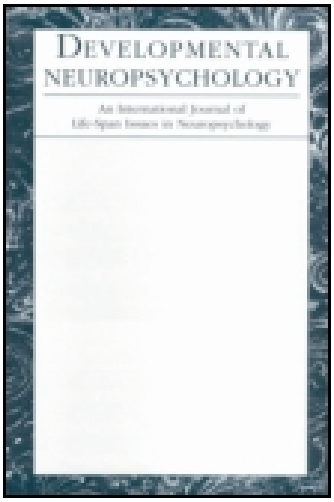

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Personality Factors and Symptom Reporting at Baseline in Collegiate Athletes

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The purpose of this study was to evaluate the relationship between personality and symptom reporting at baseline in collegiate athletes. Participants were 759 athletes who completed the Post-Concussion Symptom Scale and NEO-Five Factor Inventory. Results showed that neuroticism and agreeableness personality dimensions were predictive of athletes' symptom reports at baseline.

Symptom monitoring and assessment play an important role in the management of sports-related concussions; consequently, an area of active research has been exploring what factors influence athletes' symptom reports. While it has been recognized that gender and concussion history may impact symptom reporting (Covassin et al., 2006; Schatz, Moser, Covassin, & Karpf, 2011), the extent to which personality variables influence symptom reporting patterns in collegiate athletes remains relatively unclear.

Garden, Sullivan, and Lange (2010) examined the relationship between common post-concussion symptoms and personality traits in a sample of healthy adults. The authors utilized the Millon Clinical Multiaxial Inventory III (MCMI-III) to measure personality, and found that several of the MCMI-III scales (i.e., depressive, sadistic, negativistic, borderline, anxiety, etc.) were significantly related to participants' symptom scores. Another study examined whether pre-injury personality is related to outcome following mild traumatic brain injury in a civilian sample (Rush, Malec, Moessner, & Brown, 2004). This study used the NEO-Personality Inventory-Revised to assess personality, and reported no significant relationships between personality and symptom reporting patterns.

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Although researchers have begun to investigate what impact personality factors have on symptom reporting, no clear predictors have been established. With the above considerations in mind, the purpose of the present study was to evaluate the relationship between the "Big 5" personality factors using the NEO-Five Factor Inventory (NEO-FFI) and symptom reporting at *baseline* in a sample of collegiate athletes. It was hypothesized that higher levels of neuroticism would be related to greater self-reported symptoms at baseline.

METHODS

Participants

Participants included 759 collegiate athletes who were involved in an ongoing concussion management program at a large university. All athletes participating in the program were administered baseline neuropsychological tests prior to their participation in varsity athletics. The following varsity athletic teams participated in baseline testing: Football, Wrestling, Men's and Women's Basketball, Men's and Women's Lacrosse, Men's and Women's Soccer, and Men's and Women's Ice Hockey.

At the time of data analysis, participants were selected from a sample consisting of 853 athletes and were included in the study if (1) they had completed the Post-Concussion Symptom Scale (PCSS) during their baseline assessment (n = 849, 99.5% of the original sample) and (2) they had completed the NEO-Five Factor Inventory (NEO-FFI) during their baseline assessment (n = 759, 89.0% of the original sample).

Procedure and Measures

Athletes underwent neuropsychological testing at baseline, prior to participating in collegiate sports. The neuropsychological test battery was administered by undergraduate research assistants or graduate students under the supervision of a Ph.D.-level clinical neuropsychologist. Baseline testing took approximately two hours. The study procedures were conducted in accordance with the university's Institutional Review Board. For the purposes of the present study, the PCSS and the NEO-FFI were the main outcome measures.

PCSS. The PCSS is a self-report measure that was designed to assess the severity of concussion-related symptoms (Lovell et al., 2006). Athletes are asked to rate the extent to which they are currently experiencing each symptom on a scale from 0–6, where 0 is none and 6 is severe. The PCSS is administered via computer as part of the Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT) program. Lovell et al. (2006) reported that the PCSS is a highly reliable measure, with an internal consistency between 0.89–0.94.

A total symptom score was generated by summing responses for the 22 PCSS items, and symptom cluster scores were generated based on a previous factor analysis by our group. The factor analysis resulted in four distinct symptom clusters: Cognitive symptoms (4 items); Physical symptoms (7 items); Affective symptoms (4 items); and Sleep symptoms (4 items).

NEO-FFI. The NEO-FFI is a 60-item self-report measure containing statements designed to assess the "Big 5" personality factors of Extraversion, Neuroticism, Openness, Agreeableness, and Conscientiousness (McCrae & Costa Jr., 2004) that have been previously established and well-replicated in the personality literature. Each item is rated using a 5-point scale, with 1 indicating "strongly disagree," 3 indicating "neutral," and 5 indicating "strongly agree." The five factor inventory is one of the most widely used conceptualizations of personality, and the NEO-FFI, in particular, has been utilized in the sports literature to assess personality and has demonstrated sufficient reliability and validity (McCrae & Costa Jr., 2004).

RESULTS

Sample Characteristics

The final sample was predominately male (75.5%) and Caucasian (74.2%), and the majority of the athletes had completed 12 years of education (83.4%). The average age of athletes completing baseline testing was 18.52 years (SD = 1.06), and nearly one-third of the sample played football (30.6%).

Regression Analyses

Linear regression analyses were conducted to assess the extent to which the five NEO-FFI personality dimensions contributed to the PCSS Total Score and the four PCSS symptom clusters (Table 1). In order to account for multiple comparisons, a Bonferroni adjusted alpha level of .01 was used to determine significance (i.e., p value of .05 divided by 5 hypothesized predictors per analysis). Additionally, to rule out previous concussions as a confounding variable, regression analyses were run in a stepwise fashion, with previous concussions in Step 1 and the five personality factors in Step 2.

With respect to the PCSS Total Score, the regression results indicated that the five personality factors significantly predicted the PCSS Total Score (R^2 = .13, F(6, 748) = 17.81, p < .001), representing a medium effect size. As for the PCSS symptom clusters, the regression results indicated that the five personality factors significantly predicted physical symptoms (R^2 = .04, F(6, 748) = 5.77, p < .001), cognitive symptoms (R^2 = .09, F(6, 748) = 12.78, p < .001), affective symptoms (R^2 = .17, F(6, 748) = 24.89, p < .001), and sleep symptoms (R^2 = .06, F(6, 748) = 7.41, p < .001), representing small to medium effects for all symptom clusters. As indicated in Table 1, the Neuroticism scale significantly predicted the PCSS Total Score and all four symptom cluster scores, such that higher Neuroticism scores were associated with higher symptom scores. Additionally, the Agreeableness scale significantly predicted the PCSS Total Score and the physical symptom cluster, such that higher Agreeableness scores were associated with lower symptom scores. Sample descriptive characteristics for the symptom and NEO-FFI variables are presented in Table 2.

DISCUSSION

The present study sought to investigate the relationship between personality factors and *baseline* symptom reporting in collegiate athletes. Our findings suggest that, when taken together, the

TABLE 1
Linear Regression Analyses for NEO-FFI Variables Predicting PCSS Total Score and PCSS Symptom Clusters

	Agreeableness	*Conscientiousness*	*Extraversion*	*Neuroticism*	*Openness*
PCSS Total Score					
B	–.165	.029	–.036	.421	.084
SE B	.060	.055	.069	.052	.053
β	–.104*	.020	–.019	.308**	.055
PCSS Physical					
B	–.048	.015	.001	.036	.011
SE B	.013	.012	.015	.011	.011
β	–.149**	.052	.001	.131**	.036
PCSS Cognitive					
B	–.018	–.018	.022	.099	.008
SE B	.016	.015	.019	.014	.015
β	–.042	–.047	.043	.266**	.019
PCSS Affective					
B	–.023	.010	–.001	.170	.032
SE B	.018	.017	.021	.016	.016
β	–.046	.023	–.002	.397**	.066
PCSS Sleep					
B	–.053	.012	–.058	.081	.026
SE B	.023	.022	.027	.020	.021
β	–.088	.023	–.082	.158**	.046

Note. A Bonferroni adjusted alpha level of .01 was used to determine significance (i.e., original p value of .05 divided by 5 hypothesized predictors per analysis); *$p < .01$, **$p \leq .001$. NEO-FFI = NEO-Five Factor Inventory; PCSS = Post-Concussion Symptom Scale.

TABLE 2
Sample Descriptive Statistics for Variables of Interest

Variables of Interest	*Mean*	*SD*	*Minimum*	*Maximum*	*Median*	*Skewness*	*Kurtosis*
PCSS Total Score	5.50	8.78	0.00	72.00	2.00	2.92	11.30
PCSS Physical Symptom Cluster	0.50	1.78	0.00	19.00	0.00	5.69	42.00
PCSS Cognitive Symptom Cluster	1.03	2.40	0.00	17.00	0.00	3.38	13.71
PCSS Affective Symptom Cluster	1.25	2.75	0.00	21.00	0.00	3.24	12.71
PCSS Sleep Symptom Cluster	2.05	3.31	0.00	20.00	0.00	2.32	6.38
NEO-FFI Agreeableness	31.89	5.52	12.00	46.00	32.00	–0.40	0.16
NEO-FFI Conscientiousness	33.79	6.14	9.00	48.00	34.00	–0.41	0.34
NEO-FFI Extraversion	32.48	4.65	17.00	45.00	33.00	–0.08	–0.14
NEO-FFI Neuroticism	16.04	6.41	0.00	35.00	16.00	0.23	–0.05
NEO-FFI Openness	23.80	5.75	8.00	43.00	23.00	0.46	0.31

Note. N = 759 (573 Males, 186 Females). NEO-FFI = NEO-Five Factor Inventory; PCSS = Post-Concussion Symptom Scale.

NEO-FFI personality dimensions significantly predict symptom reporting at baseline. As hypothesized, higher levels of neuroticism were associated with increased symptom reports at baseline, even after controlling for concussion history. Additionally, higher levels of

agreeableness were associated with fewer baseline symptoms. However, the personality dimensions of openness, conscientiousness, and extraversion were not significantly predictive of baseline symptom reports.

Few studies have examined the relationship between personality and symptom reporting, and among the studies that have, discrepant findings have resulted. Notably, however, our results are consistent with Garden et al. (2010) who demonstrated a clear relationship between personality variables and symptom reporting in a healthy population. Conversely, our findings are inconsistent with Rush et al. (2004) who concluded that personality factors are *unrelated* to symptom reporting patterns in patients with mild traumatic brain injury.

When considering the implications of these findings, the present study lends support to previous research that has shown that "post-concussion-like" symptoms are present in a healthy sample, suggesting that traditional "post-concussion symptoms" are not concussion-specific (Iverson & Lange, 2003; Wang, Chan, & Deng, 2006). Additionally, these results are consistent with previous studies showing that post-concussion symptoms are commonly reported in other clinical groups, including trauma patients (Meares et al., 2006) and depressed patients (Garden & Sullivan, 2010). Clinically, this is meaningful because it underscores the utility of making comparisons between pre- and post-injury symptom profiles, and not to simply assume that post-concussion symptoms are the direct result of the concussion.

Limitations to the present study include that athletes are aware that their baseline test results will be compared to their post-concussion test results in the event of sustaining a concussion; consequently, this may impact athlete self-report of symptoms at baseline. Additionally, because the sample characteristics are somewhat limiting, caution should be used when generalizing our findings to other populations. Finally, there is a need for a shorter personality screening tool in the sports concussion community.

To our knowledge, this is the first study that has examined the relationship between the NEO-FFI personality dimensions and symptom reporting patterns in collegiate athletes. The present study suggests that consideration of baseline personality profiles can inform the interpretation of symptoms reported in the post-concussion period in these athletes.

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REFERENCES

Covassin, T., Swanik, C. B., Sachs, M., Kendrick, Z., Schatz, P., Zillmer, E., & Kaminaris, C. (2006). Sex differences in baseline neuropsychological function and concussion symptoms of collegiate athletes. *British Journal of Sports Medicine*, *40*(11), 923–927.

Garden, N., & Sullivan, K. A. (2010). An examination of the base rates of post-concussion symptoms: The influence of demographics and depression. *Applied Neuropsychology*, *17*(1), 1–7.

Garden, N., Sullivan, K. A., & Lange, R. T. (2010). The relationship between personality characteristics and postconcussion symptoms in a nonclinical sample. *Neuropsychology*, *24*(2), 168–175.

Iverson, G. L., & Lange, R. T. (2003). Examination of "postconcussion-like" symptoms in a healthy sample. *Applied Neuropsychology*, *10*(3), 137–144.

Lovell, M. R., Iverson, G. L., Collins, M. W., Podell, K., Johnston, K. M., Pardini, D., … Maroon, J. C. (2006). Measurement of symptoms following sports-related concussion: Reliability and normative data for the post-concussion scale. *Applied Neuropsychology*, *13*(3), 166–174.

McCrae, R. R., & Costa Jr., P. T. (2004). A contemplated revision of the NEO Five-Factor Inventory. *Personality and Individual Differences*, *36*(3), 587–596.

Meares, S., Shores, E. A., Batchelor, J., Baguley, I. J., Chapman, J., Gurka, J., & Marosszeky, J. E. (2006). The relationship of psychological and cognitive factors and opioids in the development of the postconcussion syndrome in general trauma patients with mild traumatic brain injury. *Journal of the International Neuropsychological Society*, *12*(6), 792–801.

Rush, B. K., Malec, J. F., Moessner, A. M., & Brown, A. W. (2004). Preinjury personality traits and the prediction of early neurobehavioral symptoms following mild traumatic brain injury. *Rehabilitation Psychology*, *49*(4), 275–283.

Schatz, P., Moser, R. S., Covassin, T., & Karpf, R. (2011). Early indicators of enduring symptoms in high school athletes with multiple previous concussions. *Neurosurgery*, *68*(6), 1562–1567.

Wang, Y., Chan, R. C., & Deng, Y. (2006). Examination of postconcussion-like symptoms in healthy university students: Relationships to subjective and objective neuropsychological function performance. *Archives of Clinical Neuropsychology*, *21*(4), 339–347.