A Mind Sport Worth Teaching

How bridge relates to concentration and confidence in young players



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Abstract

The card game bridge, recognised as a mind sport, often struggles to appeal to young people because it is perceived as a game for older players. Nonetheless, there is a junior bridge community. This study examines potential benefits of playing bridge for young players, focusing on mental wellbeing, particularly concentration and confidence. The analysis is based on a survey of 909 bridge players of all levels under the age of 32. Levels of bridge engagement (level, length, and frequency of play) is examined in relation to self-reported changes in concentration and confidence. A majority reported improvement in both concentration and confidence, and higher engagement in bridge was associated with a greater likelihood of reporting such improvements. These findings are interpreted using Dreyfus' model of skill acquisition and Csikszentmihalyi's concept of flow. The observed association between bridge engagement and self-reported concentration and confidence may help bridge federations promote bridge in schools.

Introduction

The card game bridge is a mind sport, played with a standard deck of cards and divided into two parts. The first part is bidding, where players estimate how many tricks they will take in the second part, the play. A trick consists of one card from each player, with the highest card winning.[1] It is a cooperative game in which two partnerships compete, so there are always four players. Bridge uses communication, concentration, strategy, memory, and logical thinking. It is primarily skill-based and can be played live or online. The World Bridge Federation is recognised by the International Olympic Committee.[2]

Bridge has struggled to reach out to a wider audience, especially among young people. Those who have heard of the game often assume it is for older people, but there are many young players. This is a challenge for the bridge community, which this research may help address by documenting perceived benefits. The focus of this paper is to examine how bridge relates to mental wellbeing in young bridge players. The paper is based on a survey of bridge players of all levels under the age of 32.[3]

There are a limited number of papers about bridge and even fewer focusing on young players, so this research addresses a gap. This is the first study conducted on such a large and varied group of young bridge players. The questions used in the analysis are part of a larger survey conducted by the research team Bridge: A Mind Sport for All (BAMSA), University of Stirling, UK. BAMSA is an academic research project that studies bridge as a mind sport across ages and contexts.[4] As the first study on the topic, this paper provides evidence that may be used to promote bridge in schools, to recruit more young players, and to change perspectives about the game. The research question is: To what extent does participation in bridge relate to self-reported levels of concentration and confidence in young bridge players? In addition to looking at concentration and confidence, this paper focuses on five independent variables, where three are bridge-specific and two are demographic. The variables are level, length, and frequency of play, plus age and gender.

[1] Note this is a simplified explanation, to further understand the game: European Bridge League, 'What is bridge?'
[2] International Olympic Committee, 'Certificate'.
[3] The oldest international junior category is under 31. See method for an explanation of the difference.
[4] 'Bridge: A MindSport for All'.

Theoretical framework

There are several theories about concentration and confidence, but this paper focuses on Dreyfus' model of skill acquisition and Csikszentmihalyi's concept of flow. Other theories, such as Goffman's frontstage-backstage, Bandura's self-efficacy, and Bourdieu's cultural capital, are relevant but fall outside the scope of this paper.

Dreyfus' model of skill acquisition explains how people of different levels of experience approach problems and learning.[5] There are five steps in the learning process:

- A novice needs problems broken into smaller parts, with clear instructions.
- The advanced beginner solves similar problems to a novice but can recognise them even if they are not as clearly stated.
- A competent learner can recognise an overwhelming number of problems. "[T]he student may well wonder how anybody ever masters the skill."[6] Guidance from a teacher, therefore, remains important, especially in identifying what to focus on. Once their ability to sort problems has improved, it becomes easier again.
- The proficient learner relies more on intuition, building on both positive and negative experiences. There is less doubt when using intuition.
- The expert seems to work in a similar way to a proficient learner. However, an expert has more experience and can spot more nuanced differences and plan further ahead.

Overall, the model shows how a learner shifts from highly guided learning to more intuitive performance, and that both concentration and confidence may vary when moving between stages.

Csikszentmihalyi's concept of flow explains what conditions are needed to enjoy learning and how this makes it easier.[7] To optimise learning, one must find a good balance between skill and challenge. If skills are low and the challenge high, the learner is likely to experience anxiety, making it difficult to learn. However, if the challenge is low, it will often lead to apathy or boredom. During the day, individuals encounter different tasks in several of these states, but the best learning happens when one achieves a sense of flow. That is when both the skill and the challenge are high. It is important that the task is solvable, yet sufficiently

[5] Dreyfus, 'Intelligence without Representation'.
[6] Dreyfus, 'Intelligence without Representation'. P. 369
[7] Csikszentmihalyi, 'Flow and Education'.

challenging. “The flow experience – is what you feel when you’re doing things that are so enjoyable that you want to pursue them for their own sake.”[8] However, flow is more than just enjoyment.

According to Csikszentmihalyi, there are nine conditions needed to achieve flow. The conditions include a match between skill and challenge, and clear goals with immediate feedback. It is also important to have deep concentration, where problems are forgotten, and self-consciousness and the sense of time disappear. However, one must still feel in control. The experience also becomes autotelic, meaning that “the activity that produces flow becomes its own reward.”[9]

Previous research on bridge

Dr. Christopher Shaw conducted a study comparing test results between bridge and non-bridge-playing 5th–7th graders in Illinois, USA.[10] He tested whether students who learnt bridge had greater improvements in test results for five areas: reading, maths, social studies, language, and science. There were three groups of students who all had the same teacher. Two learnt bridge and one did not. For language, the non-bridge-playing group placed in the middle, since only one bridge-playing group showed greater improvements. For the four other categories, both bridge-playing groups showed greater improvements than the non-bridge-playing group.[11] However, the study was never peer-reviewed.

[8] Csikszentmihalyi, ‘Flow and Education’. P. 132
[9] Csikszentmihalyi, ‘Flow and Education’. P. 137
[10] Shaw, ‘Carlinville, Illinois Test Score Study’.
[11] Shaw, ‘Carlinville, Illinois Test Score Study’.

Method

Research approach

Since there is little prior research on concentration and confidence in bridge players, it is important to establish whether there is any correlation, and a quantitative analysis is well suited to that. This is in line with Loseke's discussion of quantitative and qualitative methods, where he argues that rather than treating them as competitors, they are suited to different types of research questions.[12] Ragin and Amoroso agree and explain quantitative research as a "sacrifice in-depth knowledge of each individual case in order to achieve an understanding of broad patterns of covariation across many cases."[13] This study follows that logic. Quantitative research normally uses a deductive approach, where existing theories and concepts are used to understand the topic, formulate a hypothesis, and design the data collection.[14] This study primarily followed a deductive approach, drawing on theories about concentration and confidence, specifically Dreyfus' model of skill acquisition and Csikszentmihalyi's concept of flow.

By contrast, a qualitative study would include fewer participants and go into greater depth.[15] This can be used to understand why a concept appears. However, with few respondents, it is difficult to demonstrate correlation, because the study would not have enough participants to generalise to a wider population.[16] Moreover, it is preferable to establish that a pattern exists before examining why it appears. Therefore, the main analysis uses quantitative questions. Some free-text answers from the survey are included in the discussion for illustration, but they are not a part of the main analysis.

Data

The data were collected via a survey conducted by the BAMSA academic research team at the University of Stirling, UK. The survey was distributed online and through national bridge federations, with a request to forward it to junior players of all levels. The dataset covers many domains, but the focus of this study is on statements about mental wellbeing and bridge.

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[12] Loseke, 'Chapter 2: Foundations'.
[13] Ragin and Amoroso, 'Using Quantitative Methods to Study Covariation'. P. 148
[14] Loseke, 'Chapter 2: Foundations'.
[15] Loseke, 'Chapter 2: Foundations'.
[16] Ragin and Amoroso, 'Using Quantitative Methods to Study Covariation'.

The age limit is based on international junior categories. In the World Bridge Federation, the oldest junior category is up to and including the year a player turns 30.[17] However, as the survey ran from autumn 2025 to spring 2026, the age group was expanded to include players whose final junior year was 2025, ensuring that eligibility did not depend on when players answered the survey. Thus, the dataset covers players under 32, and older respondents were excluded, leaving 909 valid responses. The responses came from a wide range of players, from complete beginners playing for less than six months to world champions who had been playing for over ten years.

There are two key criteria needed to claim representativeness. Firstly, there must be enough responses both overall and for each variable. The dataset has 909 responses, which, if sampled correctly, would be sufficient for a representative sample.[18] Secondly, the respondents need to be selected randomly, so every type of person is as likely to be represented.[19] The survey was open to everyone in the age group, but participation was voluntary, resulting in a self-selected sample. It is important to consider who chose to answer, since respondents who are particularly engaged, satisfied, or dissatisfied may be overrepresented compared to the general population of young bridge players. When biases affect the sample, it is not possible to claim that it is fully representative. However, a fully representative sample is uncommon in social research and not necessarily a problem if the findings are presented more cautiously.[20]

Hypotheses

As an extension of the research question, six hypotheses were formulated. The first three are for concentration, with the null hypothesis expecting no effect, and two alternatives expecting increased or decreased concentration with higher bridge engagement. The same three types of hypotheses were formulated for confidence. If there is insufficient evidence for hypotheses H^1 or H^2, the null hypothesis is kept. Bridge engagement is operationalised as level, length, and frequency of play. Age and gender are included as control variables.

Hypotheses for concentration

Ha^0 Higher engagement with bridge has no effect on self-reported levels of concentration.

[17] World Bridge Federation, 'Eligibility regulations'.
[18] Krejcie and Morgan, 'Determining Sample Size for Research Activities'.
[19] Loseke, 'Chapter 7: Samples'.
[20] Loseke, 'Chapter 7: Samples'.

Ha^1 Higher engagement with bridge is associated with higher self-reported levels of concentration.

Ha^2 Higher engagement with bridge is associated with lower self-reported levels of concentration.

Hypotheses for confidence

Hb^0 Higher engagement with bridge has no effect on self-reported levels of confidence.

Hb^1 Higher engagement with bridge is associated with higher self-reported levels of confidence.

Hb^2 Higher engagement with bridge is associated with lower self-reported levels of confidence.

Variables

This paper focuses on two statements as the dependent variables: "Bridge has helped me develop better concentration" and "Bridge has increased my confidence." Both use Likert-scale responses with 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, and 5 = Strongly agree.

Five independent variables were also used. Three capture the levels of engagement with bridge: level of play (level), frequency of play (frequency), and length of play (length). The variables were chosen from the theoretical framework. Dreyfus focuses on level, which is likely correlated with frequency and length, since a player typically plays more to improve. Frequency and length were therefore chosen to capture different aspects of bridge engagement. The two other independent variables are demographic controls: age and gender. These were included to test whether the observed differences were attributable to characteristics of the game or the players.

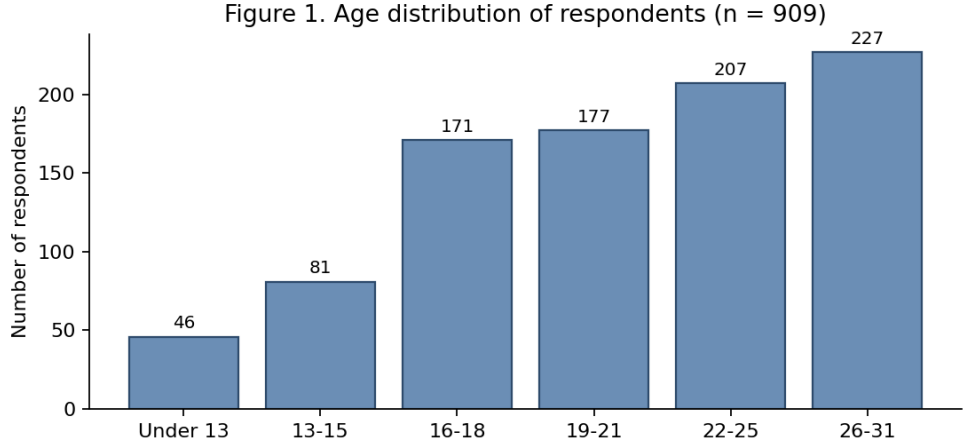
A few categories had to be adjusted to preserve representativeness and anonymity. For the question "How likely are you to continue playing bridge in the next 5 years?" over 90% answered that they "probably" or "definitely" would continue to play bridge. Since that made the three other categories very small, the question was excluded from the analysis. For the frequency variable, the "other" category was small, with only 2.4% of the responses, and was excluded from the analysis.

A similar issue occurred with the gender variable, where only a few answered something other than male or female. Thus, to keep both representativeness and anonymity, the analysis only includes the two largest categories, male and female. The male-to-female ratio was

exactly two to one. This may seem surprising, since females are more likely to answer a questionnaire.[21] However, there are more males playing bridge, especially at higher levels, including among young players. There are five junior categories in international championships, where under 16, under 21, under 26, and under 31 are open to all, while the under 26 women category is exclusively for women. The female category is always the smallest one, and the open categories have a large majority of male players. At a BAMSA conference on bridge and gender, a panellist reported that women made up 14% of the players in the under 26 open category at the 2019 European Championship.[22] Hence, even an exclusive female category does not compensate for the number of male players in the open categories, and the strong overrepresentation of males was replicated in the survey.

The last independent variable is level, where only 2% of the respondents answered "complete beginner". The "novice" category was also considerably smaller than the rest of the categories, so they were merged into one category called "beginner". The distribution of the independent variables is presented below, with age and length as figures and frequency and level as tables:

Figure 1. Age distribution of respondents (n = 909)



[21] Porter and Whitcomb, 'Non-Response in Student Surveys: The Role of Demographics, Engagement and Personality'.
[22] Sjødal, 'Why We Need the under 26 Women Category'. Note: There are no official records of gender for players participating in international championships.

Figure 2. Length of bridge experience (n = 909)

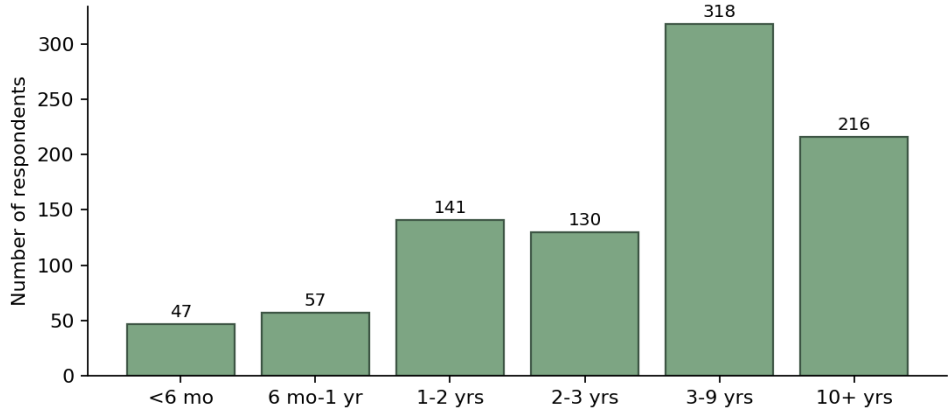


TABLE 1

Frequency

Frequency	n	%
Occasionally/rarely	78	8.60%
A few times per month	71	7.80%
Once per week	176	19.40%
Several times per week	209	23.00%
Daily	353	38.80%
Other (excluded)	22	2.40%

Note The "Other" category is displayed descriptively but excluded from inferential analyses.

TABLE 2

Level

Level	n	%
Beginner	124	13.60%
Intermediate (play regularly, understand strategies)	233	25.60%
Advanced (compete in tournaments)	282	31.00%
Expert (represent country internationally)	270	29.70%

Analytical strategy

The analysis was completed in three steps: descriptive statistics, bivariate tests for each independent variable, and a multivariate ordinal logistic regression. Each step was conducted for both concentration and confidence.

For the bivariate analyses, a Mann–Whitney U test was used for gender, since it only includes male and female respondents.[23] The rest of the independent variables had more than two

[23] Chicco et al., *A Simple Guide to the Use of Student's t-Test, Mann-Whitney U Test, Chi-Squared Test, and Kruskal-Wallis Test in Biostatistics*.

categories, thus a Kruskal–Wallis test was used.[24] After the calculations were complete, the p-values were adjusted with the Holm correction to control the family-wise error rate. The Holm correction is preferred over the Bonferroni correction because Holm has "a non-negligible increase of power" compared to Bonferroni.[25]

The bivariate analyses shows whether an independent variable is associated with the dependent variable on its own. However, some of the independent variables, such as level, frequency, and length, are correlated themselves. To address this, an ordinal logistic regression, a type of multivariate logistic regression, was conducted. It estimates the association between each independent variable and the outcome, holding the others constant. This helps distinguish overlapping from independent effects. An ordinal logistic regression is the appropriate test when the dependent variable is ordinal with more than two categories.[26]

Before the ordinal regression was conducted, the proportional odds assumption was checked to assess whether the effects of the predictors were constant across all cut-points of the ordinal outcome. The Brant test was used because it is well suited to ordinal categories.[27] After a multivariate regression, it is common to report an R^2 measure. However, an ordinal logistic regression cannot use a standard R^2 measure as in ordinary least squares (OLS). Because pseudo-R^2 measures are more controversial and not directly comparable to R^2 in OLS, they were not included here.[2829]

In addition, a Spearman's correlation test was run to examine the relationship between confidence and concentration. Spearman's rho was chosen because both variables are ordinal and it does not require interval-level measurement.[30]

Positionality

The paper is focused on the junior bridge community, which the author is a part of. The author is a professional bridge player and teacher with an interest in seeing the game presented favourably. An insider position has both risks and benefits. The main risk is bias,

[24] Chicco et al., *A Simple Guide to the Use of Student's t-Test, Mann-Whitney U Test, Chi-Squared Test, and Kruskal-Wallis Test in Biostatistics*.
[25] Holm, 'A Simple Sequentially Rejective Multiple Test Procedure'. P. 68
[26] O'Connell, 'Background: Logistic Regression'.
[27] Liu et al., 'On Testing Proportional Odds Assumptions for Proportional Odds Models'.
[28] Veall and Zimmerman, 'Pseudo-R2 Measures for Some Common Limited Dependent Variable Models'.
[29] Simonetti et al., 'Goodness of Fit Measures for Logistic Regression Model: An Application for Students' Evaluations of University Teaching'.
[30] Alshahrani, 'Statistical Reproducibility of Correlation Tests: Pearson, Spearman, and Kendall'.

with the possibility of a more sympathetic reading of the data and drawing on personal experiences in the interpretation. To manage this risk, the analysis relies on survey data and covers limitations of the study in the discussion. However, there are also positive aspects of being an insider researcher. Bridge is a complex game that takes time to master, so understanding the principles of the game can help in interpreting the responses.

Results

Both variables had a median of 4 (Agree), but concentration had a mean of 4.03 and confidence 3.59. One respondent skipped the confidence question and three the concentration one, leaving a valid *n* of 908 and 906.

TABLE 3

Distribution of responses across agreement categories

Variable	Strongly disagree *n (%)*	Disagree *n (%)*	Neither *n (%)*	Agree *n (%)*	Strongly agree *n (%)*
Concentration	11 (1.2%)	47 (5.2%)	163 (18.0%)	368 (40.6%)	317 (35.0%)
Confidence	32 (3.5%)	85 (9.4%)	302 (33.3%)	292 (32.2%)	197 (21.7%)

SUB-TABLE 3.1

Collapsed agreement and disagreement percentages

Variable	Agree + strongly agree (%)	Disagree + strongly disagree (%)
Concentration	75.6%	6.4%
Confidence	53.9%	12.9%

SUB-TABLE 3.2

Summary statistics for concentration and confidence

Variable	Valid n	Mean	SD	Median
Concentration	906	4.03	0.92	4
Confidence	908	3.59	1.04	4

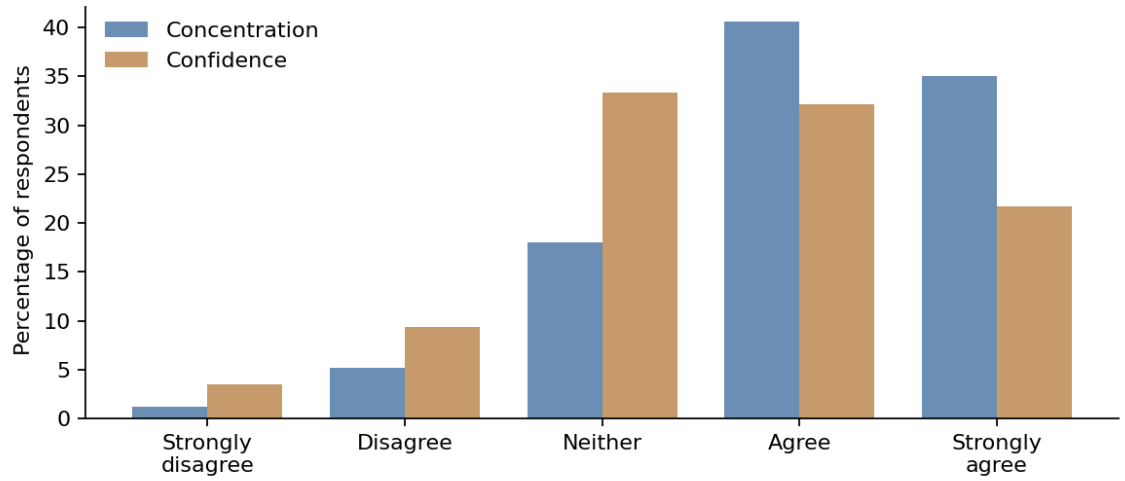


Figure 3: Distribution of responses for concentration and confidence

A majority of respondents indicated that playing bridge was associated with increased concentration and confidence. For concentration, 75.6% agreed or strongly agreed and only

6.4% disagreed or strongly disagreed. Confidence was reported less positively, but a majority (53.9%) agreed or strongly agreed, while 12.9% disagreed or strongly disagreed.

Spearman's correlation between concentration and confidence was $r_s = 0.336$, $p < .001$, indicating a moderate positive association: players who reported higher concentration tended to report improved confidence.

Results for concentration

TABLE 4

Associations between independent variables and concentration

Bivariate results using Holm-adjusted p-values

Independent variable	Mean range	Pattern	Holm-adjusted *p*-value
Age	3.89 to 4.15	No clear difference across age groups	.367
Gender	4.00 to 4.06	Very small difference between males and females	.275
Level	3.63 to 4.20	Concentration increased from beginner to expert	< .001***
Length	3.51 to 4.20	Concentration was higher among those with longer playing experience	< .001***
Frequency	3.73 to 4.17	Concentration was highest among those playing several times per week or daily	< .001***

Note. Mean range refers to the lowest and highest observed subgroup means for the outcome. Holm-adjusted *p*-values come from the bivariate analyses. Significance is defined as adjusted * p < .05, ** p < .01, *** p < .001.

The bivariate analysis showed that level, length, and frequency were significant for concentration. More engaged players with a higher level, more frequent play, or longer experience reported greater improvements than newer or less experienced players. Age and gender had no significant effect. Consequently, bridge-specific variables affected concentration, while demographic variables did not. These tests indicate correlation, not necessarily causality.

A Brant test was conducted before the ordinal logistic regression. For concentration, $p = 0.999$ indicated that the proportional odds assumption was satisfied.[31] Since the gender analysis only included male and female, and the "other" category in frequency was excluded, the valid *n* for concentration was 863.

[31] Liu et al., 'On Testing Proportional Odds Assumptions for Proportional Odds Models'.

TABLE 5

Logistic regression results predicting concentration

Predictor	Category	OR	95% CI	SE	*p*
Age					
	Under 13	*ref*			
	13-15	0.64	[0.33, 1.25]	0.34	.194
	16-18	0.57	[0.31, 1.06]	0.31	.075
	19-21	0.59	[0.32, 1.10]	0.32	.096
	22-25	0.33***	[0.18, 0.61]	0.31	<.001
	26-31	0.38**	[0.20, 0.70]	0.32	.002
Gender					
	male	*ref*			
	female	0.92	[0.70, 1.20]	0.14	.516
Level					
	beginner	*ref*			
	intermediate	1.23	[0.74, 2.03]	0.26	.429
	advanced	1.34	[0.76, 2.37]	0.29	.312
	expert	1.67	[0.91, 3.07]	0.31	.096
Length					
	Less than 6 months	*ref*			
	6 months - 1 year	1.08	[0.52, 2.23]	0.37	.843
	1-2 years	1.37	[0.70, 2.68]	0.34	.358
	2-3 years	1.81	[0.88, 3.73]	0.37	.106
	3-9 years	1.94	[0.96, 3.94]	0.36	.066
	10+ years	2.68*	[1.26, 5.70]	0.38	.010
Frequency					
	Occasionally/rarely	*ref*			
	A few times per month	1.50	[0.80, 2.80]	0.32	.203
	Once per week	1.01	[0.60, 1.70]	0.26	.962
	Several times per week	1.85*	[1.08, 3.19]	0.28	.026
	Daily	1.52	[0.91, 2.53]	0.26	.112

Note. OR = odds ratio. SE = standard error of the log-odds, computed from the saved confidence intervals. 95% CI = 95% confidence interval. Significance: * p < .05, ** p < .01, *** p < .001. Reference categories are shown in italics. Valid n = 863.

Age was not significant in the bivariate analysis, but the two oldest age groups (22-25 and 26-31) were significant in the multivariate analysis. Because the independent variables substantially overlapped, age alone did not explain the results. When other variables were held constant, older players were less likely to report improved concentration than players under 13. This overlap also reduced the number of significant variables. Only 10+ years of play and playing several times per week remained significant alongside the oldest age groups, both associated with a higher likelihood of improved concentration. Playing daily was not significant.

Results for confidence

TABLE 6

Associations between independent variables and confidence

Bivariate results using Holm-adjusted p-values

Independent variable	Mean range	Pattern	Holm-adjusted *p*-value
Age	3.42 to 3.67	No clear difference across age groups	.367
Gender	3.44 to 3.66	Males reported slightly higher confidence than females	.006**
Level	3.09 to 3.94	Confidence increased from beginner to expert	< .001***
Length	3.28 to 3.74	Confidence was higher among those with longer playing experience	< .001***
Frequency	3.31 to 3.91	Confidence was highest among those playing several times per week or daily	< .001***

Note. Mean range refers to the lowest and highest observed subgroup means for the outcome. Holm-adjusted *p*-values come from the bivariate analyses. Significance is defined as adjusted * p < .05, ** p < .01, *** p < .001.

For confidence, the bivariate analysis showed more significant independent variables. Gender, level, length, and frequency were significant, while age was not. Level, length, and frequency showed the same trends as for concentration. More engaged players reported higher improvements in confidence. All bridge-specific variables were significant, and males reported slightly higher improvements than females. As with concentration, these tests indicate correlation, not causality.

In the ordinal logistic regression for confidence, the valid *n* was 865 for the same reasons as for concentration. The Brant test gave $p = 0.985$, indicating that the proportional odds assumption was satisfied.[32]

[32] Liu et al., 'On Testing Proportional Odds Assumptions for Proportional Odds Models'.

TABLE 7

Logistic regression results predicting confidence

Predictor	Category	OR	95% CI	SE	*p*
Age					
	Under 13	*ref*			
	13-15	0.70	[0.37, 1.32]	0.33	.270
	16-18	0.67	[0.37, 1.21]	0.30	.184
	19-21	0.67	[0.37, 1.23]	0.31	.196
	22-25	0.81	[0.46, 1.46]	0.30	.490
	26-31	0.79	[0.44, 1.44]	0.31	.449
Gender					
	male	*ref*			
	female	0.82	[0.63, 1.07]	0.13	.146
Level					
	beginner	*ref*			
	intermediate	1.68*	[1.02, 2.75]	0.25	.040
	advanced	2.13**	[1.22, 3.71]	0.28	.008
	expert	3.76***	[2.07, 6.81]	0.30	<.001
Length					
	Less than 6 months	*ref*			
	6 months - 1 year	0.69	[0.34, 1.42]	0.37	.315
	1-2 years	0.62	[0.32, 1.19]	0.34	.151
	2-3 years	0.70	[0.35, 1.40]	0.36	.312
	3-9 years	0.77	[0.39, 1.54]	0.35	.461
	10+ years	0.70	[0.34, 1.46]	0.37	.343
Frequency					
	Occasionally/rarely	*ref*			
	A few times per month	0.94	[0.51, 1.73]	0.31	.845
	Once per week	0.90	[0.54, 1.50]	0.26	.689
	Several times per week	1.89*	[1.11, 3.22]	0.27	.018
	Daily	1.15	[0.70, 1.90]	0.26	.581

Note. OR = odds ratio. SE = standard error of the log-odds, computed from the saved confidence intervals. 95% CI = 95% confidence interval. Significance: * p < .05, ** p < .01, *** p < .001. Reference categories are shown in italics. Valid n = 865.

For the multivariate analysis of confidence, only level and frequency had significant effects. All levels were significant compared to beginners, with higher levels associated with stronger effects. More experienced players were more likely to report improved confidence, and expert players were almost four times as likely as beginners to be in a higher confidence category, holding age, gender, length, and frequency constant. As with concentration, playing several times per week was significantly related to increased confidence, whereas playing daily was not.

Discussion

The results showed that a majority believed that playing bridge increased both their confidence and concentration. These are important traits in everyday life, and there is concern that they have declined among younger generations with the rise of social media.[33] This was mentioned by some respondents, such as this 19–21-year-old:

> I think concentration and memory is specifically beneficially especially in today's day and age. There are many classmates who cannot get off short-form content on their phones and being able to really think deeply about something for long periods of time is becoming less and less common in day to day life.

75.6% reported that their concentration had increased after they started playing bridge, where 35% strongly agreed. This is consistent with Csikszentmihalyi's concept of flow.[34] He argues that motivation is an important factor in learning, and most people learn bridge voluntarily, primarily because they enjoy it. The most productive learning comes in a flow state, where one works more automatically and loses track of time and everyday problems.[35] To achieve this state, the task must be sufficiently challenging but solvable, and bridge provides such challenges frequently. Every board is important, so players must maintain concentration throughout the tournament, since distractions hinder the flow state. Thus, performing well in bridge requires temporarily forgetting other concerns.

Csikszentmihalyi identifies nine conditions needed for the flow state.[36] These fit well with bridge. Most bridge players have goals, either for each tournament or for the long term. Additionally, every board has a clear goal of how many tricks to take, so players receive frequent and immediate feedback. Challenges can be adjusted to match skill level, for example by competing in tournaments for less experienced players or focusing on different bids or playing techniques. Since beginners are not aware of more advanced techniques, they can evaluate their performance relative to their skill level and experience a sense of achievement. Bridge is primarily a game of skill, rather than luck, allowing players to feel in control of their performance. Tournaments for experienced players often last around eight hours, requiring sustained concentration throughout. Thus, players need to set aside both

[33] Saxena, 'A Study on Impact of Social Media on Productivity of College Students'.
[34] Csikszentmihalyi, 'Flow and Education'.
[35] Csikszentmihalyi, 'Flow and Education'.
[36] Csikszentmihalyi, 'Flow and Education'.

everyday problems and previous boards, especially mistakes.[37] The remaining conditions also align well with bridge. Some are discussed later, whereas others fall outside the scope of this paper. The concept of flow is therefore useful for understanding why bridge players report improved concentration, a view supported by the large proportion of respondents who indicated that bridge increased their ability to concentrate.

Dreyfus' model of skill acquisition describes how learners progress.[38] Although illustrated with chess, the model also applies to bridge and helps explain players' improved concentration and confidence. The learning process is not linear, and both concentration and confidence can vary across stages.[39] Novices require problems to be broken into smaller parts, such as practicing with one suit. Mastering these elements typically increases confidence, but learners must progress to more demanding tasks, in line with Csikszentmihalyi.[40] Consequently, concentration and confidence may temporarily decline until they master new challenges. When players become competent, they know most techniques but struggle to select the appropriate one, which may lead to lower confidence. Proficient learners have automated most techniques and recognise when intuition is insufficient, helping them focus deliberately, which enhances both concentration and confidence. Even experts are not flawless, and their belief that they should perform better can lead to a temporary drop in confidence. Both Dreyfus and Csikszentmihalyi focus on learning processes and on advancing to maintain concentration, which also influences confidence.

Spearman's correlation showed a moderate relationship between concentration and confidence ($r_s = 0.336$), indicating that players who reported improved concentration tended to report improved confidence. This is consistent with both Csikszentmihalyi's concept of flow and Dreyfus' model of skill acquisition. During a period of flow, a person stops being self-conscious and then feels a stronger sense of self afterwards, which usually entails increased confidence.[41] Flow requires perceiving the task as solvable, which is facilitated by confidence, indicating a bidirectional relationship. Additionally, Dreyfus describes how concentration and confidence can vary across learning stages.[42] Thus, in periods of high

[37] Scott and Punch, 'The Physicality of Mindsports through Elite Bridge Players' Sensorial Experiences: Presence, Confidence and Bodies'.
[38] Dreyfus, 'Intelligence without Representation'.
[39] Dreyfus, 'Intelligence without Representation'.
[40] Csikszentmihalyi, 'Flow and Education'.
[41] Csikszentmihalyi, 'Flow and Education'.
[42] Dreyfus, 'Intelligence without Representation'.

concentration, increased confidence could be expected. Another potential reason is that a concentrated player will generally perform well, which may lead to improved confidence.

In the multivariate regression for both dependent variables, playing several times a week was significant, but playing daily was not. Several explanations are possible, such as playing more online, which often involves less concentration,[43] or reduced engagement if playing becomes overly habitual. There could also be biases that make the group non-representative. However, the group was the largest, with 353 responses. Since none of the open-ended questions addressed the topic, it is not possible to say why.

In the bivariate analyses, indicators of player engagement, namely higher level, longer experience, and more frequent play, were associated with improved concentration and confidence. Thus, playing occasionally or being a beginner made it less likely that players would report improvements in concentration and confidence. There was a substantial overlap between the three bridge-specific variables, all covering different aspects of engagement. This resulted in fewer variables reaching statistical significance in the ordinal logistic regression.

Age was not significant in any of the bivariate analyses, likely because older players tended to have more experience, making the effect of age alone less apparent. However, it was significant for the two oldest age groups in the multivariate regression for concentration. Older players were less likely to report improved concentration compared to those under 13, when the other variables were kept constant. Several factors may explain why older players report less improvement in concentration. Younger players may not clearly distinguish improvement due to bridge from maturing. Older players have also often played longer and may not accurately recall their concentration before they started. Both potential biases are discussed in the limitations section.

Limitations

Both confidence (12.9%) and concentration (6.4%) have low levels of disagreement. “Neither” is larger for both statements, with 18% for concentration, and quite substantial for confidence with 33.3%. It is important to consider how respondents interpreted the categories, specifically whether disagree was interpreted as worse or not improved, and how

[43] Brkljačić et al., ‘Well-Being, Motives and Experiences in Live and Online Game Settings: Case of Contract Bridge’.

neither was positioned compared to these options. There could also be differences in how much improvement one considers for strongly agree compared to agree. These interpretations mean that the percentages should be interpreted cautiously. However, the parts of the analyses that look at strongly agree and agree together are not affected, since both would mean perceived improvement, no matter how much.

Another important factor is that the answers are self-reported. No pre- or post-test was conducted, creating some potential biases. It may be more difficult for a person who has played a long time to remember their concentration and confidence before they started. This can lead to a top-down strategy of answering, where a general value can influence the answer, instead of their actual previous state.[44] It may also be difficult to determine whether improvements in concentration were due to bridge or maturing. Players who began early may differ from peers, but it is unclear whether they chose bridge because they like to concentrate, or if they became more focused through playing. In a small sample it is difficult to detect correlation, and even with larger samples it can be challenging to establish causation.

Someone who enjoys bridge may also unconsciously or consciously give more positive answers, because they believe it can help recruitment to a sport they enjoy.[45] The survey was distributed on social media and by federations, so players who actively participate in the community were more likely to see the survey. These potential biases are difficult to control for. However, that does not invalidate the results. If the results are interpreted cautiously, it is possible to make inferences.

Most tests in social science have biases.[46] A potential way to measure concentration is by using school results, as in Dr. Shaw's study of young bridge players in Illinois.[47] He used tests conducted by the school for all students, where some learnt bridge and others did not. However, that does not directly measure concentration, and can also be influenced by other factors, such as more studying or a new teacher. Even tests directly measuring concentration have confounding variables, such as variation in concentration from day to day. Confidence is more difficult to measure without using self-reported answers. Therefore, even if self-reported answers must be interpreted cautiously, it is still a valuable method for assessing subjective concepts.

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[44] Yan, '15 - Self-Report Measures'.
[45] Yan, '15 - Self-Report Measures'.
[46] Loseke, 'Chapter 7: Samples'.
[47] Shaw, 'Carlinville, Illinois Test Score Study'.

The group of respondents was heterogeneous, with variation in most variables. That made it more difficult to include a control group, since there were no clearly defined start and end times, without limiting the participants in the study. Moreover, this study did not collect new data but instead used an existing dataset, which did not include a control group. Instead, the analyses looked at beginners compared to more experienced players, and at players who had played less than six months compared to longer. This was not a control group, but it examined differences between players with little and more experience. Since the bivariate analyses showed that greater experience was associated with higher levels of agreement, this confirms that the groups differed.

Implications

Realising the benefits of playing bridge requires that concentration and confidence transfer to everyday life. That was addressed by the question "In what ways has bridge benefited you personally (e.g. academically/at work)?" Several respondents mentioned both confidence and concentration. Five responses specifically mentioned school or studies, while others referred generally to improved concentration. A 16–18-year-old saw clear improvements in their studies after they started playing bridge:

> Bridge has done wonders for me. I have been playing it for two years and I have already seen noteworthy improvements in my academics, concentration and memory. I am able to visualise a lot better and have to study much lesser to master and understand any concept taught in school. I would say this is all thanks to bridge.

This person reported that after learning to concentrate through bridge, they transferred it to school. This aligns with the last condition of Csikszentmihalyi's flow. Once you have experienced it, you want to feel it again.[48] Confidence was also mentioned as a reason for improved academic results, for example, this 19–21-year-old wrote: "My tournament results gave me a sense of achievement, and it also helped build my confidence which was useful in … exam situations." This supports the argument that confidence and concentration are closely related. Csikszentmihalyi argues that trying to solve a task that is too difficult leads to nervousness. However, a confident person may believe they can solve more problems, moving them from nervousness to flow.[49]

[48] Csikszentmihalyi, 'Flow and Education'.
[49] Csikszentmihalyi, 'Flow and Education'.

These results may also be important for both schools and bridge federations. By showing that bridge players self-report higher levels of both concentration and confidence, it may be easier to convince schools to teach bridge to their students. Federations around the world are trying to implement bridge as part of school or as an after-school activity. Research showing the benefits of bridge may help convince schools to participate in the project. This may help federations to promote bridge and schools to foster better concentration and confidence among students.

Conclusion

This paper examined concentration and confidence in bridge players under the age of 32. The research question was: To what extent does participation in bridge relate to self-reported levels of concentration and confidence in young bridge players? Additionally, the hypotheses focused on bridge engagement, operationalised as level, length, and frequency of play. Age and gender were included as control variables. The study was based on a questionnaire developed by the BAMSA research team.

The Ha hypotheses covered concentration and Hb confidence. The null hypotheses were: "Higher engagement with bridge has no effect on self-reported levels of concentration or confidence." Ha^1 and Hb^1 predicted increased levels of concentration or confidence, and Ha^2 and Hb^2 decreases. Bivariate analyses showed significant associations between all three bridge engagement variables and both concentration and confidence. Neither control variable was significant for concentration, but males reported higher confidence than females.

Because the three bridge engagement variables partly overlapped, fewer variables remained significant in the multivariate analysis. However, playing several times a week was significant for both. Playing more than ten years also remained significant for concentration. For confidence, all playing levels were significant compared to beginners, with more experienced categories showing stronger effects. Thus, greater experience was associated with increased confidence. These findings support Ha^1 and Hb^1: "Higher engagement with bridge is associated with higher self-reported levels of concentration or confidence." The competing hypotheses were rejected.

Overall, 75.6% self-reported improved concentration and 53.9% increased confidence after they began playing bridge. Although the question covers change after they started to play, it is difficult to establish causation, since it is impossible to control for all other factors, and the results are self-reported. Nonetheless, the results indicate a relationship between bridge and both concepts, which strengthens with higher bridge engagement.

As this was the first study on young bridge players and mental wellbeing, this research can be extended in several ways. One option is to analyse other concepts from the survey not covered here. A second option is a qualitative study on why players believe their concentration and confidence improved after starting bridge. Finally, more accurate measures

of concentration and confidence would allow more robust causal assessments. However, as discussed earlier, this is challenging.

Overall, the study indicates an association between bridge engagement and young players' self-reported levels of concentration and confidence. Federations may use these findings to present the potential benefits of bridge to new players and schools.

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