



Temperamental and Neurocognitive Predictors in Korean Basketball League Draft Selection

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Objective This study hypothesized that physical status, temperament and characteristics, and neurocognitive functions of basketball players could predict the result of Korean Basketball League (KBL) draft selection.

Methods We recruited the number of 89 college elite basketball players (KBL selection, n=44; non-KBL selection, n=45), and the number of 82 age-matched healthy comparison subjects who major in sports education in college. All participants were assessed with the Temperament and Character Inventory, Sports Anxiety Scales, Beck Depression Inventory, Perceived Stress Scale-10, Trail Making Test, and Computerized Neuro-cognitive Test for Emotional Perception and Mental Rotation.

Results Current results showed that physical status, temperament and characteristics, and neurocognitive functions of college basketball players could predict the KBL draft selection. Among temperament and characteristics, novelty seeking and reward dependence were associated with KBL draft selection. The basketball performances including average scores and average rebound were associated with Emotional Perception and Mental Rotation.

Conclusion In order to be a good basketball player for a long time, it was confirmed that temperamental factors and neurocognitive factors were very closely related. Furthermore, it is also judged that these results can be used as basic data to predict potential professional basketball players.

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Keywords Novelty seeking; Reward dependence; Neurocognition, Korean Basketball League.

INTRODUCTION

Korean Basketball League and draft situation

The Korean Basketball League (KBL) holds an annual draft to allow teams to select new players, mostly graduates from the elite college basketball teams even though some are from high school teams. Recently, many college players want to register for the draft even before they graduate college, just like the National Basketball Association. The draft order is determined by the previous season's results, with the teams that finished 7–10th place in the regular season receiving the highest chance to pick the first player in the draft (<https://www.kbl.or.kr/story/rule>). The draft process involves teams selecting

players in turn until all available spots are filled, each team would pick 3–4 players every year. Recently, the KBL introduced a modified draft system aimed at increasing transparency and reducing potential conflicts of interest. The new system involves a lottery to determine the draft order, with the odds of winning the lottery weighted based on the team's performance in the previous season. 60–70 people register to the KBL draft to be professional basketball players every year, but only half of them would get selected by the KBL teams (<http://www.sportsq.co.kr/news/articleView.html?idxno=206368>).

Temperament and characteristics for elite sports players

In sports games, many factors might influence the success of an athlete. In addition to possessing excellent physical and technical factors, success in a sports game is also influenced by remarkable psychological factors.¹ In particular, the temperament and characteristics of players have been regarded as crucial determinants of the player's performance and goal. In this regard, numerous studies suggest that personality is considered to be an important predictor of long-term success in

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professional sports.²⁻⁴ In Big Five Personality Model, Piepiora and Piepiora⁵ reported that elite athletes showed a lower level of neuroticism and a higher level of extraversion, openness to experience, agreeableness, and conscientiousness, compared to non-elite athlete. A Temperament and Character Inventory (TCI) based study by Kang et al.⁶ assert that predictive temperamental factors for success in baseball players include traits of novelty seeking (NS) and reward dependence (RD). In addition, esports elite pro-gamers and pro-baseball elite players were similar in their higher levels of NS, self-directedness, and self-transcendence.⁷

The TCI measures four higher-order personality dimensions, as defined by Cloninger.⁸ The temperament traits are defined in terms of individual differences in associative learning in response to areas of novelty, danger or punishment, and reward.⁹ The inventory is used to analyze the temperamental traits of NS, harm avoidance (HA), RD and persistence. Generally, the risk-taking and exploratory features of NS are often highlighted. However, there are also several factors of NS that may be described as self-regulatory skills, such as limiting impulsivity.¹⁰ On the other hand, HA is related to the inhibition or cessation of behaviors, passive avoidance, shyness of strangers, and rapid fatigability. RD is related to the maintenance or continuation of ongoing behaviors, sentimentality, and social attachment.

Psychological and neurocognitive factors for elite sports players

Several studies reported that elite sports players can control their anxiety during competition, which may lead to better performance.¹¹ This result means that the upper player group has a lower anxiety level compared to the lower player group.⁶ Mitić et al.¹² reported that elite athlete showed higher score in self-efficacy, emotionality, present fatalistic time perspective, past positive time perspective, and openness to experience, compared to non-elite athlete. Not only that higher ranking players show increased brain activation in response to performance errors, indicating that they are controlling their anxiety.

Recently, many studies have focused on this neurocognitive aspect of athletes.¹³⁻¹⁵ Kang et al.⁷ reported that pro-baseball players performed significantly faster in the Emotional Perception and Mental Rotation tests. Their faster reaction times in these two tests suggest that they have superior intuitive perception. In connection with this result, they reasoned that intuitive perception is a key characteristic of becoming a professional baseball player. Mental rotation skills signify people's ability to spatially transform two-dimensional (2D) or three-dimensional (3D) objects or bodies from one orientation in mental space to another.¹⁶ On the other hand, emo-

tional perception skills refer to the ability to recognize and interpret facial expressions, which are one of the nonverbal signals.¹⁷

Hypothesis

Based on previous reports and studies, we hypothesized that physical status, temperament and characteristics, and neurocognitive functions of basketball players could predict the result of KBL draft selection. Especially, temperament and characteristics were associated with the result of KBL selection. The basketball performances including average scores and average rebound were associated with Emotional Perception and Mental Rotation.

METHODS

Participants

We recruited the number of 89 college elite basketball players in five colleges, and the number of 82 age-matched healthy comparison subjects who major in sports education in three colleges. All participants were selected for recruitment by simple random sampling. Upon securing their permission, we visited three different elite college basketball teams and the sports education college of Chung-Ang University. From August 1st, 2019 to August 1st 2022, all elite college basketball players recruited were members of the Korea University Basketball Association.

Depending on whether the players were drafted by any professional team or not, we describe them as KBL selection and non-KBL selection. The total number of 89 players (KBL selection, n=44; non-KBL selection, n=45) agreed to participate in our study. The protocol of the present study was approved by the Institutional Review Board of Chung-Ang University (1041078-202108-HR-261-01), and written informed consent was provided by all participants.

Measures

TCI

The Korean version of the TCI was used for trait analysis.¹⁶ The inventory consists of 240 items of true or false questions to evaluate four dimensions of temperament and three dimensions of character. The Cronbach's α and test-retest reliability of TCI have been previously reported as 0.77 and 0.81, respectively.¹⁸

Sports Anxiety Scales

The Korean version of the Sports Anxiety Scale (SAS) form K with 21 items (nine for somatic anxiety, seven for worry anxiety, and five for concentration) was used to assess the

sports anxiety levels in Korean players. On a 4-point Likert-type intensity rating scale (1=not at all; 4=very much so), respondents indicated the degree to which they generally experienced the 21 anxiety-related symptoms before and during the competition. Korean SAS had Cronbach's alpha values ranging from 0.80 to 0.88.¹⁹

Beck Depression Inventory

Depression status in participants with players and healthy control subjects was measured with the Korean version of Beck Depression Inventory (BDI), a 21 item widely used self-report questionnaire covering the major features of depression.²⁰ The BDI yields a total score ranging between 0 and 63, with higher scores reflecting more severe levels of depression and was translated into Korean and checked by back-translation into English by another translation. The Cronbach's alpha and test-retest reliability of BDI translated into Korean have been previously reported as 0.91.²¹

Perceived Stress Scale-10

Stress traits in all participants were assessed using 10 items from the Perceived Stress Scale-10 (PSS-10).^{22,23} This scale measures the degree to which situations in one's life are deemed stressful. Items in this section were scored from 0 (never) to 4 (very often). Four items (4, 5, 7 and 8) that were worded in a positive direction were reversed scored. The total scores of the items in this scale can range from 0 to 40 and higher scores indicate greater levels of stress. The Cronbach's alpha and test-retest reliability of the Korean version of PSS-10 translated into Korean have been previously reported as 0.75.²⁴

Neurocognitive functions

Neurocognitive functions in all participants were assessed using an Emotional Perception test, and the Mental Rotation test (CNT-Hudit®, Seoul, Korea). The Emotional Perception test consisted of 108 questions, in which two to eight faces were presented at one time on the screen. The participants were asked to press the "same" or "different" buttons to indicate whether the faces depicted the same or different emotional expression. The possible emotional expressions were pleasant, neutral, and unpleasant, and were presented in different combinations on each trial. During the test, the mean correct rate and reaction time from presentation of the pictures to pushing of the buttons were recorded. The test-retest reliability for emotional face identification is 0.933.²⁵ Faster reaction times and more correct responses in the Emotional Perception test represent better emotional perception.

In the Mental Rotation test, the computer presented a pair of 3D objects, often rotated on a certain axis through a specific number of degrees (0°, 60°, 90°, 120°, or 180°). In some

trials, the two 3D shapes presented were the same but rotated, and in other trials the shapes were different. The participants judged whether the two 3D objects were the same or different and pressed the "same" or "different" button to indicate their response. During the test, the mean correct rate and reaction time from presentation of the pictures to pushing of the buttons were recorded. Test-retest reliability is 0.91.²⁶⁻²⁸

Trail Making Test

Part A of the Trail Making Test (TMT) asks participants to draw connecting lines between circles numbered 1–25. Part B asks participants to draw connecting lines between numbers (1–13) and letters (A–L) by turns, as quickly as possible. The progression from part A to part B ensures that participants are challenged in visual attention and processing speed. The TMT has also been shown to have high test-retest reliability for both form A and B²⁹ and has been utilized frequently in tests of executive function.³⁰

Statistical analysis

The differences of demographic characteristics, TCI, psychological including BDI, SAS, and PSS-10 and neurocognitive functions including TMT-A, B, emotional perception reaction time and correction rate, and mental rotation reaction time and correction rate between three groups were assessed using analysis of variance. The differences of average scores and average rebound between KBL selection and non-KBL selection group were analyzed using an independent t-test.

Hierarchical regression analysis is used to examine how well different sets of variables explain variation in an outcome. In this model, predictors are entered into the regression model in a series of steps to test the added predictive power of each step over the previous ones. This method is useful when researchers want to understand the incremental value of adding new variables to a model. In a current study, we added demographic variables in the first set, followed by temperament and characteristics, psychological factors, and neurocognitive functions in the next set to see if these add any additional explanatory power. In a multiple hierarchical regression analysis of all participants, a discrete set of hierarchical variables with KBL selection group as the dependent variable was added: demographic factors (age, school year, height, and weight) for Model 1, Model 1+temperament and characteristics for Model 2, Model 2+psychological factors for Model 3, and Model 3+neurocognitive functions for Model 4.

In hierarchical regression analysis, NS, RD, emotional perception correction rate, and mental rotation correction rate were associated with KBL selection. The correlation between four factors were assessed using person correlations. All statistical analyses were conducted using IBM SPSS 24 (IBM

Corp., Armonk, NY, USA). Statistical significance was set at $p < 0.05$.

RESULTS

The comparison of demographic, TCI, psychological and neurocognitive factors

There were no significant differences in age and school years among three groups (Table 1 and Figure 1). However, the height and weight in KBL selection and non-KBL selection players were significantly greater than those observed in sport students. The scores of NS and self-transcendence in KBL selection and sports students groups were significantly higher than those observed in non-KBL selection group (Table 1 and Figure 1). The scores of RD and persistence in KBL selection and non-KBL selection groups were significantly higher than those

observed in sports students. The scores of self-directedness were highest in KBL selection, compared to non-KBL selection and sports students groups (Table 1 and Figure 1). The scores of cooperativeness were highest in non-KBL selection groups, compared to KBL selection and sports students groups (Table 1 and Figure 1). The correction rate of Emotional Perception and Mental Rotation were highest in KBL selection group, compared to non-KBL selection and student groups. The average scores and average rebound in KBL selection group were higher than those observed in non-KBL group (Table 1).

Hierarchical logistic regression analysis for KBL selection group

All four models applied in the current study were significantly associated with KBL selection. In Model 4, model χ^2

Table 1. The comparison of demographic, TCI, psychological, neurocognitive factors, and basketball performance

	KBL selection ^a	Non-KBL selection ^b	Sports students ^c	Statistics, post hoc test
Demographic factors				
Age (yr)	21.2±1.2	21.1±1.1	20.8±0.9	F=1.29, p=0.281
School (yr)	13.7±1.3	13.5±1.4	13.6±1.0	F=1.88, p=0.196
Height (cm)	188.6±7.5	188.1±8.5	178.5±5.9	F=25.28, p<0.001, a=b>c
Weight (kg)	83.6±7.2	84.4±7.7	77.9±5.9	F=10.86, p<0.001, a=b>c
TCI				
Novelty seeking	21.4±3.9	15.9±4.7	19.0±4.5	F=11.08, p<0.001, a=c>b
Harm avoidance	16.7±4.5	14.9±6.9	17.6±5.5	F=2.08, p=0.092
Reward dependence	17.6±3.8	17.0±2.9	9.4±3.5	F=46.27, p<0.001, a=b>c
Persistence	5.7±1.5	6.0±1.3	3.4±1.7	F=20.00, p<0.001, a=b>c
Self-directedness	28.7±6.3	24.2±6.6	18.4±5.9	F=20.77, p<0.001, a>b>c
Cooperativeness	27.5±5.2	32.1±5.3	15.9±6.9	F=55.17, p<0.001, b>a>c
Self-transcendence	14.4±4.4	11.0±5.1	16.3±5.9	F=10.39, p<0.001, a=c>b
Psychological factors				
BDI	4.3±2.6	3.7±3.9	5.3±4.6	F=1.84, p=0.112
SAS	31.0±5.7	36.6±7.8	41.1±15.0	F=3.95, p=0.016, a<b=c
PSS-10	17.3±6.0	17.8±8.5	13.7±5.8	F=2.94, p=0.061
Neurocognitive functions				
TMT-A	18.1±3.6	19.0±6.3	20.5±4.5	F=2.87, p=0.074
TMT-B	45.4±14.8	52.0±17.4	49.4±15.8	F=1.25, p=0.375
EP-RT	2.9±1.0	2.4±0.5	2.6±1.0	F=2.72, p=0.142
EP-CR	0.88±0.10	0.77±0.14	0.72±0.08	F=15.99, p<0.001, a>b>c
MR-RT	3.1±0.66	3.1±0.90	2.6±0.87	F=1.501, p=0.199
MR-CR	0.88±0.15	0.76±0.13	0.70±0.14	F=10.902, p<0.001, a>b=c
Basketball performance				
Average scores	8.94±5.69	4.34±4.97	-	t=2.59, p=0.011
Average rebound	3.57±2.11	1.81±2.36	-	t=2.21, p=0.023

TCI, Temperament and Character Inventory; BDI, Beck Depressive Inventory; SAS, Sports Anxiety Scale; PSS-10, Perceived Stress Scale-10; TMT A-B, Trail Making Test A-B, EP-RT, CR, emotional perception reaction time, correction rate; MR-RT, CR, mental rotation reaction time, correction rate

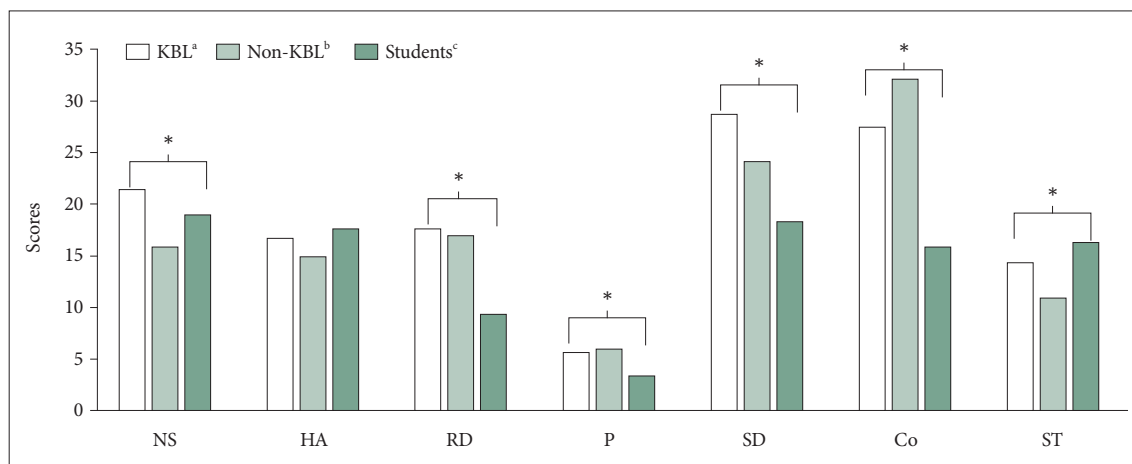


Figure 1. The comparison of Temperament and Character Inventory. *statistically significant, post hoc test. KBL, Korean Basketball League; NS (novelty seeking): $a=c>b$, HA (harm avoidance), RD (reward dependence): $a=b>c$, P (persistence): $a=b>c$, SD (self-directedness): $a>b>c$, Co (cooperativeness): $b>a>c$, ST (self-transcendence): $a=c>b$.

(58.410, $p<0.001$), and Nagelkerke's R^2 (0.798, explaining approximately 79.8% of the dependent variable, KBL selection) indicated that the model was adequate for predicting KBL selection, with an accuracy of 92.7%. Considering step χ^2 , demographic factors, TCI, and neurocognitive functions were associated with KBL selection. Of them, TCI was strongest predict factors for KBL selection ($\chi^2=27.038$, $p<0.001$), compared to demographic ($\chi^2=16.468$, $p=0.002$) and neurocognitive factors ($\chi^2=14.566$, $p=0.025$) (Table 2).

Wald statistics were used to confirm whether each variable had a significant individual relationship with KBL selection. Among all independent variables, NS, RD, emotional perception correction rate, and mental rotation correction rate were statistically significant predictors of KBL selection (Table 2).

The correlation between neurocognitive function and basketball performance

In KBL selection basketball players, the average scores were positively correlated with emotional perception correction rate ($r=0.468$, $p=0.001$) and mental rotation correction rate ($r=0.581$, $p<0.001$) (Figure 2). In addition, the average rebound was positively correlated with emotional perception correction rate ($r=0.581$, $p<0.001$) and mental rotation correction rate ($r=0.506$, $p<0.001$) (Figure 2).

DISCUSSION

Current results showed that physical status, temperament and characteristics, and neurocognitive functions of basketball players could predict the KBL draft selection. Especially NS and RD were associated with KBL draft selection. The basketball performances including average scores and average rebound were associated with Emotional Perception and

Mental Rotation.

Height and weight in basketball players

Starting with the demographic data, height and weight were rated significantly higher for KBL selection and non-KBL selection compared to sports majors. Lidor and Ziv³¹ reported that there are physical attributes that favor basketball and physical attributes that allow players to perform well at each position in basketball. In addition, the talent of basketball was demonstrated through a group comparison of the two youth basketball players that began with physical attributes as well as athletic ability.³² This might underline the importance of physical stature in elite basketball, even when not selected by the KBL draft.

NS and RD in elite basketball players

One intriguing result of this study concerns our analysis of the temperament of the players, which shows that KBL selections have higher levels of NS traits than non-KBL selections. The results show that one of the highest predictors of KBL selection might be NS. NS is thought to be a genetic tendency to feel intense excitement or arousal in response to novel stimuli or cues about potential rewards.³³ Recent research on extraversion in athletes suggests that professional athletes report being more extraverted than the average competitive athlete.³⁴ Kang et al.⁶ reported that NS may be an important temperamental indicator for rookie professional baseball players to quickly achieve a major league title. Comprehensively, athletes in dynamic, competitive environments may be naturally drawn towards novel experiences as they continuously seek to improve and find new strategies to enhance their performance.³⁵ Thus, NS was shown to one of the variables with high accuracy in predicting KBL selection.

Table 2. Hierarchical logistic regression analysis for professional basketball players

	Model 1				Model 2			
	B	Wald	Sig	OR	B	Wald	Sig	OR
Demographics factors								
Age	-1.005	0.483	0.487	0.366	-4.178	2.962	0.085	0.015
School	1.892	1.363	0.243	6.633	5.836	4.079	0.043	33.483
Height	0.140	5.157	0.013	1.160*	0.129	3.201	0.074	1.137
Weight	-0.084	1.538	0.215	0.920	-0.202	3.544	0.060	0.817
TCI								
Novelty seeking					0.441	4.917	0.027	1.654*
Harm avoidance					0.136	1.454	0.228	1.146
Reward dependence					0.394	4.243	0.039	1.493*
Persistence					0.082	0.066	0.798	1.086
Self-directedness					0.055	0.376	0.540	1.057
Co-cooperativeness					0.080	0.596	0.440	1.083
Self-transcendence					0.040	0.163	0.686	1.041
Model statistics					Model statistics			
-2LL		65.511				39.472		
Model χ^2		$\chi^2=16.468$, $p=0.002^*$				$\chi^2=43.806$, $p<0.001^*$		
Step χ^2		$\chi^2=16.468$, $p=0.002^*$				$\chi^2=27.038$, $p<0.001^*$		
Nagelkerke R^2		0.296				0.646		
Class accuracy		78.4%				88.8%		
Model 3					Model 4			
Demographics factors								
Age	-3.651	2.240	0.134	0.026	-5.009	0.655	0.418	0.007
School	5.226	3.234	0.072	18.069	7.777	1.044	0.307	23.056
Height	0.113	2.130	0.144	1.120	0.466	1.442	0.230	1.594
Weight	-0.187	2.521	0.112	0.829	-0.616	2.197	0.138	0.540
TCI								
Novelty seeking	0.392	4.612	0.037	1.470*	0.663	3.890	0.049	1.947*
Harm avoidance	0.099	0.666	0.414	1.104	0.537	1.390	0.238	1.711
Reward dependence	0.402	4.252	0.039	1.495*	0.303	3.679	0.041	1.355*
Persistence	0.041	0.015	0.902	1.042	-0.189	0.131	0.718	0.828
Self-directedness	0.056	0.303	0.542	1.057	0.198	0.983	0.422	1.219
Co-cooperativeness	0.054	0.252	0.615	1.056	0.352	1.666	0.197	1.422
Self-transcendence	0.034	0.116	0.733	1.035	0.145	0.175	0.676	1.156
Psychological factors								
BDI	0.054	0.173	0.677	1.055	0.058	0.032	0.758	1.059
SAS	-0.049	0.568	0.451	0.952	-0.085	0.852	0.356	0.919
PSS-10	0.000	0.000	0.894	1.000	-0.113	0.472	0.492	0.893
Neurocognitive functions								
TMT-A					0.281	1.128	0.188	1.325
TMT-B					-0.016	0.079	0.778	0.984
EP-RT					0.002	3.102	0.078	1.002
EP-CR					27.113	3.860	0.035	5.957*
MR-RT					-0.003	1.823	0.177	0.997
MR-CR					6.937	3.308	0.047	6.428*
Model statistics					Model statistics			
-2LL		38.435				24.868		
Model χ^2		$\chi^2=44.814$, $p<0.001^*$				$\chi^2=58.410$, $p<0.001^*$		
Step χ^2		$\chi^2=1.038$, $p=0.774$				$\chi^2=14.566$, $p=0.025^*$		
Nagelkerke R^2		0.658				0.798		
Class accuracy		89.8%				92.7%		

* $p<0.05$. OR, odds ratio; TCI, Temperament and Character Inventory; BDI, Beck Depressive Inventory; SAS, Sports Anxiety Scale; PSS-10, Perceived Stress Scale-10; TMT A-B, Trail Making Test A-B; EP-RT, CR, emotional perception reaction time, correction rate; MR-RT, CR, mental rotation reaction time, correction rate; -2LL, log likelihood

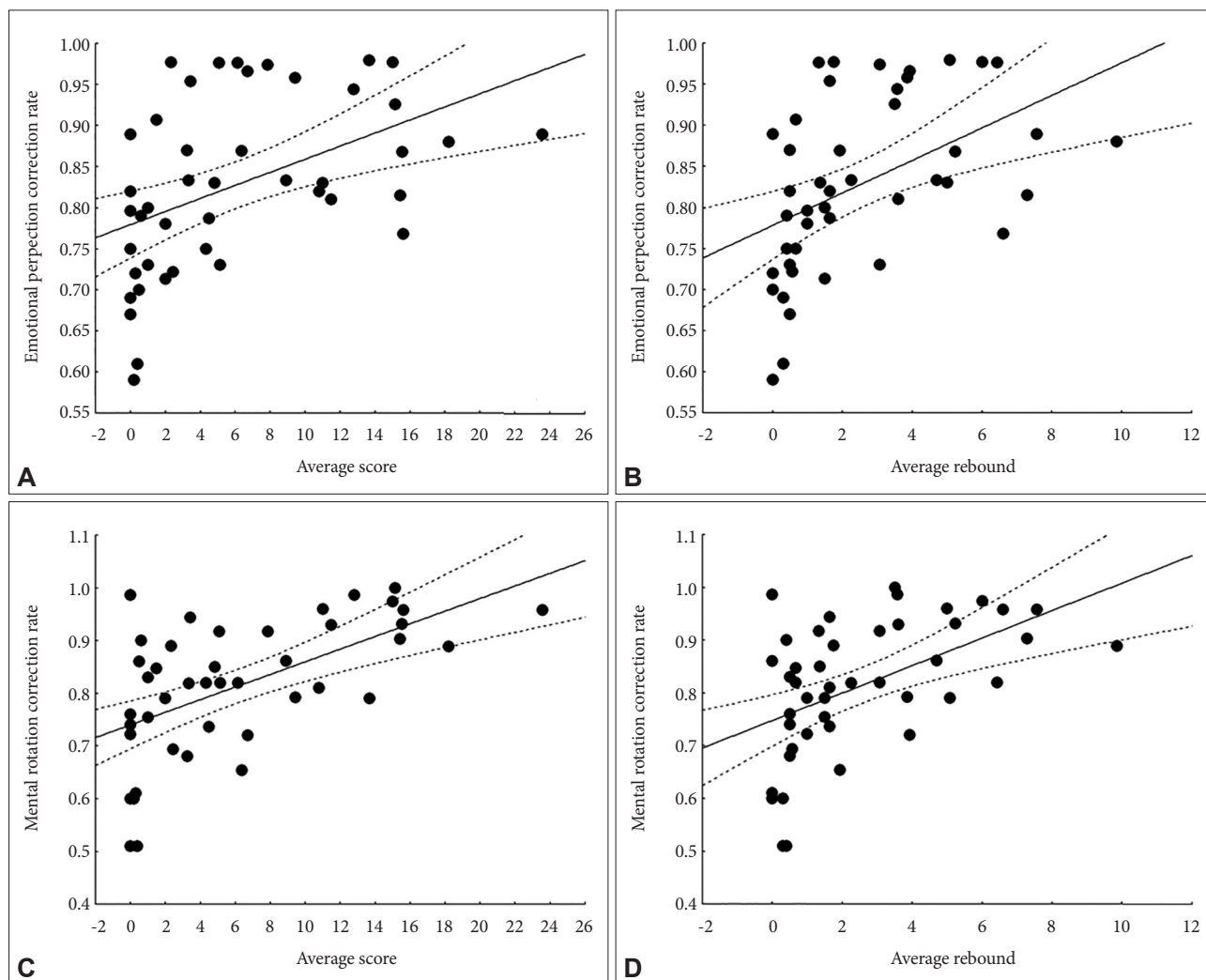


Figure 2. The correlation between neurocognitive function and basketball performance. A: Emotional perception correction rate vs. average scores ($r=0.468$, $p=0.001$). B: Emotional perception correction rate vs. average rebound ($r=0.581$, $p<0.001$). C: Mental rotation correction rate vs. average scores ($r=0.581$, $p<0.001$). D: Mental rotation correction rate vs. average rebound ($r=0.506$, $p<0.001$).

The RD was significantly higher in both KBL selection and non-KBL selection compared to sports students. The traits of individuals with high RD include persistence, hard work, sensitivity to social cues and social support, and the ability to delay gratification in anticipation of eventually receiving a reward.³³ This suggests a stronger response to rewards such as winning games or improving grades, and a greater ability to keep working toward a goal in the face of difficulty.³⁶ Interestingly, for athletes with high RD, it can affect persistence and endurance,³⁷ and baseball players with high RD were found to be associated with development as a major leaguer after the second season, not the first.⁶

The correlation between neurocognitive function and basketball performance

As a result of logistic regression analysis, Emotional Perception and Mental Rotation, which are sub-factors of neurocog-

nition, showed a significant influence relationship with KBL selections in Model 4. Therefore, the correlation between the performance indicators of KBL selected players and Emotional Perception and Mental Rotation was analyzed.

The significant positive correlations, found between both emotional perception correction rate and mental rotation correction rate with average scores and average rebounds, suggest that neurocognitive functions play a crucial role in athletic performance. These results align with previous studies that have shown the importance of cognition in sports.³⁸

In particular, mental rotation ability, which is effectively a player's ability to visualize and manipulate 2D and 3D shapes or objects in their mind, has been linked with sports performance.^{39,40} Basketball players experience several situations in which they rotate about their body axis.³⁹ Krause and Weigelt⁴¹ reported that the rotational movement characteristics of basketball are related to mental rotation. From the results of

this study and previous research, it can be predicted that the potential of axial rotational athleticism exhibited by athletes with high mental rotation is an important variable for player prediction and selection.

On the other hand, emotional perception relates to the ability to understand and manage emotions, both in oneself and in others. This is a key aspect of emotional intelligence, which has been associated with success in various fields, including sports.⁴² Athletes with high emotional intelligence are often better equipped to handle stress, maintain concentration, and work effectively within a team context.⁴³ This makes sense given that many sports, including basketball, require spatial awareness and the ability to quickly anticipate and react to changing game situations.

Limitations

This study attempted to contribute to improving the accuracy of KBL selection and providing insights that can promote more sophisticated selection processes in the future. However, the direction of follow-up research has been proposed through several limitations. First, due to the small number of subjects comprising our study, we are unable to generalize the results of the current research. Second, in order to the results of this study to contribute to the future KBL player selection, more detailed and various basketball statistical data should be used.

Clinical implication

Current results suggested that players preparing for the draft could increase their chances of selection by participating in programs that enhance these psychological traits such as NS behavior and sensitivity to rewards. In addition, sports psychologists or coaches could improve draft potential and performance by providing individualized guidance and interventions that consider players' personality traits and cognitive abilities.

Conclusions

In this study, it was found that temperament and neurocognitive factors affect basketball players' success. Through this, each professional team will be provided with evidence to predict the future success of current college players, and the possibility of improving the team's future performance is expected to increase.

Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Doug Hyun Han. Data curation: Kyungjin Oh. Formal analysis: Doug Hyun Han. Investigation: Kyungjin Oh. Methodology: Kyung Doo Kang. Project administration: Kyung Doo Kang. Resources: Kyungjin Oh. Software: Doug Hyun Han. Supervision: Doug Hyun Han. Validation: Jea Woog Lee. Visualization: Jea Woog Lee. Writing—original draft: Doug Hyun Han. Writing—review & editing: Kyungjin Oh.

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REFERENCES

1. Dosil J, Cremades JG, Rivera S. Psychological skills training and programs (1st ed). In: Papaioannou A, Hackfort D, editors. Routledge companion to sport and exercise psychology. London: Routledge, 2014, p.327-342.
2. Allen MS, Greenlees I, Jones M. An investigation of the five-factor model of personality and coping behaviour in sport. *J Sports Sci* 2011;29:841-850.
3. La Place JP. Personality and its relationship to success in professional baseball. *Res Q Am Assoc Health Phys Educ* 1954;25:313-319.
4. Peterson SL, Weber JC, Trousdale WW. Personality traits of women in team sports vs. women in individual sports. *Res Q* 1967;38:686-690.
5. Piepiora P, Piepiora Z. Personality determinants of success in men's sports in the light of the big five. *Int J Environ Res Public Health* 2021; 18:6297.
6. Kang KD, Han DH, Hannon JC, Hall MS, Choi JW. Temperamental predictive factors for success in Korean professional baseball players. *Psychiatry Investig* 2015;12:459-465.
7. Kang JO, Kang KD, Lee JW, Nam JJ, Han DH. Comparison of psychological and cognitive characteristics between professional internet game players and professional baseball players. *Int J Environ Res Public Health* 2020;17:4797.
8. Cloninger CR. A unified biosocial theory of personality and its role in the development of anxiety states: a reply to commentaries. *Psychiatr Dev* 1988;6:83-120.
9. Cloninger CR. A systematic method for clinical description and classification of personality variants: a proposal. *Arch Gen Psychiatry* 1987; 44:573-588.
10. Rettew DC, Stanger C, McKee L, Doyle A, Hudziak JJ. Interactions between child and parent temperament and child behavior problems. *Compr Psychiatry* 2006;47:412-420.
11. Han DH, Kim BN, Cheong JH, Kang KD, Renshaw PF. Anxiety and attention shifting in professional baseball players. *Int J Sports Med* 2014; 35:708-713.
12. Mitić P, Nedeljković J, Bojanić Ž, Franceško M, Milovanović I, Bianco A, et al. Differences in the psychological profiles of elite and non-elite athletes. *Front Psychol* 2021;12:635651.
13. Faber IR, Elferink-Gemser MT, Faber NR, Oosterveld FG, Nijhuis-Van der Sanden MW. Can perceptuo-motor skills assessment outcomes in young table tennis players (7-11 years) predict future competition participation and performance? An observational prospective study. *PLoS One* 2016;11:e0149037.
14. Furlay PA, Memmert D. Working memory capacity as controlled atten-

- tion in tactical decision making. *J Sport Exerc Psychol* 2012;34:322-344.
15. Notarnicola A, Maccagnano G, Pesce V, Tafuri S, Novielli G, Moretti B. Visual- spatial capacity: gender and sport differences in young volleyball and tennis athletes and non-athletes. *BMC Res Notes* 2014;7:57.
16. Weigelt M, Memmert D. The mental rotation ability of expert basketball players: identifying on-court plays. *Res Q Exerc Sport* 2021;92:137-145.
17. Poljac E. Perception of emotional facial expressions in individuals with high autism-spectrum quotient (AQ). *Epiphany* 2012;5:1-17.
18. Sung SM, Kim JH, Yang E, Abrams KY, Lyoo IK. Reliability and validity of the Korean version of the temperament and character inventory. *Compr Psychiatry* 2002;43:235-243.
19. Cho S, Choi H, Eklund RC, Paek I. Validation and reliability of the Korean version of the sport anxiety scale-2. *J Hum Kinet* 2018;61:217-225.
20. Hahn HM, Yum TH, Shin YW, Kim KH, Yoon DJ, Chung KJ. [A standardization study of Beck Depression Inventory in Korea]. *J Korean Neuropsychiatr Assoc* 1986;25:487-500. Korean
21. Yu B, Lee HK, Lee K. [Validation and factor structure of Korean version of the Beck depression inventory second edition (BDI-II): in a university student sample]. *Korean J Biol Psychiatry* 2011;18:126-133. Korean
22. Mondo M, Sechi C, Cabras C. Psychometric evaluation of three versions of the Italian perceived stress scale. *Curr Psychol* 2021;40:1884-1892.
23. Liu X, Zhao Y, Li J, Dai J, Wang X, Wang S. Factor structure of the 10-item perceived stress scale and measurement invariance across genders among Chinese adolescents. *Front Psychol* 2020;11:537.
24. Hong GR, Kang HK, Oh E, Park Y, Kim H. Reliability and validity of the Korean version of the perceived stress scale-10 (K-PSS-10) in older adults. *Res Gerontol Nurs* 2016;9:45-51.
25. Lewis GJ, Lefevre CE, Young AW. Functional architecture of visual emotion recognition ability: a latent variable approach. *J Exp Psychol Gen* 2016;145:589-602.
26. Habacha H, Lejeune-Poutrain L, Margas N, Molinaro C. Effects of the axis of rotation and primordially solicited limb of high level athletes in a mental rotation task. *Hum Mov Sci* 2014;37:58-68.
27. Habacha H, Molinaro C, Dosseville F. Effects of gender, imagery ability, and sports practice on the performance of a mental rotation task. *Am J Psychol* 2014;127:313-323.
28. Lütke N, Lange-Küttner C. Keeping it in three dimensions: measuring the development of mental rotation in children with the rotated colour cube test (RCCT). *Int J Dev Sci* 2015;9:95-114.
29. Dikmen SS, Heaton RK, Grant I, Temkin NR. Test-retest reliability and practice effects of expanded Halstead-Reitan neuropsychological test battery. *J Int Neuropsychol Soc* 1999;5:346-356.
30. Alves CR, Gualano B, Takao PP, Avakian P, Fernandes RM, Morine D, et al. Effects of acute physical exercise on executive functions: a comparison between aerobic and strength exercise. *J Sport Exerc Psychol* 2012;34:539-549.
31. Lidor R, Ziv G. The psychology of closed self-paced motor tasks in sports (1st ed). New York: Routledge; 2022.
32. Ramos S, Volossovitch A, Ferreira AP, Fragoso I, Massuça L. Differences in maturity, morphological and physical attributes between players selected to the primary and secondary teams of a Portuguese basketball elite academy. *J Sports Sci* 2019;37:1681-1689.
33. Cloninger CR, Przybeck TR, Svrakic DM. The tridimensional personality questionnaire: U.S. normative data. *Psychol Rep* 1991;69(3 Pt 1): 1047-1057.
34. Han DH, Kim JH, Lee YS, Bae SJ, Bae SJ, Kim HJ, et al. Influence of temperament and anxiety on athletic performance. *J Sports Sci Med* 2006; 5:381-389.
35. Allen MS, Vella SA, Laborde S. Health-related behaviour and personality trait development in adulthood. *J Res Pers* 2015;59:104-110.
36. Kegelaers J, Wylleman P. Exploring the coach's role in fostering resilience in elite athletes. *Sport Exerc Perform Psychol* 2019;8:239-254.
37. Lauriola M, Panno A, Levin IP, Lejuez CW. Individual differences in risky decision making: a meta-analysis of sensation seeking and impulsivity with the balloon analogue risk task. *J Behav Decis Mak* 2014; 27:20-36.
38. Voss MW, Kramer AF, Basak C, Prakash RS, Roberts B. Are expert athletes 'expert' in the cognitive laboratory? A meta-analytic review of cognition and sport expertise. *Appl Cogn Psychol* 2010;24:812-826.
39. Krause D, Richert B, Weigelt M. Neurophysiology of embodied mental rotation: event-related potentials in a mental rotation task with human bodies as compared to alphanumeric stimuli. *Eur J Neurosci* 2021;54: 5384-5403.
40. Lin CH, Chen CM. Developing spatial visualization and mental rotation with a digital puzzle game at primary school level. *Comput Hum Behav* 2016;57:23-30.
41. Krause D, Weigelt M. Mental rotation of tactic board instructions in basketball: domain-specific expertise improves on-court performance. *Res Q Exerc Sport* 2023;94:568-577.
42. Ubago-Jiménez JL, González-Valero G, Puertas-Molero P, García-Martínez I. Development of emotional intelligence through physical activity and sport practice. A systematic review. *Behav Sci (Basel)* 2019;9:44.
43. Laborde S, Lautenbach F, Allen MS, Herbert C, Achtzehn S. The role of trait emotional intelligence in emotion regulation and performance under pressure. *Pers Individ Differ* 2014;57:43-47.