) found that older adult pickleball players may play a role in positive psychological functioning, as higher levels of authenticity reported by players were statistically correlated with less stress.

Chen et al. (2021) found links between pickleball involvement and leisure satisfaction and recommended future research divide study between “Serious Leisure” and "Peak Experience" players, and in doing so, is possibly the first publication to recognize a difference in competitive and recreational pickleball play. Chen et al. (2021) points out that data collection for studies surveying pickleball players has thus far occurred at pickleball tournaments and indicates that while recreational players may have been included in the response groups of these surveys, it is highly likely that the response groups for these studies most enjoyed competitive, rather than recreational, pickleball play and alternative data collection strategies may be needed to collect insights as to those who play for recreation.

Since 2020 pickleball research has moved from tournament survey data collection to new environments. Studies focusing on the impact of pickleball play on cognitive response have emerged. Hutton (2021) found that pickleball players have slightly higher
responses, though the study had much attrition. Søgaard (2021) looked for differences in cognitive response and physical performance between pickleball players, aerobic participants, and a control group, wherein only differences between the active and control groups were found. Studies have also been published exploring the value of pickleball as a social intervention (Wray et al., 2021) and the emergence and most common types of pickleball injuries (Vitale & Liu, 2020).

Only a few studies have specifically explored the older adult recreational pickleball player experience. Hess and Scally (2013) asked 594 players to list 3-5 motivators, reasons players participated in adult recreational doubles pickleball, and collected the data with electronic tablets at recreation centers. The two researchers concluded that health, fun, competition, social, and development benefits motivated players to participate in the game. Buzzelli and Draper (2019) designed a computer survey collecting pickleball player responses to questions taken from the Sports Motivation Scale (SMS), Task and Ego Orientation in Sport Questionnaire, and Recreation Service Questionnaires. Data from more than 3,000 respondents found participants to be task rather than ego-oriented, but that competition (ego) was thought by respondents to be the main benefit of participating in the sport. The disjoint nature of the results inspired the researchers to encourage further research in the area.

Flow in sports research has been extensive and has included developing and validating specifically designed flow research tools. These tools (such as the long, short, and core flow scales) have been used to understand flow in youth, collegiate, and professional sports. At this point, however, these tools have yet to be used to determine
(as best as the author can confirm) if adult recreational doubles pickleball players experience flow.

While flow has been researched in sports to understand its impact on performance, Csikszentmihalyi (1990) hypothesized that flow experience is a reason humans pursue activities with no specific end. While 80% of the pickleball games played nationally are thought to occur in a recreational (versus a competitive) format (SFIA, 2018) and that play for fun rather than play to win could be considered a game played without an "end," researching flow in this format may increase or understanding of flow. At present, data gathered for pickleball studies have been collected at pickleball competitions or based on surveys distributed online to members of the American Pickleball Association (APA), of which membership is required to play in competitive events in the sport (and therefore likely skewed to the perspective of competitive, rather than recreational, players) (Ryu et al., 2020; Ryu et al., 2018; Heo, Ryu, Yang, Kim & Rhee, 2018; Heo, Ryu, Yang, & Kim, 2018; Hess & Scally, 2013). This study will expand the understanding of flow in recreational settings.

Flow research explicitly focused on the occurrence of flow in the older age category is less common, as research has focused on younger athletes. While this study did not "dive deep" into a discussion of game nuances with older adult pickleball players, it will use carefully constructed and validated data collection instruments to gain a deeper understanding of player flow experience based on established constructs.

Research results may help reveal the appeal of this game when played recreationally. Understanding the appeal of pickleball with current participants may help improve and develop new leisure programming ideas for adults and could help generate
ways to adjust the format of other established sports so that they may be of greater appeal to older players. It also may provide critical concepts to remember when developing new games for this age group.

**Recently Published Pickleball Research**

The results of the quantitative studies thus far reveal several possible sources of enjoyment in pickleball. However, this methodology has restricted participant responses to pre-defined survey responses and parameters. Results indicate that respondents enjoy the "social aspects" of the game, for example, rather than defining what types of social interactions occur and are appreciated as a result of play. A statistical study by Ryu et al. (2018) reported less stress recalled by pickleball players as an output of playing the game. A similar study by Ryu et al. (2020) employing a Likert-based survey found adult pickleball players with higher “authenticity.” Casper et al. (2021) concluded that playing pickleball impacted positive life satisfaction among adults. Heo, Ryu, Yang, and Kim (2018) survey reported an inverse relationship between pickleball play as serious leisure and depression. In all three studies, the results were tallies of "check the box" answers to electronic survey questions with little description or definition of terms provided to respondents. Chen et al. (2021) found that leisure involvement significantly affected leisure satisfaction in pickleball players. A control (non-pickle ball playing) group was not present for comparative purposes in the studies.

Ryu et al. (2018, 2020) collected data from paper surveys at pickleball competitions. While the data reported the findings as representative of all pickleball players, the data was collected only from participants at state-level competitions where membership in a pickleball association is required in order to compete. These studies
likely captured only the experience of competitive pickleball players, as recreational players are not known to maintain association memberships and may not attend competitive meets.

This differentiation is crucial, as sources indicate there may be a difference between competitive and recreational pickleball players (Hagger & Chatzisarantis, 2007). The United States Pickleball Association estimated there were nearly 1.57 million “casual” pickleball players (who play 1-7 times a year) and approximately 930,000 “core” players who played more often (8+ times per year) and noted that the core group also tended to compete (USAPA, 2017).

Buzzelli and Draper (2019) worked to understand the motivation and perceived benefits of pickleball participation in older adults with an online survey completed by 3,012 competitive pickleball players. The study consisted of a computer survey comprising the Sport Motivation Scale, Task and Ego Orientation in Sport Questionnaire, and the Recreation Service Questionnaire. Data was collected by sending email invitations to the active United States of America Pickleball Association (USAPA) members. While some respondents reflect an overall enthusiasm for the game, most members are competitors, as USAPA membership is required to play in pickleball tournaments. Membership in USAPA is not necessary to participate in recreational pickleball play. Research is needed to explore the dynamics of the recreational pickleball experience.

Buzzelli and Draper's study was declared by its authors as a "possible understanding of all older adults in sport" due to its study size (n=3,012). However, the study resulted in conflicting results. Study participants were more task (intrinsic) oriented
rather than ego (extrinsic) oriented and yet claimed competition (ego/extrinsic) as the main benefit. The authors recognized this dichotomy of results as the results conflict. Noting this conflict, the authors recommended a more in-depth investigation into this area in the future.

This study will use the Dispositional Flow Scale – 2 (Jackson & Eklund, 2002) to identify if members of this group are experiencing flow. The 36-question DFS will provide insight into the older adult recreational pickleball player experience as millions of older adults are drawn to the game worldwide.

**Research Opportunities in Pickleball**

Expanding an understanding of the adult recreational pickleball experience is a great opportunity. As mentioned earlier, data at this point has been primarily collected at competitive events or distributed to members of the American Pickleball Association (for which membership is required to play in competitive events). With this approach, the results primarily reflected the competitive perspective of the game (rather than the recreational perspective). This study expands current knowledge, as it investigates the experience of recreational players who play pickleball frequently and compete or do not compete in tournaments.

Survey questions used to inquire into the adult pickleball experience have been resourced from a variety of established psychological research instruments from various fields of psychology (Table 3).
Table 3

*Examples of Pickleball Research Using Psychological Instruments*

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Instrument</th>
<th>Survey Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casper &amp; Jeon</td>
<td>2018</td>
<td>PCM (Psychological Continuum Model)</td>
<td>690</td>
</tr>
<tr>
<td>Heo, Ryu, Yang &amp; Kim</td>
<td>2018</td>
<td>Depression (MDI), Serious Leisure (SLIM), Life Orientation (LOT)</td>
<td>153</td>
</tr>
<tr>
<td>Buzzelli &amp; Draper</td>
<td>2019</td>
<td>Sport Motivation Scale (SMS), Task &amp; Ego Orientation in Sport Questionnaire, Quality &amp; Importance of Recreational Services*</td>
<td>3012</td>
</tr>
</tbody>
</table>

*Note.* *Selected questions only. Entire models not used. Data collected by author (Dec 2021).*

Several sports motivation and flow surveys have been primarily developed to achieve a greater understanding of competitive and elite sports participants (Swann, Keegan, Piggott, Crust, & Smith, 2012; Jackson & Roberts, 1992; Chavez, 2008), as autotelic flow has been documented in this younger to middle-aged adult population and thought to enhance athlete performance. These surveys were predominately taken by academic (high school and college) athletes or professional athletes (age 35 and younger) with years of experience playing and talking about their sports experience. This historic sports experience helped respondents who completed prior surveys in sports and other activities be more familiar with the process of self-diagnosis, psychological concepts, and sport motivation vocabulary. These strategies may not be insensitive to the older (age 50 and older) adult athletes who may not have completed years of sports participation and not developed sports understanding similar to younger players. Awareness of this possible gap in knowledge may be necessary when undertaking psychological research with older or new players.
Data collected in any setting can be influenced by researcher bias. While it is easy to generate statistics from a number set, the data generated may be affected by the decisions of the researcher. This is of particular concern when a few questions are analyzed and the conclusions are expected to explain the phenomena. This study used a very established professional research instrument, the DFS-2 (Jackson & Eklund, 2002), to prevent omission/submission of variables at the researcher level. This approach also allowed study results to be compared and contrasted with results from other studies.

**Proposed Study Challenges**

The challenge of this project was to accurately record the adult recreational doubles pickleball experience from the players’ points of view. Flow is a subjective experience, consisting of emotional and cognitive components as opposed to an objective experience which consists of actual events. So that the information collected is as accurate as possible, the following challenges were considered and addressed before undertaking the project.

The research aimed to collect data reflecting the flow experience with accuracy. With this in mind, the researcher selected the established Flow State Scales (Jackson & Eklund, 2002) to measure player flow. Specifically, the Dispositional Flow State Scale (DFS-2) was used to determine if respondents experience flow while playing pickleball (in general, rather than when playing a specific game). Investigating dispositional experience helps to broaden the perspective across multiple incidents rather than having data based on or influenced by a particular game outcome or interaction. The instrument has been validated and found reliable in several studies (Kawabata et al., 2008; Riva et al., 2017; Johnson et al., 2014).
The dispositional and state scales are of parallel form; however, the DFS assesses whether the respondent tends to experience flow in general rather than during a specific experience. Using the dispositional version of the scale benefitted the study, as it inquired about the overall player experience and did not risk a different outcome of results based on a particularly good or bad game experience the respondent may have had immediately before participating in the survey.

The DFS-2 has been validated through extensive factor analysis (Johnson et al., 2014), the scale validated in several languages (Kawabata et al., 2008; Gouveia et al., 2012; Riva et al., 2017), and the instrument used to capture flow occurrence in multiple sports settings (Table 4).

Table 4

Examples of Studies Using the DFS-2 in Sports Research

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Sport</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Türksoy et al.</td>
<td>2015</td>
<td>U13-U16 Football (Soccer) Players</td>
<td>125</td>
</tr>
<tr>
<td>Schuler</td>
<td>2009</td>
<td>Marathon Runners</td>
<td>109</td>
</tr>
<tr>
<td>Hamari &amp; Koivisto</td>
<td>2014</td>
<td>Computer Game Players</td>
<td>200</td>
</tr>
<tr>
<td>Silva et al.</td>
<td>2018</td>
<td>Brazilian Rugby</td>
<td>8</td>
</tr>
</tbody>
</table>

*Note.* Data collected by author (December 2021).

The subjective nature of flow and the age/experience of respondents required special consideration for this study. While several tools have been developed to measure flow, these tools were primarily designed to be administered to collegiate and elite young adult athletes. Adult pickleball players, many of whom are new to sports, may have a
different point of reference and personal experience than is assumed with established flow tests or have the same conversational capability as other demographic groups about experience, emotions, and sport. With this in mind, the DFS-2 survey was administered to adult recreational doubles pickleball players and field tested to ensure understanding. No issues were found regarding completion capability or understanding the questions asked. Time was taken to understand the development of flow theory across Csikszentmihalyi’s career, 1975 – 2022, to ensure proper interpretation of the data of the respondent’s self-reported dispositional experience.

This data significantly expands knowledge about the pickleball experience from a player’s point of view, as the proposed quantitative data had not been collected from older recreational pickleball players before this study.

The Gap in Current Knowledge

This study provides evidence that adult recreational doubles pickleball players are experiencing flow (Csikszentmihalyi, 1990). This study also provides new knowledge regarding the flow experience of sport in adults, providing insight into the adult recreational doubles play experience for the first time. Many pickleball players enjoy the game recreationally without the goal of participating in formal competitions known as tournaments. While official data is unavailable, local club ambassadors estimate that up to 80% of the club "regulars" play regularly (once or more per week) yet do not participate in competitions or tournaments. This group of players' motivations and pickleball experiences had yet been specifically studied.

Research had also yet to occur investigating flow in sports participation specifically in elderly athletes. Studies of "older" athletes claim to have occurred in golf,
marathon running, and tennis (Catley & Duda, 1997; Schüler & Brunner, 2009).

However, upon careful review, it is revealed that the athletes surveyed for these studies had an average age of at most 40, nearly two decades less than the 68.6 average age of respondents in this study. Other studies of "older" Master athletes (claimed as "older" in this study but were age 35+) have predominantly investigated participant motivations (Dionigi, 2002). In a study of flow in Master athletes (Jackson et al., 1998) the average age was 46.1 years, much lower than the 68.6 average age of respondents in this study.

Additionally, current research has investigated the leisure-time physical activity of older adults at a very general level. Yamada and Heo (2016) explored why older adults (average age 63) participate in leisure-time physical activity. The advantages reported were health, camaraderie, self-actualization, family & travel. Disadvantages found were injury and impediments in physical ability, lack of opportunity, and lack of knowledge/information. It is unclear how the respondents indicated they felt self-actualized or how this state was determined. Research is needed to explore this demographic's sport participation experience, including how and to what degree older adults participating in sports experience flow.

Information learned in this study may be used to bring more players to pickleball or draw more older adults (age 50 and older) to participate in the sport. Helping to improve the game or increasing the number of people who play may contribute significantly to positive aging, as older adults who are more active lead healthier and happier lives (Zhang & Chen, 2019).
Chapter 3: Methods

This study aims to identify if adults age 50 and older recreational doubles pickleball players experience flow. This study also investigates if any single or set of gameplay or demographic characteristics influences this group's experience of flow dimensions. Finally, it compares flow dimension experience data collected from adult recreational doubles pickleball players to similar data collected from participants in other activities and sports. This study helps to establish a preliminary understanding of the player experience in this new research frontier (adults age 50 and older in active recreational play) and new sport (doubles pickleball).

Using a proper data collection instrument is vital to the research process. This study used phenomenological research methods (Polkinghorne, 1989) to explore player flow experience and collected data using a quantitative approach (Creswell & Creswell, 2017). The use of a validated research instrument, established instrument protocols, and practical design (Leedy & Ormrod, 2015) were used in this study.

Flow measurement instruments have been developed, tested, and repeatedly validated by Jackson and collaborators (Jackson et al., 2008; Jackson & Eklund, 2002; Jackson & Marsh, 1996) and have been used across many domains to measure flow (Jackson et al., 2010). Simultaneously, work in flow and sport was published by Jackson and Csikszentmihalyi, including the book Flow in Sports (Jackson & Csikszentmihalyi, 1999).

As discussed in the Literature Review, participants experiencing the flow state are fully absorbed in the task (Csikszentmihalyi, 1975). They cannot reflect in the flow state. They must leave the autotelic state to describe the experience. With player participant
safety in mind, this research study gathers self-reported experience data retrospectively through the use of a survey, as have previous studies.

**Survey Instrument**

The Dispositional Flow Scale Version 2 (DFS-2) data collection instrument (Jackson et al., 2010) was used to collect data for this study. The DFS-2 consists of an online survey composed of 36 sentences that respondents read and provided feedback relative to their personal experience via a 5-point Likert response scale. The survey also included a consent agreement, a reminder that questions were to be answered based on the experience the respondent has during recreational doubles pickleball play, demographic questions, questions about player pickleball play, an offer to participate in a follow-up interview, and a request to receive a copy of the study once it is completed for a total of 49 questions.

The Flow State Scale (FSS), first introduced in 1996 (Jackson & Marsh, 1996), assesses respondent flow experience in a given situation and has often been used for flow in sports research. The Dispositional Flow State Scale (DFS) was later developed to determine the tendency to experience flow while participating in an activity over time rather than associated with a particular game or event (Jackson et al., 2010). The models are based on participant experience as defined by Csikszentmihalyi’s nine dimensions of flow (Table 5). Both models were further assessed, updated, and validated (Jackson et al., 2008). As mentioned earlier, the FSS-2 and DFS-2 have been used for several studies and are robust instruments for assessing the presence of flow, as described in the dimensional flow model. The pair refined the tool and expanded the data collection vehicle’s use.
beyond sport. Subsequently, the DFS-2 was used to study flow in music (Fritz & Avsec, 2007) and education (Cermakova et al., 2010).

**Table 5**

*The Nine Dimensions of Flow, FSS, and DFS-2*

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
<th>FSS</th>
<th>DFS-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge-Skill Balance</td>
<td>The activity level of the challenge must match the individual’s ability. If it is too hard, frustration happens. If it is too easy, boredom.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Action-Awareness Merge</td>
<td>Individual becomes wholly absorbed. Who they are and what they are doing converge.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>The participant is fully versed in task objectives and expectations.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>The individual has clear feedback as to how their performance is helping them meet their goals.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Concentration on Task at Hand</td>
<td>This stage seems effortless. The individual is entirely focused and tunes out all distractions.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>The individual feels infallible and empowered with no thought of failure.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Loss of Self-Consciousness</td>
<td>The individual is not aware, nor concerned, of what others think of them.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Transformation of Time</td>
<td>Time seems to go more quickly or more slowly than actually.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>An intense feeling of pleasure/“out of self” experience brought on by the presence of multiple flow factors.</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Note.* Source: Jackson and Eklund, 2002.
The Dispositional Flow Scale - 2 (Jackson et al., 2010) collects responses to 36 questions that reflect respondent levels of experience with the nine dimensions of flow defined by Csikszentmihalyi (1990). Respondents reflect how often they experience each using a 5-point Likert scale (Likert, 1932) (Never 1, Rarely 2, Sometimes 3, Frequently 4, Always 5), with a high score indicating the respondent recalls always having the experience in question during the activity. Each of the nine components of flow is measured with four questions (Figure 4). The four questions can be combined to create subscales and an overall score (Jackson et al., 2010). While the instrument does not explicitly measure if the respondent experiences flow, it measures the respondent’s recollection of experiencing the nine dimensions of flow. It is the research instrument most used to reflect the flow experience in sports. As noted in the literature review, the DFS-2 has been used to identify flow experience in marathon runners (Schüler & Brunner, 2009), Brazilian rugby (Silva et al., 2018), computer game players (Hamari & Koivisto, 2014), and Turkish football players (Türksoy et al., 2015).
Figure 4

*Dispositional Flow Scale-2 (DFS-2) Question and Dimension Map*

Note. Chart source Procci et al., 2012. Figure reflects the question numbers that map to each flow dimension in the DFS-2 survey instrument.

The Long Scale DFS-2-Physical data collection instrument was developed in sports and performance settings (Jackson et al., 2010) in the collegiate environment with collegiate athletes. The tools have been validated in environments heavy in (though not isolated to) similar demographics and settings. Studies have typically been undertaken with higher-educated, college-age collegiate competitors and slightly older professional athletes.

Caution must be taken as it should be assumed that adult recreational pickleball players are only partially aware of this competitive environment. Those new to sports as adults or who have been away from school sports for decades, for example, may not have a comfortable understanding of sports and involvement terms based on personal experience or practice. With this in mind, a pilot study was undertaken with members of this demographic group. The survey was shared with four individuals: a 56-year-old
woman who did not previously play sports, an 83-year-old man who did not previously play sports, a 52-year-old man who played limited sports prior to playing pickleball, and a 53-year-old woman who did not previously play sports to test respondent comprehension. All four easily completed the survey, and interviews with the participants revealed that the participants understood the questions and were easily able to respond to the survey using the Likert scale. The four test respondents to the questionnaire completed the survey without skipping questions in an average of 8 minutes and 25 seconds.

**Survey Sample**

In addition to selecting the proper data collection instrument, another critical step in undertaking research related to experience is to choose individuals that have had the experience in question and are willing to describe their experience. Participants for this study will be selected for their active recreational play of pickleball. In the case of this study, “active recreational play” will be defined as visiting a community pickleball facility on average two (2) or more times per week to play/participate in doubles (4 persons per court) gameplay rather than to enhance competitive skills through drills, play or skill practice.

The survey was distributed by club email to members of three pickleball clubs in Arizona, Texas, and Iowa. A linked invitation to participate in the study was also posted on a Facebook page of an Iowa/Illinois club. No compensation nor prize was offered for participation.

While claims have yet to be made of perfect sample size calculations, work by Krejcie and Morgan (1970) recommended that for populations over 1,000, at least 20%
(200) should be sampled. Anderson and Gerbing (1988) suggested that the sample size should be 100 to 150 when conducting structural equation model studies. Hoelter (1983) found that no less than 200 surveys should be collected to provide sufficient data for analysis. With these recommendations in mind, 220 adult recreational doubles pickleball players were surveyed to collect at least 200 complete responses.

Although in-person invitations to participate in the study were used in previous DFS-2 flow studies, in-person invitations were not used for this study due to government requests to limit community contacts due to the risk of COVID exposure during the study period. Instead, electronic communications were used to invite adult recreational doubles pickleball players to participate in the study. A web link to the survey was distributed via email to the members of a recreational pickleball club in Iowa (235 members) and Arizona (587 members), and Texas (212 members).

The Iowa club members enjoy an outdoor 8-court complex. The club communicates with members via weekly emails, a website (cfpickleball.com), and a Facebook page. While the club consists of many snowbirds, more than 50 players attended the club’s 2022 in-person Christmas party, and most players are believed to reside in Iowa during the summer months. The club gathers over 35 hours weekly for pickup play (weekday mornings 7-10:30 am, two evenings per week, and Sunday afternoons) year-round.

The club in Arizona maintains active communication with members via web site and email and enjoys a 24-court outdoor complex. The club in Texas keeps in contact with its members via email and Facebook and encourages play sessions across ten
facilities in the community. Active club communication via electronic media likely helped players feel comfortable answering the electronic survey.

**Survey Distribution and Administration**

The survey was made available via researcher subscription to Mind Garden (mindgarden.com) services, an international publisher of psychological research assessment instruments. Mind Garden provides a 24/7 terminal-neutral electronic distribution system that appears similarly on laptops, tablets, phones, and other devices and is the data collection host.

To further ensure that the data collected is specific to recreational players, the survey introduction reminded respondents that the experience they are to reflect upon and report on while completing the survey is the experience they have while playing pickleball in a doubles format. The survey also included a question that asked how often players participate in tournaments (a more formal, competitive construct compared to recreational play). To ensure that the proper age categories are tallied, players playing the game less than specified or under age 50 were kindly asked to refrain from participating in the study as part of the introductory greeting in the online survey. Although they were requested to be over 50, two respondents were withdrawn from the sample based on answers to the age question.

The suggested instructions for the dispositional version of flow will be used (Jackson et al., 2010). The scales are rated on a 5-point Likert scale from “1” (strongly disagree) to “5” (strongly agree). Respondents were asked to rate their personal experience with regard to each descriptor about their general (dispositional) experience
playing recreational pickleball in a doubles format. Specifically, the recommended introduction for the Dispositional Flow Scale - 2 was used:

Please answer the following questions about your experience playing recreational doubles pickleball. These questions relate to thoughts and feelings you may experience during participation in your activity. You may experience these characteristics some of the time, all of the time, or none of the time. There are no right or wrong answers. Think about how often you experience each characteristic during your activity, then circle the number that best matches your experience. (Jackson et al., 2010. p. 69)

The introduction included a cover letter explaining that the survey comprised of multiple-choice questions regarding the player experience and requested only players aged 50 and over to participate in the study. Demographic questions in the survey acted as sorters to ensure participants are age 50 and over and play the game. Players were invited to complete the survey based on their personal experience while playing the game (not any particular game or the game they most recently completed) to ensure a dispositional response.

Instructions were provided to club contacts to distribute the surveys on a Tuesday morning at approximately 10 AM CST hoping that the invitation would be at the top of participant “in” boxes early in the day (Vinjay, 2022). Additional instructions requested that a reminder email be sent out 24 hours following the distribution of the survey (Zong, 2022). Using this process, 231 complete and qualified survey responses were collected for analysis.

**Respondent Safety**

Online survey distribution was used to ensure researcher and respondent safety, as access restrictions and concerns due to the COVID pandemic were still in force during
the study. A web-based survey gave respondents easy access to questions, convenient answer input, and easy submission. While this approach is less controlled than in-person survey administration, research indicates that respondents are typically honest and reliable in online responses concerning demographics, beliefs, and psychometric test instruments (Hewson, 2008).

Traditionally, there have been concerns with electronic-based data collection with older adults, as this age category was thought not to access electronic environments. However, research from the Pew Institute (Faverio, 2022) reports that more than 96% of adults aged 50-64 use the internet, as do 75% of adults over 65. Additionally, the study found that in 2021 the share of adults under age 30 and adults over 65 with broadband access was the same, with 70% of households of both age groups having internet. Though concern for a possible lack of being tech-savvy among older people in current times is an everyday conversation, this data reflects there is little basis for a concern specifically directed towards older participants in this environment.

**Demographic and Pickleball Play Data**

The survey included collecting demographic and player data to better understand player profiles and pickleball experience (Table 6). Respondents were asked for gender information to determine if gender is a differentiator in this sport, play format, or demographic group. Age (as of January 1, 2022), the highest level of education attained, and current marital status demographic questions will be asked to identify if specific characteristics lead to more flow experience among pickleball players. Respondents were also asked how many years of experience playing pickleball and how many days (on average) they played weekly.
Table 6

Demographic and Player Characteristic Survey Questions

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Player Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Average Number of Days Played per Week</td>
</tr>
<tr>
<td>Age</td>
<td>Number of Years of Play</td>
</tr>
<tr>
<td>Education (Highest)</td>
<td>Frequency of Tournament Play</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
</tr>
</tbody>
</table>

Note. Demographics and player characteristics determined by author (Dec 2021).

Play variables may be used to measure the level of a player’s involvement in the game. Care will be taken to recognize that these play variables are self-reported participation data, not measures of player skill or abilities in playing the game.

Data Analysis

Analysis of the quantitative data was used to answer the three research questions, 1.) do adults age 50 and older experience flow based on the nine dimensions of the flow model when they play recreational doubles pickleball? 2.) what participant characteristics or demographic variables may be associated with higher levels of player flow experience? and 3.) do adult recreational doubles pickleball experience flow at levels similar to that experienced in other sports and activities based on previous research in the nine dimensions of flow?

Descriptive statistics described the study sample on the various data elements collected. A Cronbach’s alpha for each of the nine flow subscales was computed to examine the reliability estimates for the DFS-2 instrument in the sample of adults age 50
and older recreational doubles pickleball players. To provide data that may answer the first research question, the calculations specified for the DFS-2 in *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010) were used to determine to what degree adults age 50 and older report having flow experience based on the nine dimensions of flow when they play recreational doubles pickleball. As described in the Manual (p. 17), mean scores were calculated for each survey question. The aggregate average scores for each of the nine dimensions of flow were calculated and used to determine if the players reported having experience found to be associated with flow. As specified in *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010), the handbook for administering and scoring flow scale instruments including the DFS-2, the researcher totaled the item scores for each dimension, then divided them by four to obtain the flow dimension item-average scores (as there are four questions in the 36-question survey, four each reflecting one of the nine dimensions of flow). The researcher used these scores to understand the prevalence of each of the dimensions relative to one another within the response group and provide data that can be compared to DFS-2 data collected by other researchers for other activities included in the manual.

Raw score averages for the flow dimension experience in adults aged 50 and older in recreational doubles pickleball were calculated and compared to data provided for physical activity, yoga, creative and performing arts, sports, and exercise in the Manual (p. 43-46). Correlation coefficients among the raw scores and sub-scores reflecting the nine flow dimensions were computed using data analysis software and reviewed. Dimensions emerging from this process as being of more significant influence (or lack thereof) may provide ideas for future research studies.
To address the second research question, bivariate analyses using t-tests and analysis of variance ANOVA were used to determine participant characteristics associated with adults age 50 and older recreational doubles pickleball players experiencing flow based on the nine dimensions of the flow model. Participant gender, age, education, marital status, number of years playing pickleball, the average number of days per week playing pickleball, and participation in pickleball tournaments characteristics data was collected and examined in relation to player flow. Multiple linear regression analysis was used to identify what participant characteristics are related to the overall flow scale, as well as the nine flow subscales. A backward stepwise regression approach beginning with a full model of all participant characteristics and eliminating variables from the model with the largest non-significant value was used to determine a reduced model explaining the data using significant predictors.

A 99% confidence level and corresponding significance level of .01 was used in this study (rather than .05). The smaller significance will help reduce the Type 1 error rate given the use of multiple flow experience levels and numerous predictor variables. A Cronbach’s coefficient was used to examine the internal reliabilities of the DFS-2 subscales (Tavakol & Dennick, 2011).

Historically, the DFS-2 has often been used in sports research to investigate the presence of flow in the minds of professional sports participants, as many, including Csikszentmihalyi, associated flow with optimal performance in sports. Recently flow research branched into new areas. For example, activities requiring concentration (thought to be needed to succeed in sports), such as stage performance and yoga, have been investigated for flow, and activities requiring mental acuity, competitiveness, and
reactiveness (also thought needed to succeed in sports) present in playing video games are new areas of flow research. Flow research has also been undertaken to understand better experiences of (primarily individual) high absorption, such as creating art or playing musical instruments. Broadly categorized, these efforts have sought flow in competitive, increased concentration, and high (primarily individual) absorption situations. This research extends the understanding of the flow experience to adult recreational doubles pickleball. The same methods and research instruments were used in this study as in others so that the data can be compared between activities.

Player data collected for this study allowed the researcher to explore the occurrence of the experience of flow dimensions from the casual participant's point of view, a newer realm of flow inquiry. Prior research has focused on collegiate and professional sports participants where the daily practice was likely “required” to maintain a position on a school team or thought necessary to keep one’s professional or competitive edge. Recreational pickleball’s “play when present” configuration (lack of attendance requirements/attendance optional) and player practices provide an environment where attendance is neither required nor essential to participation.

Flow experience data was examined based on skill level (to understand the influence or lack of effect of play levels on the propensity to experience flow dimensions). Play data were analyzed compared to respondent answers to Challenge/Skill Balance questions (Table 7). This analysis provides insights into the importance of a player's perception of their skills in combination with the perception of the demand of the task at hand and, for the first time, provides quantitative (yet somewhat indirect) data
reflecting recent work by Barthelmä and Keller (2021) in which player perceptions are a critical component of flow.

**Table 7**

*Components of the Skill/Challenge Flow Dimension Subscale in the DFS-2*

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>I was challenged, but I believe my skills would allow me to meet the challenge.</td>
</tr>
<tr>
<td>Q10</td>
<td>My abilities matched the high challenge of the situation.</td>
</tr>
<tr>
<td>Q19</td>
<td>I felt I was competent enough to meet the high demands of the situation.</td>
</tr>
<tr>
<td>Q28</td>
<td>The challenge and my skills were at an equally high level.</td>
</tr>
</tbody>
</table>


**DFS-2 Data from Other Activities and Sports**

The DFS-2 has been used to collect information on the frequency of flow preceptors' experience across various sport and activity realms, with descriptive data from several studies and overall composite calculations (a combination of several studies) published in *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010, pp. 41-44). Sampling “was quite wide-ranging for the data presented in the chapter; it is in no way random or representative, and thus should be regarded as descriptive” (p. 41). Results can be used to make general observations. The data does not vary widely, and none of the measures reported fall below a 3 (indicating the nine dimensions of flow are thought to at least sometimes occur), with differences found across activities in specific measures (Table 8). These values were examined to gain insight into the data collected in this research compared to previous studies. The unequal variance Welch’s t-test (Delacre
et al., 2017) was used to compare mean flow scores between pickleball players and respondents from other populations participating in activities reported in *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010). This analysis examines mean score differences in sub-score measures to determine if adults age 50 and older recreational pickleball players experience flow dimensions at levels significantly different from participants in other sports and activities (Jackson et al., 2010).

**Study Permissions**

Informed consent on behalf of each survey participant was obtained, as participants will be asked to review and electronically acknowledge Participant Consent (Exhibit 2). Clubs agreed to electronically distribute the link to the study.
### Table 8

*Flow Subscale Mean Scores – Previous Studies*

<table>
<thead>
<tr>
<th>Flow Dimension</th>
<th>Physical Activity N=1,717</th>
<th>Yoga N=2,668</th>
<th>Performing Arts N=371</th>
<th>Sports N=1,452</th>
<th>Exercise N=265</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (Composite) Flow</td>
<td>3.78</td>
<td>3.78</td>
<td>3.56</td>
<td>3.79</td>
<td>3.74</td>
</tr>
<tr>
<td>Challenge/Skill Balance</td>
<td>3.76</td>
<td>3.7</td>
<td>3.62</td>
<td>3.8</td>
<td>3.56</td>
</tr>
<tr>
<td>Merge Action/Awareness</td>
<td>3.74</td>
<td>3.28</td>
<td>3.37</td>
<td>3.76</td>
<td>3.63</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>4.04</td>
<td>3.79</td>
<td>3.8</td>
<td>4.05</td>
<td>4.01</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>3.94</td>
<td>3.79</td>
<td>3.6</td>
<td>3.96</td>
<td>3.85</td>
</tr>
<tr>
<td>Concentration on Task</td>
<td>3.69</td>
<td>3.67</td>
<td>3.56</td>
<td>3.72</td>
<td>3.56</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>3.82</td>
<td>3.74</td>
<td>3.49</td>
<td>3.8</td>
<td>3.89</td>
</tr>
<tr>
<td>Loss of Self-Consciousness</td>
<td>3.38</td>
<td>3.9</td>
<td>3.03</td>
<td>3.36</td>
<td>3.53</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>3.48</td>
<td>3.69</td>
<td>3.56</td>
<td>3.47</td>
<td>3.55</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>4.19</td>
<td>4.42</td>
<td>4.01</td>
<td>4.2</td>
<td>4.14</td>
</tr>
</tbody>
</table>


Response scale: 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree. A subscale score of 3 or greater indicates that flow characteristic is experienced some of the time, a score of 5 always (Jackson et al., 2010, p. 18).
Chapter 4: Results

This study identifies the degree adult age 50 and older recreational doubles pickleball players experience flow during gameplay (Csikszentmihalyi, 1990), identifies player demographics and characteristics related to higher flow during gameplay, and compares flow data collected from this group with data previously collected from sports and other activities from *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010).

This chapter of the research study reflects on the analysis of the data collected from survey responses, including respondent rate, demographic information, reliability and validity data, and data analysis. Statistical analysis processes and procedures were used to analyze the data, and the resulting values of these calculations were used to answer the research questions.

Study Sample

A convenience sample of adult recreational doubles pickleball club members participated in this study. Respondents were asked to be age 50 and older and play recreational doubles pickleball. Respondents accepted an online survey invitation to participate in the survey in an email to club members. A total of 231 players meeting the age and pickleball play criteria participated in the study. Two participants responded to the survey but needed to meet the age requirement and therefore were not included in the analyses. The survey collected demographic and pickleball play descriptive statistics and responses to the Dispositional Flow Scale – 2 (DFS-2) (Jackson et al., 2010).

The data was collected using licensing and data collection services provided by Mind Garden (mindgarden.com), an online psychological assessment provider and
authorized DFS-2 distributor. The survey collected demographic and pickleball play descriptive statistics from participants in addition to the Dispositional Flow Scale – 2 (DFS-2) (Jackson et al., 2010) data.

**Response Rate**

In total, 1,801 members of four pickleball clubs were invited to participate in the survey. A response rate of 12.8% occurred, as 231 surveys were collected. Invitations to participate in the survey were distributed electronically by leaders of local pickleball clubs in Cedar Falls, Iowa; Davenport, Iowa; Green Valley, Arizona; and Plano, Texas. The 587 members of an Arizona club, 235 members of an Iowa club, and 212 members of a Texas Club received email invitations to participate in the study.

An electronic invitation to participate in the survey was also distributed to 767 members of the Davenport club in a private Facebook group. One hundred sixty-two responses were collected from the Arizona email recipients and 69 from the Texas and Iowa clubs. Two portals were used to accept survey responses to identify the invitation associated with the response. Unfortunately, the researcher did not discover the ability to establish multiple portals in time to collect origination data from all four participating groups. It is believed that the Facebook invitation was the least effective, as the FB invitation was the last to be distributed and generated few responses after it was posted.

The email invitation contained a brief description of the study, the respondent requirements, and a link to the survey. Players believing themselves qualified to respond and interested in participating in the study clicked the link and were taken to the study website. As required by IRB, participants read and virtually signed the Informed Consent by clicking a "Yes, I agree to participate" button. They were also reminded to answer
based on their experience while playing the game in general (dispositional) rather than in response to any particular game or event.

Data was collected with respondents clicking on the appropriate response measure based on their personal experience playing recreational doubles pickleball, demographics, or personal experience playing the game in this format. The experience level with flow indicators was collected using the DFS-2 (Jackson et al., 2010). This instrument measures flow experience (Jackson et al., 2008). The survey was expanded to include demographic and pickleball participation questions to collect additional information from respondents, which may be predictors of flow (Jackson et al., 2010). The data from the pickleball participation questions will be referred to as “player characteristics” in this study. The DFS-2 asks respondents to reflect upon how often they have experienced the nine dimensions of flow using a 5-point Likert scale (1=never, 5=always). The essence of each of the nine identified flow indicators (Challenge/Skill Balance, Merging of Action and Awareness, Clear Goals, Unambiguous Feedback, Concentration on the Task at Hand, Sense of Control, Loss of Self-Consciousness, Transformation of Time, Autotelic Experience) are explored in the survey. Respondents recorded the degree to which they had experienced the described condition for each item. The dispositional version of this instrument was used to gain a general understanding of the flow experience.

**Respondent Demographics**

Demographic data on gender, age, ethnicity, education level, and marital status were collected from participants (Table 9). A nearly equal number of males (111 respondents) and females (119 respondents) completed the survey. The respondents’
average age was 68.6 years, with a standard deviation of 6.1 years. The minimum age of respondents was 51 years, and the oldest was 82.

Respondents were educated, with 77.5% having earned a college degree. Many respondents had earned a college degree (89 respondents), with many continuing in education with a master's (71 respondents) or doctoral degree (19 respondents). Respondents were married (173 respondents), divorced (30 respondents), widowed (13 respondents), or never married (9 respondents) and were Caucasian (220 respondents) or another ethnicity (6 respondents).
### Table 9

*Frequency and Percentage Distributions of Demographic Variables of Respondents*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>N=231</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>111</td>
<td></td>
<td>48.1</td>
</tr>
<tr>
<td>Female</td>
<td>119</td>
<td></td>
<td>51.5</td>
</tr>
<tr>
<td>No Answer</td>
<td>1</td>
<td></td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td>18</td>
<td></td>
<td>7.8</td>
</tr>
<tr>
<td>60-64</td>
<td>42</td>
<td></td>
<td>18.2</td>
</tr>
<tr>
<td>65-69</td>
<td>67</td>
<td></td>
<td>29.0</td>
</tr>
<tr>
<td>70-74</td>
<td>69</td>
<td></td>
<td>29.9</td>
</tr>
<tr>
<td>75-79</td>
<td>27</td>
<td></td>
<td>11.7</td>
</tr>
<tr>
<td>80+</td>
<td>8</td>
<td></td>
<td>3.4</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>220</td>
<td></td>
<td>95.2</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td></td>
<td>2.6</td>
</tr>
<tr>
<td>No Answer</td>
<td>5</td>
<td></td>
<td>2.2</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>5</td>
<td></td>
<td>2.2</td>
</tr>
<tr>
<td>Trade School</td>
<td>7</td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td>Some College</td>
<td>37</td>
<td></td>
<td>16.0</td>
</tr>
<tr>
<td>College Degree</td>
<td>89</td>
<td></td>
<td>38.5</td>
</tr>
<tr>
<td>Master Degree</td>
<td>71</td>
<td></td>
<td>30.7</td>
</tr>
<tr>
<td>Doctorate</td>
<td>19</td>
<td></td>
<td>8.3</td>
</tr>
<tr>
<td>No Answer</td>
<td>3</td>
<td></td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>173</td>
<td></td>
<td>74.9</td>
</tr>
<tr>
<td>Widowed</td>
<td>13</td>
<td></td>
<td>5.6</td>
</tr>
<tr>
<td>Divorced</td>
<td>30</td>
<td></td>
<td>13.0</td>
</tr>
<tr>
<td>Never Married</td>
<td>9</td>
<td></td>
<td>3.9</td>
</tr>
<tr>
<td>Separated</td>
<td>1</td>
<td></td>
<td>0.4</td>
</tr>
<tr>
<td>No Answer</td>
<td>5</td>
<td></td>
<td>2.2</td>
</tr>
</tbody>
</table>
Respondent Pickleball Participation & Player Characteristics

The respondents surveyed actively participate in adult recreational doubles pickleball and report having played pickleball in various years of play and age combinations (Figure 5; note the jitter option was used in the scatterplot to gain a better sense of the number of observations for each age-years played pair). The average number of years respondents have played adult recreational doubles pickleball was 5.0, with a standard deviation of 3.6 years. The sample included players new to the game, having played one year or less (39 respondents, 16.9%), as well as those who have been playing the game for five years or more (116 respondents, 50.2%) (Table 10). Respondents reported playing the game an average of 3.5 days per week, with a standard deviation of 1.4 days. One in four respondents (26.4%) reported playing the game five or more days a week (Table 11).

Respondents represented a broad range of ages and the number of years playing pickleball, with the youngest respondent newest to the game just over age 50 with a year of experience and the oldest over 80 with more than 20 years of doubles pickleball experience. A moderate positive correlation exists between age and the number of years of pickleball play ($r = 0.37, p < .001$).
Table 10

Respondent Frequency and Percentage Distributions – Number of Years Playing Pickleball

<table>
<thead>
<tr>
<th>Years</th>
<th>Frequency</th>
<th>Percent</th>
<th>Years</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>2</td>
<td>0.9</td>
<td>9</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>1</td>
<td>37</td>
<td>16.0</td>
<td>10</td>
<td>7</td>
<td>3.0</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>10.8</td>
<td>11</td>
<td>6</td>
<td>2.6</td>
</tr>
<tr>
<td>3</td>
<td>27</td>
<td>11.7</td>
<td>12</td>
<td>5</td>
<td>2.2</td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>10.4</td>
<td>13</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>15.2</td>
<td>14</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>6</td>
<td>18</td>
<td>7.8</td>
<td>15</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>7</td>
<td>21</td>
<td>9.1</td>
<td>20+</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>8</td>
<td>13</td>
<td>5.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 5

Scatterplot: Age and Number of Years Playing Recreational Doubles Pickleball
### Table 11

**Respondent Frequency and Percentage Distributions - Average Number of Days per Week Playing Adult Recreational Doubles Pickleball**

<table>
<thead>
<tr>
<th>Days per Week</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
<td>3.9</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>4.3</td>
</tr>
<tr>
<td>2</td>
<td>38</td>
<td>16.5</td>
</tr>
<tr>
<td>3</td>
<td>61</td>
<td>26.4</td>
</tr>
<tr>
<td>4</td>
<td>52</td>
<td>22.5</td>
</tr>
<tr>
<td>5</td>
<td>49</td>
<td>21.2</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>4.3</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Respondents weekly play experience varied widely, with players enjoying the game at various frequencies on average days per week (Figure 6). Nearly a quarter of the respondents reported playing an average of two or fewer days per week, and nearly a quarter reported playing adult recreational doubles pickleball an average of five days or more per week. More than 70% of the respondents played recreational doubles pickleball 3-5 times per week, and nearly half reported playing four or more days per week. Overall, respondents reported playing adult recreational doubles pickleball an average of 3.45 days per week. No statistical relationship was found between age in years and days played per week ($r = -.15, p = .02$).
The majority of respondents did not participate in pickleball tournaments (139 respondents, 60.2%). Of those who did participate in tournaments, more participated in one or two tournaments (76 respondents, 32.9%) instead of three or more tournaments (16 respondents, 6.9%) (Table 12).
Respondents reported primarily playing in a doubles format, with the majority always playing doubles (174 respondents, 75.3%) or primarily doubles (54 respondents, 23.4%) (Table 13).

Table 12

Respondent Distributions - Participation in Tournaments

<table>
<thead>
<tr>
<th># Tournaments/Year</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three or More</td>
<td>16</td>
<td>6.9</td>
</tr>
<tr>
<td>One or Two</td>
<td>76</td>
<td>32.9</td>
</tr>
<tr>
<td>None</td>
<td>139</td>
<td>60.2</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Table 13

Respondent Frequency and Percentage Distributions - Most Frequent Play Format

<table>
<thead>
<tr>
<th>Typical Play Format</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always Doubles</td>
<td>174</td>
<td>75.3</td>
</tr>
<tr>
<td>Mostly Doubles</td>
<td>54</td>
<td>23.4</td>
</tr>
<tr>
<td>Equal Doubles &amp; Singles</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Mostly Singles</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Respondent Location

Adult recreational doubles pickleball is very popular with retirees. The game has expanded nationwide by becoming popular in senior communities in southern states during winter, then expanding to other states. With this in mind, data reflecting player geography was collected in two ways. Separate response portals were created to differentiate responses based on club invitations (Table 14).

Respondents were also asked in what state they most frequently played recreational doubles pickleball at the time of the survey (Table 15). This distribution differed somewhat from the geographic base of the pickleball club of which they were members and from which they received a survey invitation. While 69 (29.9%) of the respondents were members of the Iowa or Texas clubs and 162 (70.1%) were members of the Arizona club, 10% reported playing pickleball most recently in fifteen other states at the time of the study. Respondents reported playing recreational doubles pickleball in Arizona (138 respondents, 59.7%), Iowa (54 respondents, 23.4%), Texas (14 respondents, 6.1%), or one of fifteen other states (23 respondents, 10.0%) at the time of the study.

Table 14

Respondent Frequency and Percentage Distributions - Club State Location

<table>
<thead>
<tr>
<th>Club State</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa &amp; Texas</td>
<td>69</td>
<td>29.9</td>
</tr>
<tr>
<td>Arizona</td>
<td>162</td>
<td>70.1</td>
</tr>
<tr>
<td>No Answer</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Table 15

Respondent Frequency and Percentage Distributions - State in Which Most Frequently Playing Adult Recreational Doubles Pickleball at the Time of the Study

<table>
<thead>
<tr>
<th>State</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>138</td>
<td>59.7</td>
</tr>
<tr>
<td>Colorado</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>Florida</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Indiana</td>
<td>2</td>
<td>0.9</td>
</tr>
<tr>
<td>Iowa</td>
<td>54</td>
<td>23.4</td>
</tr>
<tr>
<td>Minnesota</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>Texas</td>
<td>14</td>
<td>6.1</td>
</tr>
<tr>
<td>Other States *</td>
<td>11</td>
<td>4.8</td>
</tr>
<tr>
<td>No Answer</td>
<td>2</td>
<td>0.9</td>
</tr>
</tbody>
</table>

*All Other States: Arkansas, California, Idaho, Maine, Michigan, Missouri, Montana, New Mexico, New York, Oregon, Wisconsin.

Research Question One

Do adults age 50 and older report having flow experience based on the nine dimensions of flow model when they play recreational doubles pickleball (Csikszentmihalyi, 1990; Jackson et al., 2010)?
The DFS-2 Data Collection Instrument

The Dispositional Flow Scale-2 questionnaire (Jackson & Eklund, 2002) was used to collect measures of the flow experience of adult recreational doubles pickleball players. Scoring procedures for the DFS-2 are specified in *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010). The validated survey instrument consists of 36 questions, with four questions designed to help respondents reflect upon and quantify their experience with each of the nine dimensions of flow.

Survey questions consist of a statement regarding the player experience, with the respondent answering how often the experience reflected in the statement applies to his/her personal experience. Flow characteristic questions were answered using a 5-point Likert scale ranging from 1: Never to 5: Always (Table 16). Lower average values indicate a stronger disagreement with the statement, while higher average values indicate a stronger agreement.
Table 16

DFS-2 Response Scale Values

<table>
<thead>
<tr>
<th>Value</th>
<th>Frequency of Experience</th>
<th>Flow Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Never</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Rarely</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Frequently</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Always</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Note. Source: Jackson et al., 2010, p. 18.


A moderate score (for example, '3' or "sometimes") on the dispositional scales indicates that the flow characteristics are experienced some of the time in the respondent's experience. A moderate or mid-way score indicates that the respondent reports experiencing the flow characteristic during the nominated activity more than rarely but not frequently. A high score range on the dispositional scale indicates the respondent "frequently" (4) to "always" (5) experiences the flow characteristic in their nominated activity. (Jackson et al., 2010, p. 18)
Flow characteristic scores are calculated by adding the total item scores and dividing the total by the number of responses. Flow dimension scores are calculated by adding the total item scores for each dimension, then dividing those numbers by 4 (p. 16). All calculations were based on the 231 responses. Missing data calculations were not used, as there was no missing data. Calculated values were interpreted as specified:

Lower item average values indicate a stronger disagreement with the proposed statement. Low agreement with statements indicative of a flow characteristic is suggestive that the person's experience was not substantially "flow-like" in nature. Conversely, a strong endorsement of item statements indicates that the individual was undergoing a substantially "flow-like" experience. (Jackson et al., 2010, p. 18)

**Flow Characteristic Scores**

Flow characteristic scores reflect that respondents experience flow while playing recreational doubles pickleball in all item scores at least some of the time. Mean score averages, sometimes called item scores, were greater than 3.0 for all 36 questions. Item score means for Challenge/Skill balance ranged from 3.68 to 4.16 with standard deviations of .70 and .66. Item score means ranged from 3.17 to 3.76 with standard deviations (SDs) of 1.13 and .96 for Time Transformation. The highest item means score was 4.63 (.54) for Question 9, an Autotelic Experience question. The lowest mean score of 3.17 (1.13) was found for Question 35, a Time Transformation question (Figure 7).
According to *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010, p.18), a three score on the dispositional scale "indicates that the flow characteristics are experienced some of the time in the respondent's experience. With this in mind, it can be reasonably concluded that adult recreational doubles pickleball players tend to experience flow at the item scale level at least some of the time on average within all 36 items.

**Flow Dimension Subscale Scores - Adult Recreational Doubles Pickleball**

As described in *The FLOW Manual: The Manual for the Flow Scales* (p. 16), item scores were tallied (four per dimension) and averaged to create flow dimension subscale scores for the study population. Results indicate that adult recreational doubles pickleball...
players have flow experience in the nine flow dimensions (Figure 8), with mean averages for each subscale exceeding the 3.0 threshold. Scores ranged from 4.387 for Autotelic Experience (SD .486) to 3.327 (SD .996) for Time Transformation.

Figure 8

*Flow Dimension Mean Values - Adult Recreational Doubles Pickleball*

*Note. 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree. A flow dimension subscale score of 3 or greater indicates that the flow characteristic is experienced some of the time, a score of 5 always (Jackson et al., 2010, p. 18).*
Table 17

*Flow Dimension Subscale Mean Scores - Adult Recreational Doubles Pickleball Players*

<table>
<thead>
<tr>
<th>Flow Dimension</th>
<th>Mean</th>
<th>Std. Error</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Skill Balance</td>
<td>3.93</td>
<td>.033</td>
<td>.51</td>
</tr>
<tr>
<td>Merge Action/Awareness</td>
<td>3.76</td>
<td>.036</td>
<td>.55</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>4.11</td>
<td>.034</td>
<td>.52</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>4.37</td>
<td>.034</td>
<td>.51</td>
</tr>
<tr>
<td>Concentration on Task</td>
<td>4.01</td>
<td>.036</td>
<td>.55</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>3.81</td>
<td>.038</td>
<td>.58</td>
</tr>
<tr>
<td>Loss of Self-Consciousness</td>
<td>3.58</td>
<td>.054</td>
<td>.82</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>3.33</td>
<td>.066</td>
<td>1.00</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>4.39</td>
<td>.032</td>
<td>.49</td>
</tr>
<tr>
<td>Total (Composite) Flow</td>
<td>3.92</td>
<td>.025</td>
<td>.39</td>
</tr>
</tbody>
</table>

According to *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010, p.18), a moderate score of 3 on the dispositional scale “indicates that the flow characteristics are experienced some of the time in the respondent's experience”. With this in mind, it can be reasonably concluded that adult recreational doubles pickleball players tend to experience flow at the sub-scale level at least some of the time on average within all nine flow dimensions, as the mean score of 3 or greater was found for each measure (Table 17).

**Respondents Not Experiencing Flow**

Of the 231 respondents, only three (3) respondents report a Total (Composite) Flow score of less than 3, with the subgroup too small to identify differentiating data points. Some respondents did not recall flow experience in specific dimensions (Figure 9). One-third (33%) of respondents had an average score of less than 3 for the Time Transformation subscale, and 15% had an average score of less than 3 for the Loss of Self Consciousness subscale (Table 18).
Table 18

Flow Dimension Subscale Score Distribution - Adult Recreational Doubles Pickleball

<table>
<thead>
<tr>
<th>Flow scales</th>
<th>Lower than 3</th>
<th></th>
<th>3 to 4</th>
<th></th>
<th>4 or higher</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge-Skill Balance CS</td>
<td>5</td>
<td>2.2</td>
<td>85</td>
<td>36.8</td>
<td>141</td>
<td>61.0</td>
</tr>
<tr>
<td>Merge Action/Awareness MAA</td>
<td>10</td>
<td>4.3</td>
<td>97</td>
<td>42.0</td>
<td>124</td>
<td>53.7</td>
</tr>
<tr>
<td>Clear Goals CG</td>
<td>1</td>
<td>0.4</td>
<td>63</td>
<td>27.3</td>
<td>167</td>
<td>72.3</td>
</tr>
<tr>
<td>Unambiguous Feedback FB</td>
<td>0</td>
<td>0.0</td>
<td>32</td>
<td>13.9</td>
<td>199</td>
<td>86.1</td>
</tr>
<tr>
<td>Concentration on Task CN</td>
<td>8</td>
<td>3.5</td>
<td>66</td>
<td>28.6</td>
<td>157</td>
<td>68.0</td>
</tr>
<tr>
<td>Sense of Control CL</td>
<td>8</td>
<td>3.5</td>
<td>105</td>
<td>45.5</td>
<td>118</td>
<td>51.1</td>
</tr>
<tr>
<td>Loss Self-Consciousness SC</td>
<td>34</td>
<td>14.7</td>
<td>96</td>
<td>41.6</td>
<td>101</td>
<td>43.7</td>
</tr>
<tr>
<td>Time Transformation TT</td>
<td>75</td>
<td>32.5</td>
<td>81</td>
<td>35.1</td>
<td>75</td>
<td>32.5</td>
</tr>
<tr>
<td>Autotelic Experience AE</td>
<td>2</td>
<td>0.9</td>
<td>20</td>
<td>8.7</td>
<td>209</td>
<td>90.5</td>
</tr>
<tr>
<td>Total Flow</td>
<td>3</td>
<td>1.3</td>
<td>125</td>
<td>54.1</td>
<td>103</td>
<td>44.6</td>
</tr>
</tbody>
</table>

Figure 9

Flow Dimension Subscale Mean Score Distributions - Adult Recreational Doubles

Pickleball

Note. Challenge/Skill Balance (CS), Merging of Action and Awareness (MAA), Clear Goals (CG), Unambiguous Feedback (FB), Concentration on Task at Hand (CN), Sense
of Control (CL), Loss of Self Consciousness (SC), Time Transformation (TT), Autotelic Experience (AE).

5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree. A subscale score of 3 or greater indicates that flow characteristic is experienced some of the time, a score of 5 always (Jackson et al., 2010, p. 18).

While some scores were below the 3.0 flow indicator level in the data set, the majority of participants reported experiencing flow dimensions at the 4.0 level (agree) in seven of the nine subscales and 90.5% of respondents report experiencing the Autotelic Experience at the 4.0 (agree) and 5.0 (strongly agree) levels. With this in mind, it is reasonable to conclude that adult recreational doubles pickleball players tend to experience flow at least some of the time on average at the item and sub-scale levels.

**Correlations**

Cross-correlation analysis revealed moderate to strong positive correlations among the flow subscales (Table 19). The nine dimensions correlate with one another at the $p < .001$ level with correlations ranging from .27 (between Autotelic Experience and Clear Goals) to .68 (for Sense of Control with Challenge/Skill Balance and Action-Awareness Merging), with the one exception being Time Transformation. Time Transformation was significantly positively correlated only with the Concentration on Task ($r = .19, p < .01$) and Autotelic Experience ($r = .35, p < .001$) dimensions.
Table 19

*Intercorrelations Among the Subscales and Total Flow and Reliability Estimates*

<table>
<thead>
<tr>
<th>Flow Scales</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Challenge-Skill Balance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.79)</td>
</tr>
<tr>
<td>(2) Action-Awareness Merging</td>
<td>0.65**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.85)</td>
</tr>
<tr>
<td>(3) Clear Goals</td>
<td>0.49**</td>
<td>0.46**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.82)</td>
</tr>
<tr>
<td>(4) Unambiguous Feedback</td>
<td>0.48**</td>
<td>0.46**</td>
<td>0.55**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.85)</td>
</tr>
<tr>
<td>(5) Concentration on Task</td>
<td>0.42**</td>
<td>0.37**</td>
<td>0.44**</td>
<td>0.38**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.84)</td>
</tr>
<tr>
<td>(6) Sense of Control</td>
<td>0.68**</td>
<td>0.68**</td>
<td>0.56**</td>
<td>0.50**</td>
<td>0.53**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.87)</td>
</tr>
<tr>
<td>(7) Loss of Self-Consciousness</td>
<td>0.09**</td>
<td>0.42**</td>
<td>0.34**</td>
<td>0.28**</td>
<td>0.28**</td>
<td>0.42**</td>
<td></td>
<td></td>
<td></td>
<td>(0.87)</td>
</tr>
<tr>
<td>(8) Transformation of Time</td>
<td>0.06</td>
<td>0.08</td>
<td>0.02</td>
<td>-0.01</td>
<td>0.19*</td>
<td>0.09</td>
<td>0.08</td>
<td></td>
<td></td>
<td>(0.91)</td>
</tr>
<tr>
<td>(9) Autotelic Experience</td>
<td>0.42**</td>
<td>0.29**</td>
<td>0.27**</td>
<td>0.33**</td>
<td>0.34**</td>
<td>0.29**</td>
<td>0.28**</td>
<td>0.35**</td>
<td></td>
<td>(0.78)</td>
</tr>
<tr>
<td>(10) Total (Composite) Flow</td>
<td>0.74**</td>
<td>0.72**</td>
<td>0.66**</td>
<td>0.63**</td>
<td>0.66**</td>
<td>0.78**</td>
<td>0.63**</td>
<td>0.42**</td>
<td>0.60**</td>
<td>(0.92)</td>
</tr>
</tbody>
</table>

*Note.* Internal consistency coefficients (Cronbach’s alpha) presented in parentheses along the diagonal.

*p<.01, **p<.001.
**Cronbach Alpha Analysis**

A Cronbach alpha of .7 or greater reflects that a study’s data is reliable (Tavakol & Dennick, 2011). This value or greater was found for each of the nine flow dimension measures in this study, as the values ranged from .78 for Autotelic Experience to .91 for Time Transformation (Table 19). It can be concluded reasonably that the respondents were replying to the DFS-2 items consistently.

**Research Question Two**

What are participant characteristics associated with adults age 50 and older recreational doubles pickleball players experiencing higher levels of flow experience based on the nine dimensions of flow model?

**Bivariate Analysis**

The two-sample t-test analysis was used to determine if there was a significant difference between the population means of flow measures between two groups determined by a demographic or play characteristic. Analysis of variance (ANOVA) was used to determine if there was a significant difference between the population means of flow measures for qualitative demographic or play characteristics that involved more than two groups (e.g., education level). A significance level of .01 was used to determine significant differences. This helps to control the Type 1 error rate when multiple comparisons of several predictor measures are being made.

**Mean Scores and Total (Composite) Flow**

Based on the two-sample t-test, there was a significant difference in the Total (Composite) Flow means between those who participated in tournaments and those who did not (M = 4.01 vs. 3.86, respectively, p < .01) (Table 20).
### Table 20

**Bivariate Relationships Between Demographic & Play Characteristics with Flow

*Measures - Adult Recreational Doubles Pickleball*

<table>
<thead>
<tr>
<th>Participant Characteristic</th>
<th>Significantly Related to Total (Composite) Flow</th>
<th>Significantly Related Flow Subscales</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tournament</td>
<td>Yes*</td>
<td>Challenge/Skill Balance**</td>
<td>Tournament player scores slightly higher.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action/Awareness**</td>
<td>Tournament player scores slightly higher.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sense of Control**</td>
<td>Tournament player scores slightly higher.</td>
</tr>
<tr>
<td>Days per Week</td>
<td>Yes**</td>
<td>Challenge/Skill Balance**</td>
<td>Moderate positive correlation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unambiguous Feedback**</td>
<td>Small positive correlation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Autotelic Experience**</td>
<td>Small positive correlation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action/Awareness*</td>
<td>Small positive correlation.</td>
</tr>
<tr>
<td>Marital Status</td>
<td>No</td>
<td>Action/Awareness*</td>
<td>Married scores are slightly higher.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unambiguous Feedback*</td>
<td>Married scores are slightly higher.</td>
</tr>
<tr>
<td>Years Played</td>
<td>No</td>
<td>Challenge/Skill Balance*</td>
<td>Small positive correlation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action/Awareness*</td>
<td>Small positive correlation.</td>
</tr>
<tr>
<td>Gender</td>
<td>No</td>
<td>Unambiguous Feedback*</td>
<td>Small positive correlation.</td>
</tr>
<tr>
<td>Age</td>
<td>No</td>
<td>None</td>
<td>Male scores are slightly higher.</td>
</tr>
<tr>
<td>Education</td>
<td>No</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Doubles</td>
<td>No</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Club State</td>
<td>No</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

*Note.* Table reflects the statistical relationship of the participant characteristic to total (composite) flow, significantly related flow subscales and score relationships.

*p < .01, **p < .001.*
There was also a significant small positive correlation between the reported average number of days play pickleball per week and Total (Composite) Flow score ($r = .24, p < .001$). None of the other participants or play characteristics were found to be significantly associated with Total (Composite) Flow scores.

**Mean Scores and Flow Subscales**

Analysis revealed a significant difference in the typical (mean) flow Challenge/Skill Balance, Merging of Action and Awareness, and Sense of Control subscales for those participating in Tournaments (Table 21).

**Table 21**

*Mean Flow Dimensions - Tournament Participation and Doubles Play*

<table>
<thead>
<tr>
<th>Flow Scales</th>
<th>Tournament Participation</th>
<th>Play Doubles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sample Size</td>
<td>139</td>
<td>92</td>
</tr>
<tr>
<td>Challenge-skill balance</td>
<td>3.81 (0.51)</td>
<td>4.13 (0.43)**</td>
</tr>
<tr>
<td>Action-Awareness Merging</td>
<td>3.68 (0.57)</td>
<td>3.88 (0.51)**</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>4.05 (0.54)</td>
<td>4.21 (0.46)</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>4.31 (0.51)</td>
<td>4.46 (0.51)</td>
</tr>
<tr>
<td>Concentration on Task at Hand</td>
<td>3.98 (0.54)</td>
<td>4.04 (0.56)</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>3.70 (0.57)</td>
<td>3.97 (0.55)**</td>
</tr>
<tr>
<td>Loss of Self-Consciousness</td>
<td>3.56 (0.85)</td>
<td>3.61 (0.79)</td>
</tr>
<tr>
<td>Transformation of Time</td>
<td>3.32 (0.92)</td>
<td>3.33 (1.11)</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>4.36 (0.52)</td>
<td>4.43 (0.44)</td>
</tr>
<tr>
<td>Total (Composite) Flow</td>
<td>3.86 (0.38)</td>
<td>4.01 (0.38)**</td>
</tr>
</tbody>
</table>

*Note.* Comparisons based on two sample t-test.

* $p < .01$. ** $p < .001$. 
Compared to those not participating in pickleball tournaments, respondents participating in at least one pickleball tournament a year tended to have significantly higher flow scores on the Challenge/Skill Balance, Merging of Action and Awareness, and Sense of Control subscale dimensions, on average (each p < .001). None of the flow subscales significantly differed between respondents who always play doubles pickleball and those who may also play singles pickleball.

Significant differences existed in some flow subscale means between the gender and marital status groups (Table 22). Males tended to have significantly higher Unambiguous Feedback scores than females on average (M = 4.47 vs. 4.28, respectively, p<.01). Additionally, married participants had significantly higher Merging of Action and Awareness (M = 3.81 vs. 3.56, p < .01) and Unambiguous Feedback scores (M = 4.42 vs. 4.19, p < .01) than the other marital status groups combined. In contrast, based on ANOVA, there were no significant differences in the typical (mean) values for any of the flow subscales among the three education level groupings (no college degree, college degree, graduate degree (Table 22).
### Table 22

**Mean Flow Dimensions - Gender, Marital Status, and Education Levels**

<table>
<thead>
<tr>
<th>Flow Scales</th>
<th>Gender</th>
<th>Marital Status</th>
<th>Education Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Not Married</td>
</tr>
<tr>
<td>Sample Size</td>
<td>111</td>
<td>119</td>
<td>53</td>
</tr>
<tr>
<td>Challenge-Skill Balance</td>
<td>4.00 (0.54)</td>
<td>3.87 (0.46)</td>
<td>3.83 (0.61)</td>
</tr>
<tr>
<td>Action-Awareness Merging</td>
<td>3.82 (0.55)</td>
<td>3.70 (0.55)</td>
<td>3.56 (0.63)</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>4.18 (0.52)</td>
<td>4.05 (0.51)</td>
<td>4.02 (0.52)</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>4.47 (0.47)</td>
<td>4.28 (0.54)*</td>
<td>4.19 (0.59)</td>
</tr>
<tr>
<td>Concentration on Task at Hand</td>
<td>4.05 (0.57)</td>
<td>3.96 (0.53)</td>
<td>4.02 (0.63)</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>3.88 (0.61)</td>
<td>3.74 (0.54)</td>
<td>3.69 (0.62)</td>
</tr>
<tr>
<td>Loss of Self-Consciousness</td>
<td>3.64 (0.84)</td>
<td>3.53 (0.80)</td>
<td>3.53 (0.92)</td>
</tr>
<tr>
<td>Transformation of Time</td>
<td>3.24 (0.99)</td>
<td>3.40 (1.01)</td>
<td>3.17 (1.02)</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>4.38 (0.50)</td>
<td>4.39 (0.48)</td>
<td>4.28 (0.59)</td>
</tr>
<tr>
<td>Total (Composite) Flow</td>
<td>3.96 (0.38)</td>
<td>3.88 (0.39)</td>
<td>3.81 (0.46)</td>
</tr>
</tbody>
</table>

**Note.** Comparisons based on two sample t-test * p < .01 ** p < .001.
The average number of days playing pickleball per week was significantly positively associated with the Challenge/Skill Balance, Merging of Action and Awareness, Unambiguous Feedback, and Autotelic Experience flow dimension subscales (r’s for these subscales ranged from .21 to .35, each p < .001; Table 23). Moreover, the number of years the respondents had played pickleball was significantly positively correlated with Challenge/Skill Balance and Merging of Action and Awareness subscales (r’s for these subscales ranged from .20 to .21, each p < .01). On the other hand, age was not significantly correlated with any of the flow dimension subscales.

### Table 23

*Correlations Between Flow Scores and Player Data*

<table>
<thead>
<tr>
<th>Flow Scale</th>
<th>Age</th>
<th>Number of Years of Play</th>
<th>Average Number of Days per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Skill Balance</td>
<td>-.07</td>
<td>.21*</td>
<td>.35**</td>
</tr>
<tr>
<td>Action-Awareness Merging</td>
<td>-.01</td>
<td>.20*</td>
<td>.19*</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>-.07</td>
<td>&lt; .01</td>
<td>.13</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>-.03</td>
<td>.11</td>
<td>.21**</td>
</tr>
<tr>
<td>Concentration on the Task</td>
<td>.06</td>
<td>-.02</td>
<td>.04</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>-.02</td>
<td>.16</td>
<td>.17</td>
</tr>
<tr>
<td>Loss of Self-Consciousness</td>
<td>.07</td>
<td>.10</td>
<td>.13</td>
</tr>
<tr>
<td>Transformation of Time</td>
<td>-.02</td>
<td>-.02</td>
<td>.03</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>-.04</td>
<td>-.11</td>
<td>.24**</td>
</tr>
<tr>
<td>Total (Composite) Flow</td>
<td>-.02</td>
<td>.11</td>
<td>.24**</td>
</tr>
</tbody>
</table>

*p < .01, **p < .001.

There were no significant differences in the typical (mean) values for any of the flow subscales between those recruited from different pickleball clubs, and no significant
differences in the typical (mean) values for any of the flow subscales among the three state groups (Arizona, Iowa, or other, results not shown).

This data indicates that in bivariate analyses, tournament participation and the average number of days of pickleball play per week were significantly associated with total (Composite) Flow (Table 21, Table 23). These two variables were also significantly associated with several subscale levels. Player marital status and the number of years played were significantly associated with player flow experience at the subscale level. Married players and those who have played longer have enhanced flow experience at the subscale level. While Unambiguous Feedback scores for males were slightly higher, gender was not significantly associated with Total (Composite) Flow.

Regression Analysis

Regression analysis was used to determine the simultaneous influence of participant demographics and player characteristics on Total (Composite) Flow and the individual flow subscales (Table 24). First, the player characteristic of days of play per week and the demographic characteristic of marital status were statistically related to adult recreational doubles pickleball Total (Composite) Flow score. The other player demographics and player characteristics collected from respondents in this study were not significantly related to the Total (Composite) Flow for adult recreational doubles pickleball players.

As shown in Table 24, player characteristics were significantly related to five of the nine flow subscales. These include: Challenge/Skill Balance, Merging Action and Awareness, Unambiguous Feedback, Sense of Control, and Autotelic Experience. The
remaining four individual flow subscales were not significantly related to any participant or play characteristics examined in this study.
<table>
<thead>
<tr>
<th>Flow Scale/ Subscale</th>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>Beta</th>
<th>t</th>
<th>p-value</th>
<th>Multiple R</th>
<th>R-squared</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (Composite)</td>
<td>Intercept</td>
<td>3.595</td>
<td>0.078</td>
<td>45.840</td>
<td>&lt;.001</td>
<td>0.281</td>
<td>0.079</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow</td>
<td>Days/Week</td>
<td>0.062</td>
<td>0.017</td>
<td>0.233</td>
<td>3.626</td>
<td>&lt;.001</td>
<td></td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Married vs. Other</td>
<td>0.147</td>
<td>0.059</td>
<td>0.161</td>
<td>2.510</td>
<td>0.013*</td>
<td></td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Challenge/ Skill</td>
<td>Intercept</td>
<td>3.424</td>
<td>0.087</td>
<td>39.388</td>
<td>&lt;.001</td>
<td>0.429</td>
<td>0.184</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance</td>
<td>Play Years</td>
<td>0.022</td>
<td>0.009</td>
<td>0.155</td>
<td>2.542</td>
<td>0.012**</td>
<td></td>
<td>1.031</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Days/Week</td>
<td>0.094</td>
<td>0.022</td>
<td>0.270</td>
<td>4.187</td>
<td>&lt;.001</td>
<td></td>
<td>1.155</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tournament Participation</td>
<td>0.193</td>
<td>0.067</td>
<td>0.187</td>
<td>2.863</td>
<td>0.005</td>
<td></td>
<td>1.185</td>
<td></td>
</tr>
<tr>
<td>Merging</td>
<td>Intercept</td>
<td>3.215</td>
<td>0.117</td>
<td>27.365</td>
<td>&lt;.001</td>
<td>0.318</td>
<td>0.101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action and Awareness</td>
<td>Play Years</td>
<td>0.027</td>
<td>0.010</td>
<td>0.174</td>
<td>2.712</td>
<td>0.007</td>
<td></td>
<td>1.013</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Days/Week</td>
<td>0.065</td>
<td>0.024</td>
<td>0.172</td>
<td>2.690</td>
<td>0.008</td>
<td></td>
<td>1.006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Married vs. Other</td>
<td>0.237</td>
<td>0.083</td>
<td>0.182</td>
<td>2.844</td>
<td>0.005</td>
<td></td>
<td>1.008</td>
<td></td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>Intercept</td>
<td>3.934</td>
<td>0.104</td>
<td>37.826</td>
<td>&lt;.001</td>
<td>0.283</td>
<td>0.080</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Days/Week</td>
<td>0.075</td>
<td>0.023</td>
<td>0.212</td>
<td>3.300</td>
<td>0.001</td>
<td></td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Married vs. Other</td>
<td>0.232</td>
<td>0.078</td>
<td>0.192</td>
<td>2.985</td>
<td>0.003</td>
<td></td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Sense of Control</td>
<td>Intercept</td>
<td>3.703</td>
<td>0.048</td>
<td>37.610</td>
<td>&lt;.001</td>
<td>0.225</td>
<td>0.051</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tournament Participation</td>
<td>0.264</td>
<td>0.076</td>
<td>0.225</td>
<td>3.494</td>
<td>0.001</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>Intercept</td>
<td>4.114</td>
<td>0.080</td>
<td>51.131</td>
<td>&lt;.001</td>
<td>0.237</td>
<td>0.056</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Days/Week</td>
<td>0.079</td>
<td>0.022</td>
<td>0.237</td>
<td>3.687</td>
<td>&lt;.001</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

Note: Binary Tournament and Married status variables. B: Unstandardized Regression Coefficient, SE: Standard Error, Beta: Standardized Regression Coefficient, VIF: Variance Inflation Factor, NA: Not applicable since only one predictor was included in the model.

* p < .01. ** p < .001.
Multiple Regression Analysis – Total Flow and Flow Factors

The multiple linear regression model for Total (Composite) Flow is written as follows:

\[
\text{Total (Composite) Flow} = 3.595 + 0.062 \times (\text{Days/Week}) + 0.147 \times (\text{Married})
\]

A quick look at the scatterplot of total (composite) flow and days played per week provides a visual image of respondent flow increase with greater play frequency (Figure 10, note the jitter option was used in the scatterplot to gain a better sense of the number of observations for each Days per Week/Total Flow pair). The model suggests that for each additional day per week that recreational doubles pickleball is played, Total (Composite) Flow increases by 0.062 units, on average holding marital status constant. Moreover, married respondents tended to experience higher Total (Composite) Flow scores than the other marital status categories combined by 0.147 units, on average holding the number of days played per week fixed. These two characteristics explain about 8% of total (Composite) Flow score variation.

The low R-squared value (.079) suggests that other participant and play characteristics, as well as variables of other types should be considered in future studies to understand better what variables influence Total (Composite) Flow in adult recreational doubles pickleball. While the R-squared values for the regression calculations for the Merging Action and Awareness, Unambiguous Feedback, Sense of Control and Autotelic Experience subscales indicate little of the variation in the subscales is explained by the variables investigated in this research, the higher R-squared (18.2%) associated with Challenge/Skill Balance indicates a portion of the variation in the subscale is explained by the number of years of play, average number of days of play and tournament participation variables.
Multiple Regression Analysis – Participant Characteristics and Flow Dimensions

Additional regression calculations reveal relationships between specific participant characteristics and the flow dimensions. The analysis reveals that participant characteristics are related to levels of flow experience with the Challenge/Skill Balance, Merging of Action and Awareness, Unambiguous Feedback, Sense of Control, and Autotelic Experience flow factors (Table 24). Conversely, none of the available participant characteristics were significantly related to Clear Goals, Concentration on the Task at Hand, Loss of Self Consciousness, and Time Transformation dimensions.

Participant Characteristics and Challenge/Skill Balance (CS). Three participant characteristics were significantly related to Challenge/Skill Balance: the number of years playing pickleball, the average number of days per week, and
tournament participation (Table 24). These three participant characteristics account for 18.4% of the Challenge/Skill Balance values variance. The interpretation of each of the significant coefficients when all other variables are held constant is as follows:

-When Days/Week and Tournament Participation are constant, as the number of Play Years increases by one year, the Challenge/Skill Balance value increases by .022 units on average.

-Holding Years Played and Tournament Participation constant, as the number of Days/Week increases by one day, the Challenge/Skill Balance value increases by .094 units on average.

-Holding Days/Week and Play Years constant, Challenge/Skill Balance values are .193 units higher for those who participated in tournaments than for those who did not, on average.

**Participant Characteristics and Merging Action/Awareness (MAA).** Three participant characteristics were simultaneously related to Merging Action and Awareness scores: Years Played, Days/Week, and Marital Status. These three participant characteristics account for 10.1% (R-squared) of the variance in Merging Action and Awareness values. The interpretation of each of the significant coefficients when all other variables are held constant is as follows:

-When Days/Week and Marital Status are constant, as the number of Years Played increases by one year, the Merging of Action and Awareness value increases by .027 units on average.
-Holding Play Years and Marital Status constant, as the number of Days/Week increases by one day, the Merging of Action and Awareness value increases by .065 units on average.

-Holding Days/Week and Play Years constant, the Merging of Action and Awareness value is .237 units higher for those married than for those from the other marital status categories combined, on average.

**Participant Characteristics and Unambiguous Feedback.** Two participant characteristics were simultaneously related to Unambiguous Feedback scores: Days/Week and Marital Status. These two participant characteristics account for 8.0% (R-squared) of the variance in Unambiguous Feedback values. The interpretation of each of the significant coefficients when all other variables are held constant is as follows:

-When Days/Week is constant, the Unambiguous Feedback value is .232 units higher on average for married people than those from the other marital status categories combined.

-Holding Marital Status constant, as the number of Days/Week increases by one day, the Unambiguous Feedback value increases by .075 units on average.

**Participant Characteristics and Other Flow Dimensions.** Participation in Tournaments was related to a Sense of Control, accounting for 5.1% (R-squared) of the variance in Sense of Control values, with Sense of Control values increasing by .264 units on average if the individual participated in one or more tournaments compared to those who did not participate in tournaments. Days per Week was related to Autotelic Experience, accounting for 5.6% (R-squared) of the variance in these scores. Autotelic
Experience values increase by .08 units on average as the number of Days/Week increases by one unit.

While the demographic data (age, gender, education, marital status) and player characteristic data (average number of days of play per week, number of years of play, frequency of tournament play) collected in this study were expected to provide a robust predictive profile, the r-squared values in these calculations (in all instances less than .25) reveal that the regression model does not yet well explain the observed variability. More research is needed to explore variables that may lead to a more predictive model.

**Findings from Intercorrelation Analyses**

Examination of intercorrelations between flow dimension values provides insight into unique aspects of the flow experience in adult recreational doubles pickleball.

**Intercorrelations Between Flow Antecedents & Sense of Control.** Flow theory's evolution includes classifying the nine dimensions of flow into three antecedent flow dimensions (challenge/skill balance, clear goals, and unambiguous feedback) and the remaining six subsequent outcome factors (Abuhamdeh & Csikszentmihalyi, 2012).

Data analysis instruction in *The FLOW Manual: The Manual for the Flow Scale* focuses on mean analysis (p. 16) and does not include instruction on tests for causality and relationships between the dimensions of flow. However, the theory identifying challenge/skill balance, clear goals, sense of control, and unambiguous feedback as flow antecedents and the variables loss of self-consciousness, time, concentration, and merging of action and awareness (Csikszentmihalyi, 1990; Nakamura & Csikszentmihalyi, 2002) indicates a relationship of sorts may exist between the variables.
Researchers have recently added correlation analysis to DFS-2 analysis to find statistical evidence to support these theories. Variable correlations have been identified in video game research. Correlation analysis of flow variable DFS-2 data completed in video games (Procci et al., 2012) found inter-correlation between the challenge skill balance, clear goals, and sense of control variables. A similar analysis in video gamification, using game design in non-game contexts, found that challenge skill balance, clear goals, unambiguous feedback, and autotelic experience were strongly correlated (Hamari & Koivisto, 2014) with the flow experience of study participants.

Evidence of dimension subscale correlations has yet to present itself similarly in sports. Correlation analysis taken on by Jackson et al. (1998) of a collection of DFS-2 data and other variables collected from Masters athletes demonstrated meaningful relationships between flow variables with the slight exception of time transformation and found relationships between perceived ability, intrinsic motivation to experience stimulation, and anxiety subscales.

A comparison of correlates with this data set sheds no light on particular correlates except for time transformation, as all eight of the nine dimensions (except for time transformation) correlate to player flow at the p<.001 level (Table 19). Further examination of the correlates based on magnitude (Taylor, 1990) reflects the moderate influence of the three flow antecedent variables challenge skill balance, clear goals, and unambiguous feedback in adult recreational doubles pickleball (Table 24). Interestingly, higher and more significant correlations were found with the variable sense of control with other flow dimension variables in this data set compared to flow antecedent relationships (Table 25).
Table 25

*Intercorrelations Between Flow Antecedents and Sense of Control*

<table>
<thead>
<tr>
<th>Flow Dimension 1</th>
<th>Flow Dimension 2</th>
<th>Coefficient</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear Goals*</td>
<td>Unambiguous Feedback*</td>
<td>0.55</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Challenge Skill Balance*</td>
<td>Clear Goals*</td>
<td>0.49</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Challenge Skill Balance*</td>
<td>Unambiguous Feedback*</td>
<td>0.48</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>Challenge Skill Balance*</td>
<td>0.68</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>Action/Awareness Merging</td>
<td>0.68</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>Clear Goals*</td>
<td>0.56</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>Concentration on Task</td>
<td>0.53</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

\( *p < .01, **p < .001. \)

**Intercorrelation between Challenge/Skill Balance and Merging of Action and Awareness.** A significant positive correlation was also found between challenge/skill balance and the merging of action and awareness (Table 26). This merging of action and awareness with challenge/skill balance correlation may be due to the pace of the game, as players often must quickly respond to the ball to return it across the net (at times so quickly the player is surprised it happens), and skill exemplified by evidence of having (repeatedly) accomplished such tasks.
Table 26

*Table 26 - Intercorrelations - Challenge/Skill Balance and Merging of Action and Awareness*

<table>
<thead>
<tr>
<th>Flow Dimension 1</th>
<th>Flow Dimension 2</th>
<th>Coefficient</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge Skill Balance*</td>
<td>Action/Awareness Merging</td>
<td>0.65</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

**Intercorrelations Between Time Transformation and Other Subscales.**

Correlation analysis of the flow dimension experience of adult recreational doubles pickleball players reveals a lack of correlation of the time transformation variable with other flow dimensions, except autotelic experience and concentration on task (Table 27) during the experience.

Table 27

*Table 27 - Intercorrelations - Time Transformation and Other Subscales*

<table>
<thead>
<tr>
<th>Flow Dimension 1</th>
<th>Flow Dimension 2</th>
<th>Coefficient</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Transformation</td>
<td>Challenge/Skill Balance*</td>
<td>0.06</td>
<td>.33</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>Action/Awareness Merging</td>
<td>0.08</td>
<td>.25</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>Clear Goals</td>
<td>0.02</td>
<td>.81</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>Unambiguous Feedback*</td>
<td>-0.01</td>
<td>.94</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>Concentration on Task</td>
<td>0.19</td>
<td>.004*</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>Sense of Control</td>
<td>0.09</td>
<td>.15</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>Loss of Self Consciousness</td>
<td>0.08</td>
<td>.23</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>Autotelic Experience</td>
<td>0.35</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*p < .01.
This level of engagement with time (either speeding up or slowing down) may conflict with the “real-time” level of engagement players need to maintain within themselves, with fellow players, with the ball's movement, and with their surroundings during gameplay.

Further research is needed to identify if autotelic experience and concentration may in some way have a different type of relationship with time in this environment, as the correlations between the subdimensions differ and are significant.

**Unambiguous Feedback and Married Males.** Bivariate analysis of player characteristics and demographics revealed that males scored slightly higher in the unambiguous feedback subscale between these variables and flow subscales (Table 22). Qualitative research previously undertaken by the researcher in hunting had determined that hunters, many of them married, most often went hunting to escape from their home and job environments to the woods where they knew how to behave and what to expect. Other resources reflect that hunters appreciate the hunting experience because it is a place where expectations are known and can be met (Dizard, 2015). The significance of marriage to the unambiguous feedback dimension in the bivariate analysis is a similar finding. It inspired a more targeted statistical investigation combining marital status and gender with the feedback dimension. Interestingly, the difference in unambiguous feedback means scores between married and unmarried women were significant, with married men experiencing significantly higher flow subscale scores (Table 28).

Distribution across the gender and marital status demographic characteristics existed in the respondent pool. Those not married included 18 males (16.7% of total males) and 35 females (29.9% of total females). ANOVA analysis comparing the
composite flow measures across gender and marital status groups revealed exciting results. Based on a post hoc pairwise comparison with Bonferroni adjustment, a statistically significant difference in mean unambiguous feedback scores was found between married males and non-married females ($p \leq .01$). However, there were no overall differences in mean flow scores among the four groups for any other flow subscales or total flow scores (all $p > .01$).

Table 28

*Unambiguous Feedback Mean Scores by Gender and Marital Status*

<table>
<thead>
<tr>
<th>Gender/Marital Status</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male/Not married</td>
<td>18</td>
<td>4.31</td>
<td>0.55</td>
</tr>
<tr>
<td>Male/Married</td>
<td>90</td>
<td>4.49</td>
<td>0.45</td>
</tr>
<tr>
<td>Female/Not married</td>
<td>35</td>
<td>4.14</td>
<td>0.60</td>
</tr>
<tr>
<td>Female/Married</td>
<td>82</td>
<td>4.34</td>
<td>0.50</td>
</tr>
</tbody>
</table>

ANOVA $F(3,221) = 4.56$, $p = .004$

*Note.* Response scale: 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree. A subscale score of 3 or greater indicates that flow characteristic is experienced some of the time, a score of 5 always (Jackson et al., 2010, p. 18).

Multiple linear regression analysis with the four gender/marital status groups with feedback scores finds gender/marital status groups remain as a statistically significant predictor of player flow ($p = .003$), with typical feedback flow scores being significantly higher for married males than non-married females ($p < .001$). The analysis indicates that when days per week are held constant, the Unambiguous Feedback value is .359 units
higher on average for married males than non-married females. Other multiple regression models that included marital status (i.e., for total flow and merging action and awareness) when marital status was replaced with the four gender/marital status groups revealed no overall statistically significant difference in average flow scores among the four gender/marital status groups ($p > .01$).

**Research Question Three**

Do adults age 50 and older recreational pickleball players experience flow based on the nine dimensions of flow model at levels similar to participants in other sports and activities (Jackson et al., 2010, pp. 41-62)?

**Comparative Analysis**

The flow dimension data collected for this study also provides an opportunity to begin understanding the first-person flow experience of adults age 50 and older while playing recreational doubles pickleball compared to similar first-person flow data previously collected for flow studies in other sports and activities. This comparison can be accomplished by comparing survey results to the flow scale scores reported in Chapter 5: The Flow Scale Score Profiles section of *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010, pp. 41-62).

The flow dimension scores collected from the adult recreational doubles pickleball players in this study generated higher flow dimension mean scores than those generated by previous studies of physical activity, yoga, the performing arts, sports, and exercise per data reported in Table 17 of *The FLOW Manual: The Manual for the Flow Scales* the resource and instruction guide for flow research tools including the DFS-2. Average flow subscale scores in adult recreational doubles pickleball were higher than
flow subscale scores compared to scores collected in many previously researched activities. They surpassed all subscale and total flow dimension mean scores, including total flow, compared to performing arts scores (Table 29).
## Table 29

**Flow Subscale Mean Scores Comparative Analysis - Adult Recreational Doubles Pickleball, Sports and Other Activities**

<table>
<thead>
<tr>
<th></th>
<th>Adult Recreational Doubles Pickleball</th>
<th>Physical Activity</th>
<th>Yoga</th>
<th>Performing Arts</th>
<th>Sports</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Size</strong></td>
<td>231</td>
<td>1717</td>
<td>2668</td>
<td>371</td>
<td>1452</td>
<td>265</td>
</tr>
<tr>
<td><strong>Challenge/Skill Balance</strong></td>
<td>3.93(0.51)</td>
<td>3.76(0.61)**</td>
<td>3.70(0.57)**</td>
<td>3.62(0.58)**</td>
<td>3.80(0.59)**</td>
<td>3.56(0.68)**</td>
</tr>
<tr>
<td><strong>Merging Action/Awareness</strong></td>
<td>3.76(0.55)</td>
<td>3.74(0.63)</td>
<td>3.28(0.69)**</td>
<td>3.37(0.66)**</td>
<td>3.76(0.60)</td>
<td>3.63(0.76)</td>
</tr>
<tr>
<td><strong>Clear Goals</strong></td>
<td>4.11(0.52)</td>
<td>4.04(0.61)</td>
<td>3.79(0.61)**</td>
<td>3.80(0.77)**</td>
<td>4.05(0.60)</td>
<td>4.01(0.66)</td>
</tr>
<tr>
<td><strong>Unambiguous Feedback</strong></td>
<td>4.37(0.51)</td>
<td>3.94(0.64)**</td>
<td>3.79(0.62)**</td>
<td>3.60(0.72)**</td>
<td>3.96(0.63)**</td>
<td>3.85(0.65)**</td>
</tr>
<tr>
<td><strong>Concentration on Task</strong></td>
<td>4.01(0.55)</td>
<td>3.69(0.65)**</td>
<td>3.67(0.63)**</td>
<td>3.56(0.71)**</td>
<td>3.72(0.63)**</td>
<td>3.56(0.77)**</td>
</tr>
<tr>
<td><strong>Sense of Control</strong></td>
<td>3.81(0.58)</td>
<td>3.82(0.60)</td>
<td>3.74(0.61)**</td>
<td>3.49(0.71)**</td>
<td>3.80(0.59)</td>
<td>3.89(0.66)</td>
</tr>
<tr>
<td><strong>Loss of Self-Consciousness</strong></td>
<td>3.65(0.82)</td>
<td>3.38(0.84)**</td>
<td>3.90(0.88)**</td>
<td>3.03(0.91)**</td>
<td>3.36(0.83)**</td>
<td>3.53(0.90)</td>
</tr>
<tr>
<td><strong>Time Transformation</strong></td>
<td>3.33(1.00)</td>
<td>3.48(0.75)</td>
<td>3.69(0.78)**</td>
<td>3.56(0.88)**</td>
<td>3.47(0.75)</td>
<td>3.55(0.76)**</td>
</tr>
<tr>
<td><strong>Autotelic Experience</strong></td>
<td>4.39(0.39)</td>
<td>4.19(0.61)**</td>
<td>4.42(0.52)**</td>
<td>4.10(0.74)**</td>
<td>4.20(0.58)**</td>
<td>4.14(0.71)**</td>
</tr>
<tr>
<td><strong>Total (Composite) Flow</strong></td>
<td>3.92(0.39)</td>
<td>3.78(0.44)**</td>
<td>3.78(0.43)**</td>
<td>3.56(0.48)**</td>
<td>3.79(0.43)**</td>
<td>3.74(0.49)**</td>
</tr>
</tbody>
</table>

*Note. Mean (Standard Deviation). Physical activity, yoga, performing arts, sports and exercise data from *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010).*

**p <0.001.**
Adult recreational doubles pickleball players reported higher total (composite) flow (3.92), challenge/skill balance (3.93), clear goals (4.11), unambiguous feedback (4.39), concentration on the task at hand (4.01), and autotelic experience (4.39) raw mean scores than participants surveyed in previous studies. Adult recreational doubles pickleball players reported raw mean score levels of merging of action and awareness (3.76) and sense of control (3.81) at levels similar to scores previously recorded.

The score for the loss of self-consciousness while participating in adult recreational doubles pickleball (3.65) was surpassed by only the variable experience while participating in yoga (3.9). In contrast, the mean flow score for time transformation (3.33) while playing adult recreational doubles pickleball was considerably lower than the mean scores for the variable previously collected for other activities and sports.

**Mean Score Differences with Statistical Significance**

While it is interesting to compare raw scores descriptively, additional analyses were conducted using Welch’s t-test (or unequal variance t-test) to compare mean flow scores between pickleball players and respondents from other populations participating in other activities reported in *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010). This analysis reveals significant mean score differences at the *p*<.001 level in all sub-score measures when comparing adult recreational pickleball to yoga and the performing arts.

Mean scores in adult recreational doubles pickleball differed significantly compared to mean scores in Exercise, Physical Activity, and Sports for Challenge/Skill Balance, Unambiguous Feedback, Concentration on the Task at Hand, Autotelic Experience, and Total (Composite) Flow scores (Table 29).
Mean scores for Sense of Control for pickleball players did not differ significantly from those for Sports and Exercise. Moreover, the means of Loss of Self-Consciousness for pickleball players did not differ significantly from those in Exercise but did differ significantly for those in Physical Activity and Sports. The Time Transformation mean score for pickleball players did not significantly differ from those for Sports, but it did differ from those associated with Exercise.

This wide range of significant differences in means suggests that participants enjoy a unique flow experience when playing recreational doubles pickleball. Players report higher flow subscale scores in this activity in most dimensions (Figure 11 and Figure 12).
Figure 11

*Flow Dimension Mean Scores – Yoga, Performing Arts, and Adult Recreational Doubles Pickleball*

![Flow Dimension Mean Scores Graph](image)


See Table 29 for Flow Subscales that significantly differed $p < .001$. 
Figure 12

Flow Dimension Mean Scores – Sports, Exercise, and Adult Recreational Doubles

Pickleball


See Table 29 for Flow Subscales that significantly differed $p < .001$. 
Chapter 5: Discussion, Implications, and Recommendations

The purpose of this study was to identify to what degree adults age 50 and older recreational doubles pickleball players experience flow during gameplay (Csikszentmihalyi, 1990), to identify demographics and play attributes related to higher flow during gameplay, and to compare flow data collected from this group with data previously collected from sports and other activities. Flow data from sports and activities from *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010) were used for comparative analysis.

This chapter’s discussion of the study’s implications and recommendations is presented in several sections. Conceptual frameworks used in the study are first discussed, followed by a discussion of the research findings, including how the results relate to the literature. Possible implications of the research in professional practice are reviewed, and future research recommendations are identified in this section.

**Discussion of Conceptual Framework**

The validated (Johnson et al., 2014) Dispositional Flow Scale-2 survey (Jackson et al., 2010) was used to collect data reflecting the first-hand flow dimension experience of adult recreational doubles pickleball players. The DFS-2 consists of 36 questions, measuring the nine flow dimension experiences, with four questions per dimension. Player demographics and gameplay data were also collected. The data were self-reported and collected in an online survey from 231 respondents. Bivariate, regression, and correlation analyses provided answers to the research questions.
Discussion of Research Findings

Research findings are reviewed in this section. Gender representation of the data set and responses to the three research questions are discussed. Suggestions for future research are identified, as are implications for professional practice.

Gender Representation

According to the Sports Industry & Fitness Association (SFIA) report of 2021, the participation in pickleball revealed a disparity between gender, with 39.5% of participants being female and 60.5% male. However, the results of this survey depict a slightly different picture, with 51.5% of the respondents being female and 48.1% male. The gender distribution of players engaged in recreational doubles pickleball, particularly those over age 50, may differ from that of the overall population. This difference may also be because of women's higher likelihood of online survey responses (Smith, 2008). Analysis of the survey data reveals that gender was a significant factor in only the sense of control sub-dimension values between married men and unmarried women and was otherwise not a significant factor in player flow. Future studies should continue to evaluate any differences that may exist by gender among older pickleball players.

Research Question One:

Do adults age 50 and older report having flow experience based on the nine dimensions of flow model when they play recreational doubles pickleball (Csikszentmihalyi, 1990; Jackson et al., 2010)?

The results of this survey indicate that adults aged 50 and older recreational doubles pickleball players experience flow and find the gameplay experience a highly enjoyable match between player skill and challenge with clear goals and unambiguous
feedback in which they experience total concentration, sense of control, merging of action and awareness, loss of self-consciousness, and time transformation.

Data collected from adult age 50 and older recreational doubles pickleball players indicate that players experience flow at least some of the time with a total (composite) flow score of 3.93 (SD 0.39) and experience flow in all nine dimensions at least some of the time as all average dimension scores were greater than 3 (Table 17). This flow value is very similar to the 3.84 (N=1150) flow mean value across fourteen studies in electronic game-based learning (Perttula et al., 2017) and is slightly higher than scores from sports and other activities reported in The FLOW Manual: The Manual for the Flow Scales (Jackson et al., 2010).

**Research Question Two:**

*What are participant characteristics associated with adults age 50 and older recreational doubles pickleball players experiencing higher levels of flow experience based on the nine dimensions of flow model? More specifically, the following participant characteristics were examined: gender, age, education, marital status, number of years playing pickleball, the average number of days per week playing pickleball, and participation in pickleball tournaments.*

Bivariate, regression, and correlation analyses provided answers to this research question. The variables of the average number of days played per week, tournament participation, marital status, and years of play were significantly related to flow. Gender, age, education, and location were unrelated to player flow.

The variables of the average number of days played per week, tournament participation, and marriage were found to be significantly related to a player’s flow
experience. Those who play more often, participate in tournaments, or are married reported more frequent flow dimension experiences.

Research is needed to understand better the opening state of mind of the adult recreational doubles flow experience and its foundation. This opening position may be based on experience (as respondents report playing several times a week). Frequent play and a high opening flow state indicate the possibility of residual or cumulative flow, as repeat flow experiences may inspire future flow experiences in this environment. More research is needed to understand players’ state of mind as they prepare to play.

Playing pickleball frequently, like sports practice, may impact player flow experience, as practice is believed to influence perceived ability in sports (Suddendorf et al., 2016). Playing pickleball frequently may increase ability as well. Jackson et al. (1998) found that perceived ability was the variable with the most substantial correlations with flow in older athletes (p.368). A greater understanding of the game’s requirements may be less of a factor, as the clear goals dimension was not strongly correlated to the number of days per week of play. This may mean that although game rules and player requirements are simple and easy to understand, skill and ability may increase with practice. More research is needed to determine how the number of days and game experience influence player total flow (Figure 5, Figure 6).

Differences between the merging of action and awareness and unambiguous feedback dimension scores and flow were found between married and unmarried players, with married player scores significantly higher on average. This may indicate that married players may connect with the game experience and appreciate its positive outcomes (or need this connection) more (or differently) than non-married players. Those
who played in tournaments had significantly higher flow scores in the three subscales: challenge, skill balance, merging of action and awareness, and sense of control. This indicates that stretching oneself to participate in a tournament experience in addition to recreational play may help a player feel more in control of the game experience. More research is needed to identify the influence of these factors on flow.

Based on the study’s findings, gender does not appear to be related to the flow experienced by adult recreational doubles pickleball players. This differs from research in male and female soccer (Larson & Oregon, 2009) and extreme sports (Chang, 2017) yet is like recent studies in adult education (Heutte et al., 2021), university volleyball and basketball players (Ceviker et al., 2020), and professional athletes (Özdemir, 2020).

The differences in gender results across studies may be due to the respective sports' varying physical demands and nature. For example, male and female soccer players (Larson & Oregon, 2009) and extreme sports (Chang, 2017) participants may experience the physical demands of their sports differently due to differences in physical ability, strength, and physique between men and women and the unique needs of these sports. Conversely, flow in adult recreational doubles pickleball did not vary by gender in this study and did not vary in education (Heutte et al., 2021; Ceviker et al., 2020). This may be because the necessary demands, skills, and abilities needed to succeed in either activity are not influenced by the participant's gender. Future research may confirm and continue to explore the level of influence of gender in adult recreational doubles pickleball flow. Additionally, adult recreational doubles pickleball players typically play with others of similar skills. This "equal playing field" environment may help to produce
similar experiences among genders, although more research is needed to confirm this hypothesis.

Respondent levels of education, age, and location were also not significant to player flow. The level of education variable may have yet to be found significant to flow in this study because many respondents held degrees. This may also result from respondent flow experience in education as children and young adults (Heutte et al., 2016). Age may not be a factor as the group may view itself as a common demographic category of retirees, or players may subscribe to the “it’s for all ages” popularity of the game (Chen, 2017). At the same time, a game-based learning study of flow experience in virtual environments (Faiola et al., 2013) consisting of respondents aged 16 to 65 (n=115) found that higher age predicted higher flow. Further research is needed to understand the roles of age and education in the flow experience in adult recreational doubles pickleball players.

The location in which players reported currently most often playing pickleball did not impact player flow scores, although the players were playing in 15 different states at the time of the study. This ubiquity of experience may be due to the national implementation of the USAPA’s Ambassador program during the early years of the sport, in which volunteers taught players the rules of the game using a program designed by USAPA across the country. In addition to game interaction, these leaders taught and supervised the group's cultural practices, including its "all are welcome" nature and player rotation practices. Pickleball's early days in adult retirement centers, where many rules already existed, were probably also a source of basic rules of engagement for
pickleball players. More data is needed to test race/ethnicity (as only six respondents were not Caucasian).

Rigorous analysis of the data set revealed a significant difference in mean scores in the unambiguous feedback flow sub-dimension between married men and not married women, with married men experiencing significantly higher flow. These results are like a study by Hou and Li (2014) that found that men experienced higher flow than women regarding challenge skill balance, clear goals, feedback, and sense of control in a digital problem-solving adventure game. Qualitative research may be used to identify the role of unambiguous feedback in adult recreational doubles pickleball players.

The three flow dimensions, challenge/skill balance, clear goals, and unambiguous feedback, have been identified as antecedents to the flow experience (Abuhamdeh & Csikszentmihalyi, 2012). An examination of the correlates based on magnitude (Taylor, 1990) reflects the moderate influence of the three flow antecedent variables challenge skill balance, clear goals, and unambiguous feedback in adult recreational doubles pickleball (Table 25).

Higher significant correlations were found with the variable sense of control than with the flow antecedents in adult recreational doubles pickleball. Lack of correlations of the time transformation variable with other flow dimensions except for autotelic experience and concentration on task were also found. These correlations may result from unique characteristics of the adult recreational doubles pickleball experience or the level of engagement players need to maintain with their surroundings during gameplay. More research is needed to investigate the flow dimension experience in adult recreational doubles pickleball players.
Finally, this study revealed just two of the surveyed player characteristics and demographic data values collected, days per week of play and marital status, explained about 8% of the Total (Composite) Flow score variation. This low R-squared value (.079) suggests that other participant and play characteristics and other variables should be considered in future studies to understand better what variables influence this score to a greater extent. More research is needed to determine the demographic, behavioral, experience, and other factors influencing adult recreational doubles pickleball player flow.

**Research Question Three:**

*Do adults age 50 and older recreational pickleball players experience flow based on the nine dimensions of flow model at levels similar to participants in other sports and activities (Jackson et al., 2010, pp. 41-62)?*

The data collected in this study indicate that adult recreational doubles pickleball players report having flow dimension experiences at levels higher on average than previously reported by participants in sports and other activities (Jackson et al., 2010) with significant differences in mean scores. This suggests that participants enjoy a unique, rich flow experience while playing adult recreational doubles pickleball.

A recent study by Özdemir and Durhan (2020) allows the opportunity to compare DFS-2 Flow data collected from professional athletes with data collected in this study (Table 30). In comparing mean scores, the flow dimension experiences of professional sports participants and adult recreational doubles pickleball players appear similar except in unambiguous feedback. The way in which adult recreational doubles players banter during games, auditory aspects of the game experience, how the server calls out the score
before a point is played, how both players on a team serve before the serve goes to the other side, or other factors may influence the unambiguous feedback sub-score. More research is needed to scientifically identify characteristics of the feedback experience in adult recreational doubles pickleball.

**Table 30**

*Flow Dimension Mean Score Comparison – Professional Athletes and Adult Recreational Doubles Pickleball Players*

<table>
<thead>
<tr>
<th>Flow Dimension</th>
<th>Professional Sports N = 506</th>
<th>Adult Recreational Doubles Pickleball N = 231</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge/Skill Balance</td>
<td>3.92</td>
<td>3.93</td>
</tr>
<tr>
<td>Merging Action/Awareness</td>
<td>3.79</td>
<td>3.76</td>
</tr>
<tr>
<td>Clear Goals</td>
<td>4.00</td>
<td>4.11</td>
</tr>
<tr>
<td>Unambiguous Feedback</td>
<td>3.89</td>
<td>4.37</td>
</tr>
<tr>
<td>Concentration on Task</td>
<td>3.87</td>
<td>4.01</td>
</tr>
<tr>
<td>Sense of Control</td>
<td>3.89</td>
<td>3.81</td>
</tr>
<tr>
<td>Los of Self-Consciousness</td>
<td>3.56</td>
<td>3.58</td>
</tr>
<tr>
<td>Time Transformation</td>
<td>3.95</td>
<td>3.33</td>
</tr>
<tr>
<td>Autotelic Experience</td>
<td>4.20</td>
<td>4.39</td>
</tr>
</tbody>
</table>

*Note.* Source of professional sports data Özdemir and Durhan (2020). Response scale: 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree. A subscale score of 3 or greater indicates that flow characteristic is experienced some of the time, a score of 5 always (Jackson et al., 2010, p. 18).
**Recommendations for Future Research**

More research is needed to expand understanding of the flow experience in adult recreational doubles pickleball. This research could expand into several areas. First, the flow experience itself could be more closely examined, as respondents to this survey reported composite flow (3.92 mean, .39 SD) and concentration on task at hand scores (4.01 mean, 0.55 SD) that surpassed scores generated in previous studies. Knowing the aspects of the game that trigger this high level of cognitive function could be beneficial. Such information could be used to design new or enhance activities this age group undertakes to increase participant flow experience.

Investigating other aspects of the game, for example, the level of stress players experience or the physical rigor they experience, may be a factor in the flow experience. Healthy stress levels, known as eustress (Milsum, 1985), might factor into the experience. The physical rigor requirements of adult recreational doubles pickleball and its possible influence on player flow should also be investigated. This could include an examination into whether tempo, a physical pace developed in distance running (Kurz et al., 2000) where the body is active and engaged but not yet producing lactic acid, may be a factor in the pickleball player flow experience, as the game is invigorating but does not drive players to the brink of their physical capacity during play.

More research is needed to understand the differences and similarities between the flow experience in yoga and the flow experience in adult recreational doubles pickleball. For decades, yoga and mindfulness have been associated with alternative medicine (Goyeche, 1979). This assumed association may have influenced respondent answers to the yoga study, as respondents may have desired to conform with the group or
to please the researcher, as was found in Asch Conformity experiments (Larsen, 1974). More research is needed to identify the possible impact of a sport being known for flow experience and the influence of this group opinion on flow data, as adult recreational doubles pickleball players may report more flow dimension experiences when these experiences are known to occur within their peer group to mitigate this effect. Simultaneously, additional research is needed to understand the difference in the flow experience among the activities.

Finally, the influence of interaction with other people in the recreational doubles pickleball flow experience may be explored. This research will help expand knowledge in the areas of group flow (Cosma, 1999), shared flow (Nakamura & Csikszentmihalyi, 2002), and social flow (Walker, 2010). This could include experiments that block player eye contact or their ability to see the facial expressions of fellow players and the impact this may have on flow. Qualitative research may be undertaken to understand player perceptions of relationships during gameplay. This could include relationships between players, among the courts, and club level. Researchers could consider using the GameFlow model developed by Sweetser and Wyeth (2005) to evaluate game enjoyment. The model includes social interaction elements, immersion, concentration, challenge, skills, control, clear goals, and feedback measures. Comparing data collected from video games collected in the GameFlow realm and adult recreational doubles pickleball may generate interesting results.

Research might also be pursued to understand the effect audio inputs have on player flow experience, as the audio experience of adult recreational pickleball gameplay appears unique in several ways. The sound generated by pickleball play has gained
considerable media attention as the noise has generated many complaints (Robinson et al., 2023; Sheets, 2022; O’Connell, 2022). Players typically converse with one another between points and often make other sound expressions, including howls and laughter, during play. Understanding the role of banter among players, common in adult recreational doubles pickleball, may ultimately provide insight into ways verbal interaction might be used to elevate the flow experience across sports.

An additional understanding of the flow experience in adult recreational doubles pickleball may be generated by examining specific aspects of the experience. Additional research might also lead to a greater understanding of psychology, game design features, or other concepts that enrich this game experience with flow. Finally, more research may provide insight into older adult lifestyles and recreational motives.

Future research is recommended in, but not limited to, the following areas:

1. **Undertake qualitative research to gain an increased understanding of adult recreational doubles pickleball players' total flow experience and flow dimension experiences.**

   Qualitative research should be pursued to understand the personal first-hand experience of adult recreational doubles pickleball player flow. Interviews with players will help to add to this study’s quantitative measurement of the flow experience of these players. Collecting descriptions of the adult recreational doubles pickleball experience will help others to understand flow in this realm. Additional questions could be asked to learn more about the dimension experiences. For example, a study is recommended to examine the autotelic experience dimension more closely as it may relate to happiness, as recent research concluded that happiness is a possible consequence of flow but not a
critical component (Barthelmäs & Keller, 2021). This could include working to gain an understanding of the basis of significantly higher unambiguous feedback dimension scores for married men compared to unmarried women.

2. Identify Additional Variables associated with Total (Composite) Flow scores.

In multiple regression analysis, only 8% of the total (Composite) Flow scores variation was explained by marital status and the average number of days played per week. The other variables collected, age, gender, education, marriage, location, tournaments, and the number of years playing pickleball, were not found to be significantly related to Total (Composite) Flow scores. More research is recommended to identify other variables influencing the adult recreational doubles pickleball experience. These variables could include many factors.

3. Explore Game Constructs, Game Dynamics, and Flow.

Pickleball is known as an easy game to learn and play (Chen et al., 2021; DeMelo, 2022). This game, however simple, inspires players to play for hours and several days per week. Research is needed to understand how a game is easy to learn yet remains interesting. Research has been undertaken to identify game constructs and dynamics that influence players’ continued interest in video games, including research linking video game information systems architecture to flow (Cowley et al., 2008). Components of daily experience have also been linked to flow (Inghilleri et al., 2014). Research is needed to understand the components of recreational doubles pickleball that interest adult players. How these components keep players engaged over time may be used in developing programs and activities to enhance player flow experience. This knowledge might also be used to aid the design of new sports and activities for seniors.
4. Develop the Concept of Residual Flow.

Development of the concept of residual flow in adult recreational doubles pickleball is recommended for two distinct reasons. The high flow values across multiple dimensions indicate that players may be entering the play experience with some influence of past play experience or with some expectation that they will experience flow. More research is needed to understand players’ mindsets at the beginning of the game and how this influences player experiences. Additionally, the impact of repeat and high-flow experiences on this demographic's mental health and cognitive functioning should be explored. The mid-term and long-term effects of high-flow experience may positively contribute to mental capacity maintenance with age (including delayed onset of Alzheimer’s and dementia). While antecedents of flow have been recognized for decades, the greater value may be found in determining and understanding the consequences of flow for this demographic group.

5. Learn more about Flow and the Perceived Value of the Task at Hand.

The Revised Flow Model (Barthelmäs & Keller, 2021) theorizes that flow occurs at the interchange of the participant’s highest level of the perceived value of the experience and the task at hand. The model predicts a higher flow propensity for players who find the activity relevant and have a positive assessment of their skills. Research is needed to identify and understand the opening mindset of players who experience high flow levels. What thoughts might they have as they enter the court? Are they reviewing expectations of what they will experience or recalling prior flow experience as they prepare to play? Do these thoughts increase the probability of higher flow? More research is needed to identify the mindset of players who experience flow.
6. Investigate the Relationship between Player Flow and Perceived Ability.

Research is needed to understand the relationship between adults aged 50 and over who are recreational doubles pickleball players and perceived ability. A player’s perceived ability has been linked with flow in previous studies (Jackson & Roberts, 1992) but has not been investigated in adult recreational doubles pickleball.

Correlation analysis of DFS-2 data and other variables collected from Master athletes (Jackson et al., 1998) largely failed to demonstrate meaningful relationships among the nine flow dimensions but found a relationship between perceived ability, intrinsic motivation to experience stimulation, and anxiety subscales in older participants. Jackson (p. 373) found that “a high perception of sports ability seems to be a critical factor for facilitating flow states” and “athletes who believe in their capabilities are probably more likely to experience a balance between challenge and skills, even when the challenge of a specific sports competition is relatively high” (p.373). Examining the influence of perceived ability in older athletes could be very interesting, as the players may (or may not) have decades of experience and understanding of their skills or the skills of professional athletes. The internet also provides easy-to-access information on what “skilled” players can do. More research is needed to understand the relationship between flow and perceived ability with adult recreation doubles pickleball players.

7. Investigate the Relationship between Player Flow and Perceived Challenge.

Research is also needed to understand the relationship between adults aged 50 and over who are recreational doubles pickleball players and perceived challenges. Like perceived ability, perceived challenges have been linked with flow in previous studies (Jackson & Roberts, 1992) and was identified as a flow antecedent regardless of skill
level in kayaking (Jones et al., 2000) but have not been investigated in adult recreational doubles pickleball. While the impact of perceived challenge in professional sports is in question (as the skills and challenges in professional sports may be factually known) (Jackson et al., 1998), pickleball is a new game. Simultaneously, Stein and colleagues (1995) found that challenge and quality of experience variables correlated only in recreational sports and not in competitive ones.

Additionally, challenges may be influenced by how players perceive the tasks, as the tasks may be considered an experience in adult pickleball rather than a competitive task as it is in traditional sports. Player flow experience based on skill level research could use USAPA skill level classifications or self-determined measures. Expert adventure recreation participants did not report significantly higher flow levels than novices (Schüler & Nakamura, 2013). Research is needed to identify the role of challenges in adult recreational doubles pickleball.

Research in this area could include developing answers to the following questions: What challenges do adult recreational doubles pickleball players believe they are facing on the court? In what ways do players feel they conquer these tasks? How does this experience relate to player flow? How might this experience influence a player’s determination of the perceived challenges in daily life compared to how non-players consider similar obstacles?

8. Explore the Relationship between Average Days/Week of Play and Player Flow.

Results also indicate that player flow experience is impacted by average days per week of play (with each additional day of weekly play increasing flow). More research is needed to identify in what ways play frequency influences flow.

Results indicate that player flow experience is higher for those who participate in tournaments. Players participating in at least one tournament in the previous year registered significantly higher scores in challenge skill balance, merging of action and awareness, and sense of control flow dimension scores than those who had not participated in tournaments. Tournament experience was also positively and significantly related to the sense of control dimension subscale. These are exciting and somewhat counter-intuitive findings, as these players are known to gather most frequently for recreational (just for fun) rather than competitive play.

Understanding what recreational players experience during a first or subsequent tournament and how this experience impacts their future flow experience could help in tournament planning. Research could also be undertaken to understand the impact of a periodic addition of competitive elements to recreational programming. Might quarterly employing some process of elimination during recreational play enhance player flow? Is the tournament format critical, or might add a competitive element, like seeing what player can do the most repetitions of a drill skill, to daily recreational play increase player flow experience? More research is needed to differentiate the differences (if any) in the impact of simple competitions, tournaments, and player flow. Research by Özdemir and Durhan (2020) found that professional athletes participating in international competitions experienced higher flow levels. Research is needed to understand better the recreational pickleball player tournament experience and how this experience influences player flow.
10. **Research the Relationship Between Physical Rigor and Flow in Adult Recreational Doubles Pickleball.**

Certain sports are thought to be more conducive to flow than others (Swann, Keegan, Piggott, & Crust, 2012). For example, stop-start games are believed to be less conducive to flow (Jackson et al., 2001), and flow occurs more often in fast-paced, externally paced team sports (Jackson & Roberts, 1992; Jackson, 1995; Chavez, 2008). A study found that work in flow was associated with vigor and low exhaustion at the end of the day (Demerouti et al., 2012). Flow studies have been undertaken in sports and activities with high physical demands (Csikszentmihalyi, 1975; Swann, Keegan, Piggott, & Crust, 2012; Özdemir & Durhan, 2020). Running theory includes pace theory which targets training levels at the pace just under that in which the body produces lactic acid, as it is believed this is where the body may operate optimally. Research is needed to investigate if the rigor of adult recreational doubles pickleball, which players often describe as "just right," might influence flow. Future research may explore the impact physical rigor has on flow dimension experience.

11. **Study the Influence of Eustress (Healthy Stress) on Flow in Adult Recreational Doubles Pickleball.**

Correlation analysis taken on by Jackson and colleagues of a collection of DFS-2 data and other variables collected from Master athletes (Jackson et al., 1998) found a relationship between perceived ability, intrinsic motivation to experience stimulation, and anxiety subscales with flow, indirectly identifying stress as a component of the experience. Flow theory is premised on the idea that flow occurs at the place where player skills and challenges match. Otherwise, anxiety may result (Figure 1, Figure 2).
High respondent subscale scores in total concentration, challenge/skill balance, and unambiguous feedback reflect that players stay actively engaged in the game. Research that identifies how players diagnose and process game inputs, interpret the success of their actions, and what they consider threats to their success might help us understand the stress players experience while playing the game and how this stress influences player flow.

12. Research Autotelic Experience and Intrinsic Motivation in Adult Recreational Doubles Pickleball.

A recent study in gamification (Hamari & Koivisto, 2014) also registered high mean autotelic experience flow scores. Correlation data from the study inspired authors to suggest that “at least in the context of computer-supported gamified exercise, the autotelic experience, that is, finding the activity intrinsically motivating, is a condition for reaching the flow state rather than being an outcome for reaching flow” (p.141). In a study of Australian Master athletes (average age 46.1 years, SD 10.9 years) Jackson et al. (1998) also “expected that intrinsic factors play an important role in sport involvement of older adults” (p.363) compared to younger athletes. Buzzelli and Draper's landmark study (2019) of more than 3000 pickleball players recommended more research, as the researchers assumed the players would be extrinsically motivated. However, the data reflected that players were intrinsically motivated.

More research is required to understand the autotelic experience and the motivation involved in adult recreational doubles pickleball. As they become understood, player motivations can be used to aid program design and implementation. Competitions, for example, would be more attractive to extrinsically motivated players. Designing play
environments with more social situations and positive experiences would be more attractive to intrinsically motivated players.

13. Investigate the Role of Social Interaction in Adult Recreational Doubles Pickleball.

This grouping also reflects components of Social Flow (Sawyer, 2015) and Group Flow (Cosma, 1999; Nakamura & Csikszentmihalyi, 2002; Walker, 2010), which theorizes that shared goals, communication, familiarity, equal participation, close listening, and well-identified group goals are needed for group flow to occur. This coordination of effort requires a rendering of self (and therefore less focus on individual actions and achievements) to experience flow. The pickleball doubles game requires the coordinated efforts of four people to play and is known as a “very social” game. It includes disgust for those insisting solely on a hard-hitting approach (Chen, 2017), indicating that social and group dynamics influence the game experience. Video game research has begun investigating the influence of interactions with others in video game flow by adding a player interaction dimension to Csikszentmihalyi's original model (Sweetser & Wyeth, 2005). More research is needed to understand the influences of social interaction in adult recreational doubles pickleball.

14. Understand Intrinsic Motivation in Adult Recreational Doubles Pickleball.

Data collected from adult recreational doubles pickleball players for this study reflected higher flow dimension subscale mean scores for autotelic experience, concentration, and total flow than in previous studies. This greater frequency of intrinsic experience factors is like the results from a 2019 online survey of over 3,000 adult
pickleball players (Buzzelli & Draper, 2019) which found participants were task rather than ego-oriented.

Buzzelli and Draper were concerned with the results of their study however, pointing out that they had expected pickleball players to be ego-oriented as it was a competition, an ego-based activity, and that ego expression has been historically thought to be a primary benefit of the sport (p. 4). The disjoint nature of the results inspired the researchers to encourage future research in the area. More research is needed to explore the nature of player motivation. Adult recreational doubles may participate in the game as an activity (something enjoyable to do and therefore intrinsic) and not as a sport (a game to win and extrinsic).

Csikszentmihalyi (1990) found that the intrinsic motivation and autotelic experience constructs are similar, as autotelic activities were done "for their own sake, without expectation of future reward". Jackson et al. (1998) expected a positive relationship between flow and intrinsic motivation, described this motivation as task/goal orientation that strives to learn and for self to improve self-improvement, and found a correlation between flow and intrinsic motivation in adult athletes, mainly linked with an experience stimulation factor. Pelletier et al. (1995) found that this motivation occurs "when someone engages in an activity because of pleasurable and exciting feelings associated with the movement of the activity itself." Scanlan et al. (1989) also found this in a study of elite figure skaters. More research is needed to understand the role of motivation in adult recreational doubles pickleball.
15. Identify the Role of Clear Goals in Adult Recreational Doubles Pickleball.

Additional research is needed to clarify the importance of the Clear Goals dimension in adult recreational doubles pickleball. For decades, flow has been associated with high performance in sports (Jackson & Roberts, 1992). Theorists are beginning to question this assumption, including Schüler and Brunner (2009), who found that athletes experience flow more frequently during practice than during competition. The two also found that flow may be a more pleasant state of consciousness than a competitive one. Simultaneously, researchers have recently questioned the link between flow and optional performance, including a meta-analysis suggesting that accomplishment has been historically misapplied in this realm (Harris et al., 2021).

The role of competitiveness and performance has also been questioned in video game research, with the clear goals dimension found to be less critical in video games than in gamification. The finding that "videogame players can potentially reach an autotelic experience even without actual goal-oriented play/mastery which most gamification implementations seem to strive for" (Hamari & Koivisto, 2014, p. 142), inspired the researchers to hypothesize that in some instances, the group experience itself may be more flow-inducing than completion of specific accomplishments or tasks. This may also be the situation in adult recreational doubles pickleball, with competition and the desire to "win" as it has historically been a lower bar in this environment. More research will provide a greater understanding of the role of this dimension in the adult recreational doubles pickleball flow experience.
16. Understand the Physiological Conditions Player Flow in Adult Recreational Doubles Pickleball.

A map of neurophysiological activities corresponding to different flow levels in video games created by Berta et al. (2013) could be reviewed and compared to pickleball players. Medical technologies may help collect data such as heart rate, eye movements, oxygen levels, and sugar levels and help researchers establish connections between physiological conditions and player flow.

17. Explore the Impact of Pickleball Flow on Older Adult Memory, Learning, and Cognition.

Research in educational gaming has identified that flow experience positively influences learning outcomes (Killi, 2005) and is a consequence of flow (Barzilai & Blau, 2014). Brom et al. (2014) found that high-scoring players were more often in the flow state and that flow correlated with motivation, which may facilitate learning. Research is needed to understand the impact of the adult pickleball experience on player learning and cognition. For example, researchers could undertake a longevity study to examine the long-term cognitive capacity of adult recreational doubles pickleball players and compare the results of the study group to the general population’s propensity toward Alzheimer’s and dementia. Neurophysiological activities associated with different flow levels identified by Berta et al. (2013) might also be tracked for additional insight.

18. Explore the Role of Task, Intellect, and Influence Flow Dimension Subgroups in Adult Recreational Doubles Pickleball.

The adult recreational double pickleball provides players with a unique sports participation experience that researchers may enjoy examining in a new way. Combining
the nine flow dimensions into a new combination of subgroups (Table 31) may reveal new insights into the flow experience.

Playing pickleball recreationally several days per week may provide adult pickleball players with collections of experience different from that of competitive athletes. Instead of undertaking hundreds of hours of preparation/practice to ready themselves for a game with peaks and valleys of experience in engagement, competitiveness, rigor, and stress as competitive athletes do, recreational players "walk on" the court and have an essentially constant experience. Interestingly, although the game experience is similar, the game remains engaging. The level of physical rigor throughout the game, remaining constant, adds exceptional stability to the game experience (on the contrary, many sports, like races, require high exertion at a particular period).

Although more research is needed, this continuity may provide a unique cognitive, physical, and emotional experience allowing players to experience high levels of concentration and autotelic experience. This high level of intellectual experience of these dimensions may be the "incredible" experience recreational doubles claim to be addicted to (Bland, 2020) and be a feature of the game that attracts highly educated players to the sport. Running theory includes the concept of Tempo Pace, a comfortable pace a runner can maintain for approximately an hour. This pace increases physical capacity without invoking the production of lactic acid and is highly suitable for training. Future research can be used to identify if a player’s engagement in this sport is a function of a combination of these or other factors.
Flow dimensions in adult recreational doubles pickleball should be further explored to understand if the dimensions consist of three types of inputs into the flow experience and what influence each group has on the flow experience in adult recreational doubles pickleball. Research focusing on the flow dimensions clustered in three hypothesized groups may provide greater insight into the flow experience of pickleball.

Table 31

*Proposed Flow Dimension Groups – Adult Recreational Doubles Pickleball*

<table>
<thead>
<tr>
<th>Task Dimensions</th>
<th>Challenge/Skill Balance, Unambiguous Feedback, Clear Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intellect Dimensions</td>
<td>Concentration on Task, Sense of Control, Autotelic Experience</td>
</tr>
<tr>
<td>Influence Dimensions</td>
<td>Merging of Action-Awareness, Loss of Self Consciousness</td>
</tr>
</tbody>
</table>

**Task Dimensions**

Playing pickleball often provides players extensive experience in the flow antecedents of challenge skill balance, clear goals, sense of control, and feedback (Nakamura & Csikszentmihalyi, 2002). Even with repeat experience, the game remains challenging. Task flow dimensions consist of knowing what one needs to play the game (tasks) and completing these tasks successfully. Adult recreational doubles pickleball is a task-rich activity.

Guo and Poole (2009) explored the relationship between the three preconditions of flow (challenge/skill balance, clear goals, and unambiguous feedback) and the effect of website complexity. The study found that website complexity affects user flow by
mediating the three preconditions of flow. A less complex website design is more likely to facilitate the three preconditions of flow. Although Guo and Poole did not include the sense of control in their research, cross-correlation data from this study (Table 19) indicate this dimension influences the respondent’s flow and is therefore included in this cluster.

**Intellect Dimensions**

Heightened task understanding allows players to take on a higher level of concentration as they play (as the gameplay moves to a higher level) and provides an environment for a rich Autotelic Experience. The influence of experience, which is assumed to include an increase in knowledge, has been linked recently to player flow. Video game research by Fu et al. (2009) included an increase in knowledge variable to EGameFlow (a validated scale measuring learners’ enjoyment of e-learning games). Daily practice, associated tasks, and the flow experience this practice provides may help pickleball players have repeated Autotelic Flow dimension experiences like researchers have uncovered in video games. However, more research is needed to confirm this. The high levels of concentration and autotelic experience found in adult recreational doubles gameplay may also share similarities with states of mindfulness (Jackson, 2016), may provide an opportunity for cross-cultivation of game flow and mindfulness, and may also provide an opportunity for the expansion of mindfulness in players’ daily lives. Research is needed to understand the adult recreational doubles pickleball experience and mindfulness.
**Influence Dimensions**

Influence Flow Dimensions are based on the actions of others: Merging of Action-Awareness and Loss of Self Consciousness. These are part of recreational doubles pickleball, as three other people (and many others in the vicinity) are on the court playing the game.

Players are near one another playing the game. Therefore, they need visual and audio inputs as to the challenge to which they must respond (with the ball moving at a pace with enough time to process decisions, but they must be processed quickly). While the scores of these dimensions were relatively high for adult recreational doubles pickleball players, they were not categorically different with significance like the Autotelic Experience and Concentration dimensions. Future research is needed to understand the influence of the presence of others in adult recreational doubles pickleball.

**Time Transformation**

Time transformation was initially observed while watching artists (an individual effort) and identified by Csikszentmihalyi as part of the flow experience in his original studies (Csikszentmihalyi, 1975). Since then, research results, including a meta-analysis by Hancock et al. (2019), have questioned the inclusion of this dimension, with the possibility that this dimension does not apply in situations involving others. Additional research is needed to clarify the role of time transformation in the flow experience in recreational sports, including pickleball. Future research on time transformation in adult recreational doubles pickleball could ask participants to estimate time (Canham & Wiley, 2003) or provide open-ended questions on time perception (Boudreau et al., 2020).
In one of the studies first published on pickleball, Casper and Jeon (2018) found agreement in the two statements "It is social" and "It is good exercise,” as the two statements reflect both physical rigor and social interaction in the game. Interacting with players (serving and hitting the ball, announcing the score, and bantering) constantly keeps players "in the game" of adult recreational doubles pickleball. This high level of interdependent activity reduces a player’s ability to "lose track of time," as is presented in the DFS-2 questions. Re-evaluation of the time transformation dimension may provide additional insight into the experience it attempts to encapsulate. Additional research may clarify that this “loss of time” may be an outcome or a symptom of something other than cognitive awareness of time.

Player awareness of other aspects of cognition, such as measures of personal space, perception of threat or danger, or some other understanding of surroundings, could act as a "tipping point” and change player awareness of time. Players are near one another while playing the game and frequently communicate with and see the facial expressions of their opponents during pickleball play. They have a visual and audio input as to the challenge to which they must respond (with the ball moving at a pace with enough time to process decisions, but they must be processed somewhat quickly at eustress levels). Additional research will help us understand how the presence of others influences time perception in this environment.
19. Explore relationship(s), if any, between the adult recreational doubles flow experience and players’ self-reported assessment of traumatic or stressful life events.

This may include, but not be limited to analyzing DFS-2 Flow Experience data along with data collected with stress and trauma assessment research instruments such as the Life Stressor Checklist – Revised (LSC-R) (Wolfe et al., 1997) or the Brief Trauma Questionnaire (BTQ) (Schnurr et al., 2002).


Research might also be pursued to understand the effect audio inputs might have on player flow experience. For example, the sound of the ball hitting the paddles is part of the game experience and may influence player flow. The sound generated by pickleball play has gained considerable media attention as the noise has generated many complaints (Robinson et al., 2023; Sheets, 2022; O’Connell, 2022). Pickleball courts emit a steady stream of about 45 decibels, sometimes up to 50 or 55. Passing cars emit up to 60 decibels. The EPA has long identified 55 decibels as the maximum average outdoor noise level that can be maintained throughout the day without impacting “health and welfare” (Robinson et al., 2023). Dr. Braxton Boren of American University has observed spiking noise nuisance from pickleball games differs from modern sounds:

“A lot of the noise sources that we have today - automobiles, HVAC systems, things that are running continuously. We have a lot of noise, but a lot of it is very continuous noise and we’re able to be sort of habituated to it, but things like pickleball, things that are more impulsive with unpredictable spikes where there
will be some noise and then some silence and then some noise, that almost continues jarring your attention.” (Robinson et al., 2023)

Gameplay also includes conversation and periodic bursts of laughter (Robinson et al., 2023). Players typically converse with one another between points while playing. Sideline conversations also occur. Research may be undertaken to understand the influence of these components of the game experience on player flow. It may contribute to the further development of social and team flow concepts.

The practice of playing the game while part of a larger group of players simultaneously playing on other courts, which players can both see and hear, may be a factor in this flow experience. Background music (Linek et al., 2011) and social mechanics (Oksanen, 2013) enjoyed in the club environment may facilitate flow. More research is needed to identify if and how the group and social factors may impact flow in adult recreational doubles pickleball.

**Implications for Professional Practice**

The results of this survey indicate that adult recreational doubles pickleball players experience flow and experience flow in the nine dimensions of flow at significantly higher levels than players surveyed in previous studies.

The data collected helps the leisure industry and senior care professionals understand that adult recreational doubles enthusiasts experience flow during gameplay and that player flow is due to experiencing a game environment consisting of a healthy level of challenge, game requirements players understand, skills that players possess, and unambiguous feedback. It additionally provides an environment where players can
concentrate, experience a merging of action and awareness, lose track of self and time, and have a delightful autotelic experience.

**Leisure Service Managers and Community Planning Professionals**

The data collected in this study may benefit leisure services managers and community planning professionals, as the results indicate that the adult recreational doubles pickleball experience may differ from a traditional understanding of sports participation. For example, while SFIA statisticians consider "frequent play" those participating in a particular sport or activity eight or more times per year (SFIA, 2020), adult recreational pickleball players play up to 200 times yearly, a number significantly larger. While play duration data (the number of minutes played per session) was not collected in this survey, players are known to play approximately 2-3 matches per day (each match consisting of 3 games of 15-20 minutes in duration) (Allracket, 2022). Given this, recreation managers and community planning professionals might like to include this increment in programming and facilities plans when developing multi-sport facilities.

It is also easy to recommend the continued construction of additional pickleball facilities and programming, as the flow experience is enjoyable and likely to continue to draw participants to the game. Community recreation departments and sports organizations are encouraged to implement, cultivate, and support recreational doubles play programs and hold regular tournaments, as tournament participation positively influences player flow experience.

**Tourism and Travel**

Tourism and travel professionals will benefit by understanding the flow dimension of the play experience, as recognizing it as a part of the play experience can be
used in developing attractive marketing literature and alluring photography. For example, showing players with pleased expressions (likely a reflection of having a pleasant autotelic experience, one of the nine dimensions of flow) will likely increase player interest in pickleball travel marketing.

**Senior Care Professionals**

The results of this study reflect that adults aged 50 and over experience flow and that older adults have a positive experience in this environment. Senior care professionals in adult community management, medicine, and mental health should consider advising clients and patients to play recreational doubles pickleball. While research in adult pickleball injuries has been published by Weiss et al. (2022), these professionals will also benefit from understanding the positive psychological impacts of playing pickleball.

**Health Research Professionals**

This study provides evidence of a high level of cognitive activity in older adults. Researchers in brain aging and cognitive activity, including the fields of Alzheimer's and dementia, may benefit from understanding brain activity adults experience while playing recreational doubles pickleball. A longitudinal study that tracks enthusiastic players' health conditions and longevity may provide incredible insights into this game’s impacts on human health.

**For-Profit Health and Recreation Facility Managers**

Large fitness companies have announced pickleball programs. For example, Life Time Inc., the $1 billion fitness company, opened its first pickleball-only destination in February 2022 and announced plans to add more than double the number of pickleball courts the company offers at its locations from 250 to 600 by the end of the year (Front
Office Sports, 2022). The Pickleball Club, a private company based in Florida, announced its intention to spend over $180 million to build 15 private clubs by the end of the year (The Pickleball Club, 2022). Typically, a gym’s profitability is based on the expectation that only 20% of members use the facility less frequently (Wroblewska, 2018).

Data collected in this study indicate that recreational doubles pickleball players experience higher flow levels the more they play, and players enjoy the game often. Survey respondents reported playing the game 3.5 days per week on average, with a standard deviation of 1.4 days, and one in four respondents (26.4%) reported playing the game five or more days a week (Table 11). Owners and managers of for-profit pickleball facilities will benefit from knowing that frequent play increases the pickleball experience and that players might expect to enjoy the game often. Managers will, therefore, benefit by designing and implementing programs that include “rotations” or “cueing” to ensure as many players enjoy court time as possible. Additional club features, such as nice waiting areas, warmup mats, or drill stations, may be added to facilitate players.

**Conclusion**

The purpose of this study was to identify to what degree older adults who play pickleball recreationally (for fun, rather than to prepare for/participate in competitions) in doubles (four players per court) format experience flow (Csikszentmihalyi, 1990). Two-sample t-tests, analysis of variance (ANOVA), Pearson correlation coefficients, and linear regression were used to analyze the Dispositional Flow Scale - 2 (Jackson et al., 2010), demographic, and player data. Analysis was completed using SPSS 28.0 with a statistical significance level of .01. Flow data from sports and other activities
from *The FLOW Manual: The Manual for the Flow Scales* (Jackson et al., 2010) was used for comparative analysis.

Results revealed that adult recreational doubles pickleball players report experiencing flow in all nine dimensions (challenge/skill balance, merging of action and awareness, clear goals, unambiguous feedback, total concentration, sense of control, loss of self-consciousness, time transformation, and autotelic experience) (Csikszentmihalyi, 1990) and do so at levels higher on average than many measures previously recorded in sports and other activities (Jackson et al., 2010). The variables of the average number of days played per week, tournament participation, marital status, and years of play were found to be significantly related to flow. Gender, age, education, and location were not related to player flow.

This study’s results may benefit community planning and recreation professionals. More research is encouraged to understand better the flow dimension experience of adult age 50 and older recreational doubles pickleball players.
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Appendix

Exhibit 1: Dispositional Flow State - 2 (DFS-2) License Permission

For Publications:

We understand situations exist where you may want sample test questions for various fair use situations such as academic, scientific or commentary purposes. No items from this instrument may be included in any publication without the prior express written permission from Mind Garden, Inc. Please understand that disclosing more than we have authorized will compromise the integrity and value of the test.

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Online administration and scoring of the Flow Scales is available from Mind Garden, (https://www.mindgarden.com/100-flow-scales). Mind Garden provides services to add items and demographics to the Flow Scales. Reports are available for the Flow Scales. If your research uses an online survey platform other than the Mind Garden Transform survey system, you will need to meet Mind Garden’s requirements by following the procedure described at mindgarden.com/mind-garden-forms/58-remote-online-use-application.html.

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Exhibit 2: Online Survey Design and Survey Questions

This study consists of analysis of Dispositional Flow Scale – 2 (Jackson et al., 2010) data collected from adult age 50 and older recreational doubles pickleball players. The online survey platform provided by Mind Garden (mindgarden.com), an online vendor of validated psychological assessments and instrument, was used to provide respondents with an easy-to-use survey interface that identifies the responses of five measures with every question.

This approach provided an opportunity for players to respond to each question with accuracy and in a similar format in which the DFS-2 was administered in previous studies. This format aided the researcher’s ability to compare results of this study with previous studies using the DFS-2 instrument and its horizontal Likert format.

Other online resources were evaluated (Survey Monkey, Survey Sparrow, Google Survey) however it was found that these services, while less expensive, were not at the time of the study able to provide Likert scale responses in a vertical (rather than horizontal) multiple-choice format and due to this change in presentation, would not be directly comparable to the structure of the original instrument.

Each of the 36 DFS-2 questions were be answered with a horizontal 5-point Likert scale response with the scale from which the respondent will select the measure most reflective of his/her experience playing recreational doubles pickleball with a response spectrum appropriate to the question with the answers of 1-Never, 2-Rarely, 3-Sometimes, 4-Frequently 5-Always or 1-Strongly Disagree, 2-Disagree, 3-Neither Agree Nor Disagree, 4-Agree, 5-Strongly Agree (Figure 13, Figure 14).
Figure 13

*Online Survey - Frequency Scale Example*

![Frequency Scale Example](image1)

Note. (Mind Garden, 2022).

Figure 14

*Mind Garden Agreement Scale Example*

![Agreement Scale Example](image2)

Note. (Mind Garden, 2022).
As mentioned earlier, the 36 questions of the DFS-2 were asked in the horizontal linear Likert scale format. Additionally, four demographic questions and three pickleball play questions were asked in an attempt to develop a greater understanding of the adult recreational doubles pickleball player. These questions include:

**Demographic Questions**

Gender, age (as of January 1, 2022), marital status and highest level of education data were collected from respondents. The questions can be answered or skipped by the respondent.

- **What is your gender?** Male, Female, Other
- **What is your age (as of January 1, 2022)?** A 3-digit numeric response field.
- **What is your highest level of education?** Some High School, High School Degree, Some College, College Degree, Trade School, Master’s Degree, Doctorate or Higher
- **Most current marital status?** Married, Widowed, Divorced, Never Married, Separated

**Player Questions**

In an attempt to gain understanding as to whether a player’s level or frequency of participation or interest in competition influences frequency of player experiences of flow dimensions, the number of years of experience playing pickleball, average number of days playing pickleball per week, and if the player participates in tournaments will be asked of the players in this survey.

- **How many years have you played pickleball?** A two-digit numeric field.
- **How many days per week (on average) do you play pickleball?** 1, 2, 3, 4, 5, 6 or 7
- **Do you participate in pickleball tournaments: (multiple choice)**
  - I participate in three or more (3+) pickleball tournaments per year.
I participate in one or two (1-2) pickleball tournaments per year.

I do not participate in pickleball tournaments.
Exhibit 3: IRB - Participant Consent

1. UNIVERSITY OF NORTHERN IOWA HUMAN PARTICIPANTS REVIEW

Project Title: The Experience of Adults age 50 and Older in Recreational Doubles Pickleball

Name of Investigator: Glynis Worthington

Invitation to Participate: You are invited to participate in a research project conducted through the University of Northern Iowa. The following information is provided to help you make an informed decision about whether or not to participate.

Nature and Purpose: The purpose of this study is to gain a greater understanding of the experience of adult age 50 and older recreational doubles pickleball players during game play.

Explanation Of Procedures: This study consists of an online survey consisting of 36 sentences that the respondent will read and provide feedback relative to his/her personal experience via a 5-point Likert response scale, demographic questions, and questions about his/her pickleball play. Privacy and Confidentiality: The study is intended to be completely confidential, however, the breach of confidentiality always exists. Indirect identifiers (sex, age, number of years playing pickleball, etc.) will be collected and combined to describe groups and behaviors, not identify individuals.

Participants will participate in the quantitative survey anonymously, then have the option of providing contact information to be used ONLY for the researcher to contact the respondent and administer a brief qualitative study to gain insight to initial findings. Information obtained during this study that could identify you, including emails and phone numbers, will be kept confidential and used only by the researcher for the research study. Identifying information will not be published in academic journals or presented at a scholarly conference.

Discomforts, Risks, and Costs: Risks to participation are minimal. The survey will be taken using a smartphone, tablet, or computer and take approximately 15 minutes to complete. The interview, by phone, should you choose to participate, will last no longer than one hour. Risks to participation are similar to those experienced in daily life.

Benefits and Compensation: There is no compensation given to respondents for
participation in this study. This research may generate important insights into the experience of adults age 50 and over as they play recreational doubles pickleball.

Right to Refuse or Withdraw: Your participation is completely voluntary. You are free to withdraw from participation at any time or to choose not to participate at all, and by doing so, you will not be penalized or lose benefits to which you are otherwise entitled.

Questions: If you have questions regarding your participation this study or about the study generally, please contact Glynis Worthington at 319-830-3552 or (if appropriate) the project investigator’s faculty advisor Dr. Oksana Grybovych, Department of Health, Recreation and Community Services, University of Northern Iowa 319-273-6819.

For answers to questions about the rights of research participants and the research review process at UNI, you may contact the IRB Administrator at 319-273-6148.

Agreement: I am fully aware of the nature and extent of my participation in this project as stated above and the possible risks arising from it. I hereby agree to participate in this project. I acknowledge that I have received a copy of this consent statement. I am 50 years of age or older. Do you agree to participate in this study? Yes No

2. Great! It’s time to take the survey. Please be sure to answer the questions based on your experience when you play pickleball in the doubles (4 people) format. It may be helpful to think of each question with the phrase "When I play doubles pickleball, I...." at the beginning of each question.

For example, the first question would be: When I play doubles pickleball ...I am challenged, but I believe my skills will allow me to meet the challenge. Then answer how much you agree using the 5-point scale.

Okay? Yes No

**Participant Permission to Participate in Qualitative Study**

Respondents will also be asked if the researcher might contact them in the future to gain clarification regarding results of the data study. This will be accomplished by the researcher asking for contact information from the participant should he/she be comfortable in being contacted. Permission is therefore granted for the researcher to contact the respondent if needed for the second portion of the study. Respondents will also be given the opportunity to receive a copy of the completed study (optional).
48. Just two more things... First, we need your help. The results of the survey may spark additional questions or give us ideas as to more things we might like to learn. Type your email, and/or telephone number in the box below if we might contact you to learn more about your experience playing pickleball for this study.

   Email   Phone Number

49. Finally, if you would like a copy of this study when it is published, type an email into the box below where we can send it.

   Email (optional)

Thank you for participating in this study!