Original Research

An Analysis of Difference in Preventive Health Behaviors for COVID-19 by Personality Characteristics in College Athletes

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Abstract

Background: Due to the uniqueness of COVID-19 compared with other infectious diseases, the need for various countermeasures against it should be emphasized, and considering that most athletes are not allowed to wear masks during competitions, stricter preventive health behaviors for COVID-19 are required among these individuals. Therefore, in an attempt to yield data that may be used to increase the engagement in preventive health behaviors for COVID-19 among college athletes, this study investigated the differences in preventive health behaviors for COVID-19 according to personality types. **Material and Methods**: Based on the Big Five personality theory, the relationship between preventive health behaviors for COVID-19 and personality characteristics was tested. Data were collected from 65 participants (male: n = 53, female: n = 12) through a questionnaire survey. **Results**: The results showed no differences in preventive health behaviors according to demographic characteristics such as sex, grade, sports type, and career. The highest score for a personality type was for conscientiousness, and those with a higher level of conscientiousness, extraversion, neuroticism, and openness reported higher scores for preventive health behavior for COVID-19. Interestingly, those with low openness also reported higher scores for preventive health behaviors for COVID-19. **Conclusions**: These results are expected to be used as important information to restrict the spread of COVID-19 and promote preventive health behaviors among college athletes.

Keywords: COVID-19; prevention; sports; athlete; conscientiousness

1. Introduction

Although more than two years have passed since the World Health Organization's declaration of the COVID-19 pandemic, the pandemic has yet to end [1,2]. As COVID-19 is different from other previous infectious diseases, the need for various countermeasures in the future is emphasized [3]. Experts have pointed out various reasons why COVID-19 continues, including the lack of preventive action and lowered awareness among the public regarding the seriousness of the pandemic due to psychological changes resulting from its prolonged state [4]. Regarding COVID-19, the Korean government has recommended and continues to recommend various preventive (e.g., social distancing, refraining from engaging in group activities, and strict compliance with personal hygiene guidelines) and social change measures (e.g., postponement of school start, forced self-quarantine for inbound travelers, and closure of group facilities, including churches) to tackle it [5]. These changes affected the sports community without exception, leading to the closure of gyms, group sports facilities, and other sports-related institutions in the field of live sports; these changes created restrictions for opportunities regarding not only sports viewing but also sports performance.

As the number of people infected with COVID-19 has decreased, the Korean government has recently introduced health prevention activities [6] in order to restore people's daily life, and is working hard to try and over-

come the impact of COVID-19 [7]. This is also the case for athletes, as all competitions and team training were restricted and only individual self-training was allowed due to the COVID-19. However, on the premise of observing the COVID-19 guidelines, almost all games have been held starting with professional games (e.g., soccer, baseball, basketball, and volleyball) and eventually translating into players in other sports, who began to participate in team training and games. This case was also introduced as an excellent case for demonstrating how the Korean government should respond to COVID-19 [8].

A study [5] showed that social distancing is an important part of Koreans' preventive health behavior, as well as that the level of preventive behavior is high among those with companions. Korean college athletes typically prevent injuries through personal body management [9], and since these athletes deem their health as importantly as their wealth, they take special care of it. However, COVID-19 has worsened the health of athletes and has brought forth mandatory preventive behaviors, such as wearing masks and social distancing. Although they tend to perform these preventive behaviors in accordance with the national policy, the level of engagement may vary by individual personality and the environment. For example, scholars have shown that those married reported higher levels of preventive health behaviors for fear of transmitting COVID-19 to their family members [5], and a research showed that

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professional basketball players differed in their preventive health behaviors according to personality type, career, and injury status [10].

Because most individual behaviors—preventive health behaviors included—are voluntary, performance levels vary according to own personality and skills. In particular, individual personality has an important influence not only on one's career choices but also on many other aspects of one's life, including which types of leisure activities people engage for health, hobbies, and social life. Freudenberger, a behavioral psychologist, in a study on individual personality, showed that since sensitive people have high burnout and a high dependence on affection, even a slight change in their environment strongly influences their psychology and behavior [11]. Supporting this assumption within the context of COVID-19, sensitive people have been shown to have high levels of depression due to social restrictions caused by the pandemic [12]. Moreover, people with high extraversion liked to interact with others and are more inclined to express their feelings openly in order to attract attention from others, and that people with high conscientiousness tend to follow social rules, norms, and principles honestly, work hard, have a high sense of responsibility, and make and follow plans. Some studies also demonstrate that personality is a strong predictor of people's adaptation to life [13], and a basic and important variable in college students' adaptation to school life [14].

2. Purpose

Personality seems to be a reliable predictor of individual behavior, especially during university, when individual choices and responsibility are both important. Therefore, this study aimed to identify the personality characteristics of college athletes and investigate the relationship between personality and preventive health behaviors for COVID-19 according to individual demographic characteristics, including sports type, sex, and injury experience.

The final purpose of this study was to identify the importance of preventive health behaviors performed by college athletes against the backdrop of the COVID-19 pandemic and the unprecedented challenges it brought forth. The results of this study are expected to be used as basic data for the establishment of guidelines of preventive behaviors to fight COVID-19 and to provide important information to prevent the spread of infectious diseases like COVID-19 among college athletes in the future.

3. Materials and Methods

3.1 Participants

Study participants were recruited through purposeful sampling, and college students from the first to fourth years of K University, who participated in the university league, were targeted. The target sports selected based on the char-

acteristics of each event were taekwondo, volleyball, and baseball players. Data were collected from 65 participants (male: n = 53; female: n = 12) through a questionnaire survey. In this study, after consultation with experts, it was decided that ethically problematic or sensitive items would not be investigated, and the research complies with the guidelines of the Declaration of Helsinki.

3.2 Instruments

This study used a questionnaire survey comprising items on demographic characteristics, personality, and COVID-19 preventive health behavior. All questionnaires were completed using an anonymous self-report method, and only those who provided informed consent after receiving an explanation of the research in advance were allowed to complete the questionnaire. The detailed factors surveyed in the questionnaire were as follows.

3.2.1 Preventive Health Behaviors

The preventive health behaviors measured in this study comprised infection prevention behaviors for COVID-19. This study used a scale developed by Kim and Cho [5], which was in turn based on the prevention behaviors for infectious diseases proposed by the Centers for Disease Control and Prevention [15] and on the basic preventive health behavior guidelines provided by the Korea Centers for Disease Control and Prevention in the context of the COVID-19 pandemic. Its 11 items (e.g., "I ventilate the room frequently" and "I avoid crowded places") are responded on a Likert 5-point scale, ranging 1 (strongly disagree) to 5 (strongly agree). In the study by Kim and Cho [5], the Cronbach's α coefficient for this scale was 0.838; in this study, it was 0.839.

3.2.2 Personality Characteristics

The personality characteristics of college athletes were measured using a 20-item scale developed based on the Big Five Brief Version proposed by Turiano *et al.* [16]. Due to the period when the current paper was conducted—namely, during the enforcement of social distancing measures due to the COVID-19 pandemic—the agreeableness factor and related items were excluded. Accordingly, the final scale comprised 16-items, being responded on a 5-point scale ranging from 1 (*not at all*) to 5 (*strongly agree*).

3.3 Data Analysis

To examine the differences in preventive health behaviors according to the personality characteristics of college athletes, all data were subjected to encoding and error reviews. Data were analyzed using SPSS, version 26.0 (IBM Corp., Armonk, NY, USA), with descriptive and frequency analyses being used for describing participants' characteristics. The Cronbach's α test and factor analysis were performed to verify the reliability and validity of the scale used. In addition, analysis of variance was performed

Table 1. Results of exploratory factor analysis for the personality characteristics scale.

Subfactor	Item	Component 1	2	3	4	h^2
Conscientiousness	Conscientiousness 6	0.888	0.214	–0.122	0.162	0.876
	Conscientiousness 7	0.875	0.222	0.000	0.139	0.834
	Conscientiousness 8	0.831	0.341	–0.052	0.074	0.815
	Conscientiousness 5	0.830	0.244	0.041	0.090	0.759
Extraversion	Extraversion 9	0.316	0.869	–0.025	0.024	0.856
	Extraversion 12	0.200	0.864	0.091	–0.012	0.795
	Extraversion 10	0.269	0.818	–0.032	0.183	0.776
	Extraversion 11	0.305	0.810	–0.038	0.248	0.812
Neuroticism	Neuroticism 15	–0.154	–0.036	0.842	0.252	0.798
	Neuroticism 14	0.169	–0.102	0.818	0.049	0.710
	Neuroticism 16	–0.183	–0.022	0.751	0.180	0.630
	Neuroticism 13	–0.048	0.275	0.750	–0.223	0.691
Openness	Openness 17	0.285	–0.001	0.521	0.491	0.594
	Openness 18	0.328	0.185	0.069	0.826	0.829
	Openness 20	0.072	0.019	0.064	0.823	0.687
	Openness 19	–0.047	0.506	0.225	0.658	0.742
Cronbach's α		0.926	0.918	0.809	0.806	
Eigenvalue		3.524	3.476	2.867	2.336	
Variance (%)		22.023	21.726	17.916	14.602	
Accumulation (%)		22.023	43.750	61.666	76.268	

Bartlett's sphericity test: 707.462; df = 120; $p < 0.001$.

KMO measure of sampling adequacy = 0.793.

to determine whether there were differences in preventive health behaviors according to personality characteristics. Significance level for this study was set at a $p < 0.05$. Normality test was performed to confirm the normal distribution of the data with preventive health behaviors as a dependent variable; results showed a skewness of –0.320, a kurtosis of –0.843, and the results of Kolmogorov-Smirnov's significance test showed a $p > 0.200$, confirming the normal distribution of the data.

4. Results

4.1 Personality Characteristics Scale Validity and Reliability

Table 1 shows the results of the exploratory factor analysis performed to determine the validity and reliability of the personality characteristics scale. Cronbach's α coefficients of the subscales were 0.926 for conscientiousness, 0.918 for extraversion, 0.809 for neuroticism, and 0.806 for openness, indicating good validity and reliability.

4.2 Demographic Characteristics

Table 2 shows the demographic characteristics of college athletes. Male (n = 52, 80%) and first-year students (n = 40, 61.5%) accounted for most participants. The most frequent sports type was taekwondo (n = 32, 49.2%), followed by baseball (n = 21, 31.3%) and volleyball (n = 12, 18.4%). The most frequent career period was over 10 years (n = 33,

50.8%), and 40 participants (61%) reported an injury experience, with the mean number of injuries being 1.9. No statistical differences were found for any preventive health behaviors by demographic characteristics.

4.3 Analysis of Differences in Personality Characteristics by Participants' Demographic Characteristics

A multivariate analysis of variance was performed to examine whether there was a difference in personality characteristics by participants demographic characteristics.

We examined personality characteristics by sex, sports type, and injury experience. The descriptive statistics showed that the scores for conscientiousness (mean [M] = 4.312, standard deviation [SD] = 0.717) and openness (M = 3.855, SD = 0.815) were higher in male than female college athletes. In general, the highest score was for conscientiousness (M = 4.296, SD = 0.744); for baseball players, it was for conscientiousness (M = 4.619, SD = 0.600); for taekwondo, it was for extraversion (M = 4.211, SD = 0.918); for those athletes who had never experienced an injury, it was for conscientiousness (M = 4.619, SD = 0.600); for those who had experienced an injury, the scores for neuroticism (M = 3.213, SD = 0.996) were higher than for those who had never experience an injury (Table 3).

A multivariate analysis of variance was performed to examine whether there were differences in personality characteristics by sex (Table 4). The Wilks' Lambda value was

Table 2. Analysis of differences in demographic characteristics and preventive health behaviors.

Item	Frequency (%)	Average	Standard deviation	Mean square	F	Significance probability	Observed power
Age							
Average		20.964					
Sex							
Male	52 (80.0)	4.015	0.605	0.070	0.182	0.671	0.070
Female	13 (20.0)	4.097	0.680				
Grade							
Freshman	40 (61.5)	3.984	0.655				
Sophomore	10 (15.4)	4.045	0.697	0.140	0.357	0.784	0.116
Junior	6 (9.2)	4.257	0.374				
Senior	9 (13.8)	4.080	0.511				
Pocket money (KRW)							
Under 0.3 M	33 (50.8)	4.148	0.629				
0.3–0.5 M	25 (38.5)	3.956	0.546	0.568	1.518	0.227	0.311
Over 0.5 M	7 (10.8)	3.753	0.750				
Sports modality							
Taekwondo	32 (49.2)	3.900	0.613				
Volleyball	12 (18.4)	4.090	0.340	0.591	1.580	0.214	0.323
Baseball	21 (32.3)	4.199	0.715				
Career period							
Under 5 years	10 (15.4)	3.936	0.791				
6–9 years	22 (33.8)	4.119	0.557	0.145	0.373	0.690	0.107
Over 10 years	33 (50.8)	4.002	0.610				
Injury experience							
Yes	40 (61.5)	4.020	0.633	0.014	0.037	0.848	0.054
No	25 (38.5)	4.050	0.601				
Number of injuries							
Average		1.9					

Table 3. Descriptive statistics of personality characteristics by demographic characteristics.

Factor		Sex		Sports type			Injury experience	
		Male	Female	Taekwondo	Volleyball	Baseball	Yes	No
Conscientiousness	M	4.312	4.230	4.179	4.179	4.179	4.250	4.250
	SD	0.717	0.874	0.821	0.821	0.821	0.780	0.780
Extraversion	M	4.052	4.384	4.211	4.211	4.211	3.988	3.988
	SD	0.880	0.826	0.918	0.918	0.918	0.803	0.803
Neuroticism	M	3.110	3.403	3.180	3.180	3.18	3.213	3.213
	SD	1.068	1.023	0.921	0.921	0.921	0.996	0.996
Openness	M	3.855	3.480	3.758	3.758	3.758	3.763	3.763
	SD	0.815	0.976	0.862	0.862	0.862	0.891	0.891

Table 4. Multivariate analysis of variance results for personality characteristics by sex.

Dependent variables	Wilks' Lambda	Df (error df)	Variance homogeneity	F	p	Eta2	Power
Conscientiousness			0.262	0.124	0.726	0.002	0.064
Extraversion	0.861 ($p = 0.058$)	4 (60)	0.818	1.510	0.224	0.023	0.227
Neuroticism			0.623	0.797	0.376	0.012	0.142
Openness			0.325	2.032	0.159	0.031	0.289

0.861, a relatively high level, and all the variations among personality characteristics were over 0.05, indicating no differences in personality characteristics by sex.

Table 5 shows the multivariate analysis of variance results by sports type. The Wilks' Lambda value was 0.826, and significant differences were found in conscientiousness (F = 1051.453, $p < 0.001$) and extraversion (F = 3.286, $p < 0.05$) among sport types.

Table 5. Multivariate analysis of variance results of personality factor by sports type.

Dependent variables	Wilks' Lambda	Df (error df)	Variance homogeneity	F	p	Eta2	Power
Conscientiousness			0.004	1051.453	0.000	0.944	1.000
Extraversion	0.826 ($p = 0.173$)	8 (118)	0.188	3.286	0.044	0.096	0.603
Neuroticism			0.217	0.351	0.705	0.011	0.104
Openness			0.880	0.010	0.990	0.000	0.051

Table 6. Multivariate analysis of variance results for personality characteristics by injury experience.

Dependent variables	Wilks' Lambda	Df (error df)	Variance homogeneity	F	p	Eta2	Power
Conscientiousness			0.349	1188.111	0.000	0.950	1.000
Extraversion	0.958 ($p = 0.623$)	4 (60)	0.723	0.396	0.532	0.006	0.095
Neuroticism			0.313	2.415	0.125	0.037	0.334
Openness			0.324	0.172	0.680	0.003	0.069

Table 7. Analysis of differences in preventive health behaviors for COVID-19 by personality characteristics.

Independent variable		N	M	SD	Variance homogeneity	F	p	Scheffe
Conscientiousness	Low	2	3.091	0.257				
	Medium	17	3.481	0.479	0.566	20.453	0.001	c>a,b
	High	46	4.277	0.493				
Extraversion	Low	7	3.662	0.370				
	Medium	15	3.727	0.723	0.057	5.281	0.008	c>b
	High	43	4.199	0.549				
Neuroticism	Low	24	4.083	0.500				
	Medium	26	3.773	0.663	0.094	5.807	0.005	c>b
	High	15	4.400	0.519				
Openness	Low	8	4.284	0.384				
	Medium	26	3.636	0.623	0.090	11.984	0.001	a,c>b
	High	31	4.299	0.477				

Table 6 shows the multivariate analysis of variance results by injury experience. Again, the Wilks' Lambda value was 0.958 (high level), and all the variations among personality types were over 0.05. However, the differences were significant by injury experience only for conscientiousness (F = 1188.111, $p < 0.001$).

4.4 Analysis of Differences in Preventive Health Behaviors by Personality Characteristics

Table 7 shows the differences in preventive health behaviors by personality characteristics. Results showed significant differences in all four personality types: conscientiousness (F = 20.453, $p < 0.001$), extraversion (F = 5.281, $p < 0.001$), neuroticism (F = 5.807, $p < 0.001$), openness (F = 11.984, $p < 0.001$). Moreover, the average score varied for conscientiousness and openness levels, and those with higher conscientiousness reported higher scores for preventive health behavior.

5. Discussion

Personality plays an important role in behavioral expression at the individual level. In particular, the characteristics of athletes may be formed or changed by team rules, training, or victory and defeat during competitions. There-fore, considering the importance of preventive health behaviors amid the COVID-19 pandemic, this study aimed to identify differences in preventive health behaviors according to the college athletes' personality characteristics.

First, we observed that scores for conscientiousness and openness were higher in male participants, while those for extraversion and neuroticism were higher in female participants. This result is consistent with that in Kwon's study on the relationship between Big Five personality factors and college life adaptation according to sex [17]. Furthermore, the study by Schmitt *et al.* [18] on behavioral genetics provides evidence that partially supports the current findings, showing that extraversion and neuroticism were higher in female participants, and that openness was higher in male participants. Being a college athlete means that the individual has been exercising continuously since high school, or sometimes even as early as elementary or middle school [19,20]. Because student athletes have a busy schedule outside their regular study obligations, they are forced to manage their time systematically, meaning that they may tend to be more diligent than their peers of the same age. Early morning training, daytime study, and evening training make students very busy with training and learning, and those who fail to perform these tasks diligently may be expelled

[21]. Therefore, the conscientiousness of college athletes may tend to be naturally high. In particular, male college athletes are often driven into fierce competition because the number of contestants is much higher than that of the female athletes. Furthermore, in Korea, male athletes are still preferred as leaders [22,23], which has formed these characteristics.

The results for differences in personality characteristics by sports type showed that conscientiousness and openness were high among those who practiced baseball, extraversion was high among those who practiced taekwondo, and neuroticism was high among those who practiced volleyball. This suggests that the personality characteristics of college athletes differ clearly by sports type, as well as corroborates the findings in one prior study [24]. Kim *et al*. [25] reported that athletes who practice sports where direct body contact occurs have a high level of aggression, whereas those who practice sports with only indirect body contact (e.g., through instruments) may have a different personality. For example, baseball players, who do not engage in direct body contact, showed greater conscientiousness to win the game than aggression caused by overheating the game [26]. In addition, because there are more team members in baseball teams than in many other sports types and several candidates must compete for a starting position, competition within baseball teams may be more intense than compared with other sports types. Accordingly, players in team sports, such as baseball, may have a high level of conscientiousness because even those who are talented cannot maintain their current positions without making an effort.

Athletes without injuries were found to have high levels of conscientiousness, extraversion, openness, and low levels of neuroticism. Choi and Oh's study on the relationship between personality characteristics and sports coping among student athletes with injury experiences demonstrated that conscientiousness influences sports coping, suggesting that conscientious athletes may be more skillful in coping with sports situations and experience less injuries [27]. According to the American College of Sports Medicine (ACSM), athletes who experience injuries display emotional responses such as sadness, a sense of isolation, lack of motivation, anger, embarrassment, and may incur in symptoms such as anorexia and sleep deprivation [28]. Since these symptoms delay the recovery of injuries and reduce athlete's functionality, coaches who manage the health of college athletes should accurately identify their personality characteristics and prepare appropriate measures according to them.

Finally, results showed that higher scores for all personality types were associated with higher engagement in prevention behaviors for COVID-19. However, the group with lower levels of openness also showed high scores for preventive behaviors for COVID-19; this may be because COVID-19 is a communicable disease [29]. These results indicate that general school rules and team bylaws, as well as personality, are important in determining engagement in preventive health behaviors against COVID-19. Since college athletes hold the statuses of being both athletes and students until they graduate, team activities are more important than individual activities. This means that it may be more effective to manage the prevention health behaviors for COVID-19 of college athletes at the school than at the individual level.

6. Conclusions

This study aimed to investigate preventive health behaviors for COVID-19 by the demographic and personality characteristics of college athletes in order to provide evidence on ways to increase engagement in such behaviors. The findings demonstrate that preventive health behaviors for COVID-19 among college athletes was above average, and that engagement in such behaviors was exceptionally high among baseball players. Regarding personality characteristics, male college volleyball players exhibited higher levels of conscientiousness and openness, and higher conscientiousness correlated with fewer experience of injuries. In addition, since higher scores for all personality characteristics were associated with higher engagement in preventive health behaviors for COVID-19, it may be that emphasizing interventions to promote preventive health behaviors at either the team or school level, rather than at the individual level, proves more effective for improving engagement in such behaviors among university athletes during a pandemic. In sum, this study provides evidence for the correlation between personality characteristics and preventive health behaviors for COVID-19 among college athletes.

Nevertheless, as the design of this study did not control for the lifestyle and training environment of college athletes, caution should be taken when interpreting the study results. To tackle this limitation, and because personality is influenced by individual traits and the surrounding environment, researchers should consider both personality types and demographic characteristics. In addition, evidence based on the use of various and recently developed measurement tools for personality may help to continue to advance our understanding in the related field of research.

Author Contributions

Ethics Approval and Consent to Participate

As this was a passive study, approval from an ethical institution was not required, and it was conducted in compliance with the Declaration of Helsinki.

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Conflict of Interest

The authors declare no conflict of interest.

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