

A Discriminant Analysis of Personality Traits and Cluster Types of Physical Education Teachers

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Abstract

This paper understands the personality traits and cluster types of physical education (PE) teachers in elementary schools. A total of 393 elementary PE teachers volunteered to participate in this study. The Personality Trait Questionnaire for PE teachers in elementary school was summarized and compiled on the basis of the theory of the Big Five personality traits. The researchers used the discriminant analysis method to analyze and obtain the data. The results show that the Big Five personality traits of PE teachers in elementary schools was agreeableness. Classification of the Big Five personality traits through discriminant analysis revealed a Wilk's λ value of .199, an eigenvalue of 3.254, and 94.7% of the variance explained. Use of Ward's minimum variance method indicated that the participants' personalities were characterized by steady and pioneering type, sensitive and cautious type, and moderate and peaceful type. There were more males than females in the steady and pioneering type, more steady and pioneering type under the age of 30 years old, and more moderate and peaceful type with more than 16 years of work experience. In conclusion, most the personality traits of PE teachers in elementary school were agreeableness, moderate and peaceful type, which shows that most PE teachers have calm emotions, appropriate expressions of emotions, regularity, optimism, and enjoy interacting and collaborating with others.

Keywords

Big Five personality traits, neuroticism, agreeableness, steady and pioneering type, sensitive and cautious type, moderate and peaceful type

Introduction

Personality traits, the intangible, dynamic aspects of individuals' psychological systems, manifest themselves as unique thoughts, emotions, and behaviors across various contexts (Parks-Leduc et al., 2014). Personality traits are also stable and consistent individual characteristics that are formed through specific life experiences and critically determine individuals' likelihood to succeed in life (Segerstrom & Smith, 2019).

The concept of personality traits was first proposed by Galton in 1884. In 1963, Norman used factor analysis to classify five elementary types of personality factors, which were given official names by Goldberg in 1981. Expanding upon his work, Costa and McCrae established the five-factor model in 1985, of what is termed the Big Five personality traits, which constitute the most widely accepted personality trait theories. These Big Five personality traits are neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness (Costa & McCrae, 1992a, 1992b, 2011). Neuroticism concerns emotional stability and the ability to withstand stress; neurotic individuals cannot properly

control their emotions and are susceptible to depression and negative affect; moreover, they are excessive worriers and are particularly sensitive, nervous, and insecure (Kim et al., 2018). Extraversion refers to individuals' sense of comfort in interpersonal communication. Extraverts are particularly comfortable interacting with others; they are self-confident, proactive, lively, outgoing, and optimistic. Furthermore, they are optimistic, excel in leadership, and enjoy expressing themselves, making friends, and participating in social gatherings (Giluk & Postlethwaite, 2015). Openness to

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experience concerns the number and depth of individuals' interests and informs their tolerance of and curiosity about the unfamiliar. People that are highly open to experience have diverse interests and are broad-minded, imaginative, creative, innovative, and enjoy thinking and exploring (Paunonen & Ashton, 2001). In social psychology, agreeableness is closely related to love and attractiveness, people tend to prefer interacting with and maintaining long-term relationships with agreeable people, who are adept at expressing love and showing respect (Nunes et al., 2018). Conscientiousness alludes to the ability to accomplish tasks efficiently, meticulously, and competently. An example of conscientious individuals is serious, responsible teachers, who are highly efficient in their work and provide students with high-quality instruction (Kim & MacCann, 2018).

PE teachers instruct students in specialized field of study, so physical education (PE) teachers are predominantly practical in PE curriculum. Generally speaking, the teacher's personality plays an important role in the teaching process and is relation to teaching effectiveness (Göncz, 2017). The teacher's individual personality characteristics therefore are essential for succeeding in teacher's the teaching career (Demir, 2016; Kim et al., 2019; Li & Wu, 2011; Schnitzius et al., 2019). Costa and McCrae (2011) believe that responsibility refers to the tendency of individuals to plan, organize, and perform tasks, as well as the tendency to be reliable, purposeful, strong-willed, and firm. Research also shows that teachers with higher conscientious personality traits are more effective in improving their student conscientiousness (Costa & McCrae, 2011). In addition, Blatný et al. (2015) believe that the stability of professional development is highly correlated with personality characteristics. Kunter et al. (2013) found that different personality characteristics will affect teachers' professional abilities, which in turn affect teachers' professional practice. This view is the same as the study by Kim and MacCann (2018) and believe that teacher's personality factors will affect teaching. Beyond disseminating knowledge, teachers are tasked with helping students develop their personalities. Physical education teachers are the most imitated objects among all subject teachers. Whether it is physical education teachers' behaviors, sports skills, speech, values, attitudes to life, etc., they are often the objects of student imitation (Cheung, 2020).

Many studies have shown that teachers' personality traits can affect students' values, attitudes, and learning outcomes (Kim et al., 2018, 2019; Kim & MacCann, 2018; Parks-Leduc et al., 2014). However, there is very little literature on this topic for PE teachers. The lack of quantification of PE teachers' personality traits is an important deficiency in evaluating PE teachers. PE teachers play the role of teaching by example, precept, physical contact, imitators, and even the model for the students. Therefore, the ethics and character of PE teachers today play a very important role as an educational instructor. The ethics and character of PE teachers today play a very important role as an educational instructor.

Therefore, the analysis of the personality traits of PE teachers in elementary schools in Taiwan is the motivation for this study. According on the above literature and motivation, the purpose of this study to explore the types of personality traits of PE teachers in elementary school. Hypothesis 1 (H1): The discriminant analysis can be used to classify the cluster types of personality traits of PE teachers in elementary school. Hypothesis 2 (H2): There are significant differences in the personality traits of PE teachers in elementary school with different background variables.

Materials and Methods

Research Participants

This study adopts the questionnaire survey method and recruits PE teachers in elementary school as the research participants. A questionnaire survey was conducted on a random sample of 500 participants from PE teachers in elementary schools in Taiwan, and 393 valid questionnaires were returned, response rate reaching approximately 79%. a total of 203 male and 190 female participants. Participants excluded those who were vulnerable to undue influence, coercion, or inability to make decisions of free will because of their age, or inability due to their environment, identity, or social and economic conditions. Participants were anonymous (no information collected to identify a specific individual) and non-intrusive and approved by the Taipei City Hospital Renai Branch for Institutional Review Board (approval number 110-96), in accordance with scientific and ethical principles.

Research Instruments

This study was based on the Big Five personality traits scales constructed by the personality trait theory proposed by Costa and McCrae in 1985 (Costa & McCrae, 1992a), Chen and Hsu were used to study the Big Five personality types of teachers that students liked most (Patrick, 2011), Hartmann and Ertl (2021) researched Big Five personality traits differences between students from different majors aspiring to the teaching profession. The first draft was summarized and revised. The questionnaire was divided into two parts, the first part was the demographic characteristics analyze the related factors that affect personality traits of PE teachers, such as gender, age, and work experience. The second part was the dimension of personality traits, neuroticism (1–8 items), agreeableness (9–17 items), extraversion (18–25 items), openness (26–33 items), and conscientiousness (34–43 items), a total of 43 items, will be designed as Likert scale. After the first draft, item, factor, and reliability analyses were performed on the first draft to finalize the questionnaire, which was titled the Personality Trait Questionnaire for PE teachers in elementary school.

Item analysis. The item analysis was performed on the basis of the correlation coefficients and composite reliability

(CR) coefficients of individual items and the total score, with a CR of 3.5 used as a threshold. All the items were retained because all their CRs exceeded 3.5 and their correlation coefficients ranged between .8 and .9, which indicated high correlations with the total score.

Factor analysis. The Kaiser–Meyer–Olkin value of the questionnaire was 0.814, and the approximate χ^2 value from the Bartlett test of sphericity of 13,807.78 was significant. This indicated the existence of common factors among the items, making them suitable for factor analysis. Through principal component analysis, factors with eigenvalues higher than 1 were extracted, and items with factor loadings no higher than 0.40 were selected through varimax orthogonal rotation. All the 43 items exhibited factor loadings higher than 0.40 and thus were retained. Five factors in the questionnaire were identified through factor rotation, namely neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. The total cumulative explained variance in the questionnaire was 73.34%, indicating satisfactory validity.

Reliability analysis. The questionnaire was tested for internal consistency (i.e., as measured by the Cronbach's α) to verify its reliability, with higher Cronbach's α values indicating higher reliability and a range between .70 and .98 indicating high reliability. The Cronbach's α values for neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness were .824, .889, .874, .902, and .898, respectively. The overall Cronbach's α value of the questionnaire was .897, indicating satisfactory reliability.

Statistical Analysis

The questionnaire was designed on the basis of findings from the literature review, and the statistical analyses, including descriptive statistics, *t*-tests, Chi-square percent homogeneity test analysis, one-way analysis of variance (ANOVA) and discriminant analysis, were performed using the Chinese version of IBM SPSS Statistics for Windows, version 23.

Results

Descriptive Statistics of the Questionnaire and Correlation Analysis of Various Dimensions

The descriptive statistics of this questionnaire were shown in Table 1. The average scores for conscientiousness and agreeableness in the five dimensions were 4.17, neuroticism was 2.55, and the other dimensions were in between. In addition, the standard deviation of conscientiousness is 0.47, and the performance of PE teachers in elementary school was the most consistent; while the standard deviation of neuroticism is 0.64, with large individual differences.

Firstly, the relationship between the five dimensions of personality traits of PE teachers in elementary school were

Table 1. Descriptive Statistical Analysis of the Questionnaire.

Dimension	M	SD
Neuroticism	2.55	0.64
Agreeableness	4.17	0.50
Extraversion	3.81	0.61
Openness	3.86	0.54
Conscientiousness	4.17	0.47

Note. $N=393$.

explored based on the correlation of Pearson's product difference. The 10 correlation coefficients formed by the pairing of the five dimensions of personality traits, except for the correlation coefficients of the two dimensions of neuroticism and agreeableness, did not reach the significant level of .05 ($r=-.072, p>.05$), the other nine correlation coefficients all reach the significant level of .05, indicating that there was indeed a correlation between the five dimensions of personality traits, as shown in Table 2. The two dimensions of extroversion and openness had the highest correlation ($r=-.702, p>.05$). The two dimensions of neuroticism and conscientiousness had the lowest correlation ($r=-.201, p>.05$), indicating the correlation coefficient of the five dimensions of personality traits, except for nervousness, which were weakly correlated with other dimensions, all others had medium-high correlation of .3 to .7.

Cluster Types of Personality Traits as Classification Indicators

Based on the results of PE teachers' questionnaires, this study uses the Wards method of the hierarchical method, also known as the minimum variance method to explore the types. In the process of hierarchical clustering, it was shown that the distance from three clusters distance was 1,156.73 to two clusters distance was 1,400.62, indicating that it was suitable to divide into three clusters. (The grouping method of Ward method is to first regard each individual as a cluster, and then merge the clusters in sequence. Individuals with the smallest increase in the total variance in the cluster are preferentially merged. The earlier the individuals merged, the higher the similarity between them.) Since the purpose of this study was to explore the types of personality traits of PE teachers in elementary school, it was an exploratory study, therefore, this study decided to divide PE teachers in elementary school into three personality cluster categories.

The descriptive statistics of the three cluster categories of PE teachers in elementary school were shown in Table 3. Cluster 1 had a total of 77 PE teachers in elementary school. According to the average of the five dimensions, the average of neuroticism the lowest at 2.34, but the average of the other four dimensions the highest, it found that neuroticism was negatively correlated with the other four dimensions. This cluster 1 shows that the personality traits of PE teachers can

Table 2. Correlation Matrix of Five Dimensions of Personality Traits.

	Neuroticism	Agreeableness	Extraversion	Openness	Conscientiousness
Neuroticism	1				
Agreeableness	-.072	1			
	.152				
Extraversion	-.297*	.547*	1		
	.000	.000			
Openness	-.275*	.443*	.702*	1	
	.000	.000	.000		
Conscientiousness	-.201*	.392*	.507*	.563*	1
	.000	.000	.000	.000	

* $p < .05$.**Table 3.** Three Cluster Categories of PE Teachers in Elementary School in the Personality Trait Dimension.

Dimension	Steady and pioneering <i>n</i> = 77	Sensitive and cautious <i>n</i> = 71	Moderate and peaceful <i>n</i> = 245
	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>
Neuroticism	2.34 ± 0.67	3.77 ± 0.52	2.54 ± 0.66
Agreeableness	4.86 ± 0.18	3.16 ± 0.38	4.06 ± 0.38
Extraversion	4.56 ± 0.40	2.80 ± 0.41	4.13 ± 0.35
Openness	4.36 ± 0.48	3.13 ± 0.44	3.91 ± 0.33
Conscientiousness	4.74 ± 0.30	3.68 ± 0.35	3.76 ± 0.42

Note. Values were presented as means ± standard deviations, *M* ± *SD*.*N* = 393.* $p < .05$.

be good at listening, step by step, extremely steady, create value in everything, and are willing to open up new opportunities, so they were named steady and pioneering type. Cluster 2 had a total of 71 PE teachers in elementary school. According to the average of five dimensions, the average of neuroticism the highest at 3.77, but the average of the other four dimensions the lowest, showing completely opposite personality traits to cluster 1. This cluster 2 shows that the personality traits of PE teachers can be self-controlling and cautious, focusing on analysis rather than emotion, so they were named sensitive and cautious type. Cluster 3 had a total of 245 PE teachers in elementary school. From the average of the five dimensions, it can be seen that compared with the other two clusters, all of them were in the middle. This cluster 3 shows that the personality traits of PE teachers can be emotional peace is just right, when the emotions are peaceful, everything can return to normal and orderly, so they were named moderate and peaceful type.

Validity Analysis of Personality Traits as Categorical Indicators

In order to further analyze whether it is valid to classify the personality traits of PE teachers in elementary school into three cluster categories, this study further tested the validity

of the five dimensions of personality traits by one-way ANOVA and analyzed the validity of the five dimensions of personality traits. Check the overall categorical validity. One-way ANOVA for the three cluster categories in personality traits is shown in Table 4. The results show that the *F* values had reached significant level of .05, indicating that the averages of the three cluster categories are significantly different in the five dimensions. It indicates that the five dimensions of personality traits can effectively discriminant the three cluster categories. That is to say, the larger the *F* value of the five dimensions, the more effective discriminant the personality types of PE teachers in elementary school. Therefore, agreeableness had the highest validity ($F=206.65$, $p < .05$), and neuroticism had the lowest validity ($F=9.66$, $p < .05$).

In order to further explore the validity of the overall classification results, this study used the cluster analysis classification results into three cluster categories as the dependent variables, and the Big Five personality traits dimensions as the independent variables to conduct discriminative analysis and reclassify PE teachers in elementary school to verify the correctness of the overall classification results. A total of two discriminant functions were obtained from the discriminant analysis of the three cluster categories, and their Wilk's λ values were .199 and .846, both reaching significant level of .05. The eigenvalue of the first discriminant function was 3.254,

Table 4. One-Way ANOVA of Three Cluster Categories and Five Dimensions of Personality Traits.

Dimension	Source	SS	df	MS	F	Post hoc
Neuroticism	SSb	7.62	2	3.81	9.66*	2 > 3 > 1
	SSw	153.86	390	0.39		
Agreeableness	SSb	50.51	2	25.26	206.65*	1 > 3 > 2
	SSw	47.66	390	0.12		
Extraversion	SSb	73.71	2	36.86	193.94*	1 > 3 > 2
	SSw	74.12	390	0.19		
Openness	SSb	57.89	2	28.94	197.26*	1 > 3 > 2
	SSw	57.23	390	0.15		
Conscientiousness	SSb	42.23	2	21.11	184.33*	1 > 3 > 2
	SSw	44.67	390	0.11		

Note. 1 represents steady and pioneering type; 2 represents sensitive and cautious type; 3 represents moderate and peaceful type.
* $p < .05$.

Table 5. Discriminant Function Significance Test For Personality Trait Categories.

function	Eigenvalues	Explained variance	Cumulative variation	ρ^2	Wilk's λ
1	3.254	94.7	94.7	.875	.199*
2	0.182	5.3	100.0	.393	.846*

Note. Function "1" represents the first discriminant function; function "2" represents the second discriminant function.
* $p < .05$.

which could explain 94.7% of the variance. The eigenvalue of the second discriminant function was 0.182, which could explain 5.3% of the variance, as shown in Table 5. That was, the first difference function could already explain 94.7% of the differences between the three cluster categories, and the second difference function can only explain only 5.3% of the variance between the cluster categories.

The structural loading represents the correlation of each variable with the discriminant function, and the higher the value, the higher the importance of the variable in explaining the variation in the discriminant function. On the first discriminant function, the structural load of agreeableness was the highest at 0.829, followed by openness, extraversion, and conscientiousness, which were 0.539, 0.522, and 0.495, respectively, while neuroticism had the lowest structural load and negative value. The first discriminant function explained 94.7% of the variance, which was consistent with the results of one-way ANOVA, that is, agreeableness, openness, extraversion, and conscientiousness were the variables with high efficiency. The second discriminant function had the highest structural load of agreeableness and neuroticism, which constitute the important variables of the second difference function, as shown in Table 6.

The centroid of each cluster in discriminant function was shown in Table 7. The centroid values could be obtained from the unstandardized discriminant function coefficients \times the mean of each cluster. In the same discriminant function, the greater the difference in centroid values, the greater the difference in the discriminant function of the three clusters. The results show that the mean centroid of the

Table 6. Structural Loadings in Five Dimensions for Three Cluster Discriminant Functions.

Cluster number	1	2
Neuroticism	-0.112	-0.455
Agreeableness	0.522	0.107
Extraversion	0.539	0.388
Openness	0.829	0.623
Conscientiousness	0.495	0.131

Note. Function "1" represents the first discriminant function; function "2" represents the second discriminant function.

first discriminating function of the steady and pioneering type was 3.194, the mean centroid of the sensitive and cautious type was -2.565 , and the mean centroid of the moderate and peaceful type was -0.260 . This result were consistent with Tables 3 and 4.

There were 77 people of steady and pioneering type in cluster analysis. After reclassification by discriminant analysis, all of them were classified as steady and pioneering type. The reclassification results were the same as the original results, and the classification accuracy rate was 100%. There were 71 people of sensitive and cautious types in cluster analysis. After reclassification by discriminant analysis, all of them were classified as sensitive and cautious types. The reclassification results were the same as the original results, and the classification accuracy rate was 100%. There were 245 people of moderate and peaceful type in cluster analysis. After reclassification by discriminant analysis, there were

Table 7. Functions at Group Centroids.

Cluster number	1	2
1. Steady and pioneering type	3.194	-0.414
2. Sensitive and cautious type	-2.565	-0.672
3. Moderate and peaceful type	-0.260	0.325

Note. Function "1" represents the first discriminant function; function "2" represents the second.

219 people classified as moderate and peaceful type, and the classification accuracy rate was 89.4%. The overall classification accuracy rate was 93.38%, indicating that the classification results of cluster analysis and discriminant analysis were highly consistent, as shown in Table 8. That is to say, this study had high degree of validity for the types of personality traits of PE teachers in elementary school, which were divided into three categories. The above verifies H1.

Difference Analysis of Different Background Variables and Three Types of Personality Traits

Analysis of different genders. The results of the chi-square percentage homogeneity test of the differences in personality trait types of PE teachers in elementary school of different genders. $\chi^2=7.77, p < .05$, which had reached significant level, as shown in Table 9. It indicates that genders were significant differences in personality traits of PE teachers in elementary school. Post hoc comparisons were further performed with adjusted standardized residuals (Haberman, 1982), and it was found that PE teachers in elementary school were steady and pioneering type, with 48 males (23.65%) and 29 females (15.26%), and the adjusted standardized residuals for males were 2.1 (The standardized residual after adjustment for females was -2.1), and the critical value of 1.96 was greater than the significant level of .05, indicating that there were more male than female PE teachers in elementary schools. For the sensitive and cautious type, there were 43 females (22.63%) and 28 males (13.79%), and the standardized residual after adjustment for female was 2.3 (the standardized residual after adjustment for male was -2.3), indicating that PE teachers in elementary school, females were more sensitive and cautious type than male. In addition, for the moderate and peaceful males (127, accounting for 62.56%) and females (118, accounting for 62.11%), the standardized residuals after correction did not reach the significant level of .05, and the number of male and female who were moderate and peaceful type was consistent.

Analysis of different ages. The results of the chi-square percentage homogeneity test of the differences in personality trait types among PE teachers in elementary school of different ages. $\chi^2=31.28, p < .05$, which has reached significant level, as shown in Table 10. It indicates that ages were significant differences in personality traits of

PE teachers in elementary school. Post hoc comparisons were further performed with adjusted standardized residuals (Haberman, 1982).

There were 59 PE teachers in elementary school under the age of 30 years old who were steady and pioneering type (accounting for 27.70%), and the standardized residual after correction was 4.4, which was greater than the critical value of 1.96 at the significant level of .05, indicating that PE teachers in elementary school under the age of 30 years old were steady and pioneering type. The numbers were significantly higher. And there were 116 people (accounting for 54.46%) of the moderate and peaceful type, and the standardized residual after correction was -3.5, indicating that the number of PE teachers in elementary school under the age of 30 years old was significantly lower than that of the other two age groups.

There were nine PE teachers in elementary school aged 31 to 40 years old who were steady and pioneering type (7.96%), and the standardized residual after correction was -3.7, which was greater than the critical value of 1.96 at the significant level of .05, indicating that the PE teachers 31 to 40 years old were more the other two age groups, the number of people in the steady and pioneering type was significantly lower, while there were 29 people in the sensitive and cautious type (25.66%). In the other two age groups, the number of sensitive and cautious types was significantly higher.

There were 54 PE teachers in elementary school over 41 years old who were moderate and peaceful type (80.60%), and the standardized residual after correction is 3.4, which is greater than the critical value of 1.96 at the significant level of .05, indicating that PE teachers in elementary school over 41 years old were more the other two age groups, the number of moderate and peaceful type was significantly higher. And there were four people (accounting for 5.97%) of the sensitive and cautious type, and the adjusted standardized residual was -2.8, indicating that compared with the other two age groups, the number of PE teachers in elementary school over 41 years old in the sensitive and cautious type was significantly lower.

Analysis of different work experience. The results of the chi-square percentage homogeneity test of the differences in personality trait types among elementary school PE teachers with different work experience. $\chi^2=43.11, p < .05$, which has reached significant level, as shown in Table 11. It indicates that work experience was significant differences in personality traits of PE teachers in elementary school. Post hoc comparisons were further performed with adjusted standardized residuals (Haberman, 1982).

There were 59 PE teachers in elementary school with less than 5 years of work experience (accounting for 29.50%) who were steady and pioneering type. The standardized residual after correction was 5.0, which was greater than the critical value of 1.96 at the significant level of .05, indicating that less than 5 years of work experience was significantly

Table 8. Discriminant Analysis Reclassification Results.

Cluster category	Forecast category			Total
	Steady and pioneering type	Sensitive and cautious type	Moderate and peaceful type	
Original category				
Steady and pioneering type	77 (100%)	0	0	77
Sensitive and cautious type	0	71 (100%)	0	71
Moderate and peaceful type	13	13	219 (89.4%)	245
Classification accuracy		93.38%		

Table 9. Chi-Square Test of Homogeneity of Personality Trait Type Differences in Different Genders.

Cluster category	Male	Female
Steady and pioneering type	48 23.65A 2.1B	29 15.26A -2.1B
Sensitive and cautious type	28 13.79A -2.3B	43 22.63A 2.3B
Moderate and peaceful type	127 62.56A 0.1B	118 62.11A -0.1B

Note. A represents the percentage of times in the straight line; B represents the standardized residual after correction.

$\chi^2 = 7.77^*$.

* $p < .05$.

Table 10. Chi-Square Test of Homogeneity of Personality Trait Type Differences in Different Ages.

Cluster category	Under 31 years old	31–40 years old	Over 40 years old
Steady and pioneering type	59 27.70 4.4	9 7.96 -3.7	9 13.43 -1.4
Sensitive and cautious type	38 17.84 -0.1	29 25.66 2.5	4 5.97 -2.8
Moderate and peaceful type	116 54.46 -3.5	75 66.37 1.0	54 80.60 3.4

Note. $\chi^2 = 31.28^*$.

* $p < .05$.

higher than that of the other two age groups. While there were 105 people in the moderate and peaceful type (accounting for 52.50%), and the standardized residual after correction was -4.1 , indicating that less than 5 years of work experience was significantly lower than that of the other two age groups.

There were nine PE teachers in elementary school with 6 to 15 years of work experience (accounting for 7.20%) who were steady and pioneering type. The standardized residual

Table 11. Chi-Square Test of Homogeneity of Personality Trait Type Differences in Different Work Experience.

Cluster category	Less than 5 years	6–15 years	More than 16 years
Steady and pioneering type	59 29.50 5.0	9 7.20 -4.2	9 13.24 -1.5
Sensitive and cautious type	36 18.00 0.0	33 26.40 2.9	2 2.94 -3.6
Moderate and peaceful type	105 52.50 -4.1	83 66.40 1.1	57 83.82 4.0

Note. $\chi^2 = 43.11^*$.

* $p < .05$.

after correction was -4.2 , which was greater than the critical value of 1.96 at the significant level of .05, indicating that 6 to 15 years of work experience was significantly lower than that of the other two age groups. While there were 33 people in the sensitive and cautious type (accounting for 26.40%), and the standardized residual after correction was 2.9, indicating that 6 to 15 years of work experience was significantly higher than that of the other two age groups.

There were 57 PE teachers in elementary school with more than 16 years of work experience (accounting for 83.82%) who were moderate and peaceful type. The standardized residual after correction was 4.0, which was greater than the critical value of 1.96 at the significant level of .05, indicating that more than 16 years of work experience was significantly higher than that of the other two age groups. While there were two people in the sensitive and cautious type (accounting for 2.94%), and the standardized residual after correction was -3.6 , indicating that more than 16 years of work experience was significantly lower than that of the other two age groups.

In summary, different background variables and the difference analysis of three types of personality traits. It is found that there were more male than female in PE teachers who were steady and pioneering type, more females than males were sensitive and cautious, and the number of male than female was moderate and peaceful type. In addition, most of the PE teachers in elementary school under the age

of 30 years old belong to the steady and pioneering type, most of the 31 to 40 years old belong to the sensitive and cautious type, and most of the above 41 years old belong to the moderate and peaceful type. Finally, most of the PE teachers in elementary school under 5 years of work experience were steady and pioneering type, most of them were sensitive and cautious type between 6 and 15 years of work experience, and most of them were moderate and peaceful type over 16 years of work experience. The above verifies H2.

Discussion

According to the results of this study, the Big Five personality traits of PE teachers in elementary school were the highest in the average part of agreeableness and conscientiousness, while neuroticism was the lowest, and the individual differences in neuroticism was the largest. The correlation analysis results show that the neuroticism dimension was negatively correlated with the other four dimensions, indicating that the higher the neuroticism dimension score, the lower the score in the other dimensions. On the contrary, there was positive correlation between the other four dimensions, showing consistent covariation direction among the four dimensions. It shows that most PE teachers in elementary school were liked by students, have affinity, take initiative, pay attention to students' safety, have rigorous attitude, and be optimistic. This was consistent with the findings of Stults-Kolehmainen and Sinha (2014). Because PE teachers need more physical activity than general teachers, they are more likely to show good psychological qualities such as optimism, affinity, initiative, attention to student safety, and rigorous attitude. Many studies have also verified that PE teachers have more personality traits of agreeableness and conscientiousness, which may be caused by the nature of their jobs and responsibilities, because PE requires the common understanding and operation of students and teachers (Demir, 2016; Schnitzius et al., 2019, 2021). The maturation of PE teachers' personalities may lead to changes in their expression of the Big Five personality traits (Costa & McCrae, 2011; Göncz, 2017). The personalities of males and females will change with age and work experience. They will become more and more introverted and stable and will gradually tend to be agreeable (Giluk & Postlethwaite, 2015). In this study, the Big Five personality traits were analyzed using discriminant analysis, and three cluster categories were obtained, namely, steady and pioneering, sensitive and cautious, and moderate and peaceful type, which had similarities with the Big Five personality traits.

The first cluster, Pawlowska et al. (2014) argue that it is the teacher's job to help students learn, so teachers must be easy to approach personality traits. Conversely, teachers with unfriendly and difficult-to-talk personality traits, such as short-tempered, unapproachable, terse, mean, arrogant, rude teachers, are often complained by parents or students

(Claessens et al., 2017). Azur's (2005) research points out that the teacher's personality has an affinity, which is crucial for building student relationships. Research by Orosz et al. (2015) found that passionate teachers can foster passion for learning in their students. Research by Kim et al. (2019) pointed out that in order to demonstrate a high degree of teaching effectiveness, it is necessary for teachers to have positive, aggressive, and serious attitude. Göncz (2017) believes that successful teaching requires teachers to be highly responsible, orderly, responsible and innovative in teaching. The results of this study are in line with the fact that most PE teachers who were under the age of 30 years old and with less than 5 years of work experience belong to the steady and pioneering type. This is similar to the agreeableness, openness, and extraversion of the Big Five personality traits.

The second cluster, Cavalcanti and Pimentel (2016) argue that excessive restraint and persistence or stubbornness may lead to negative emotions, pessimism, low tolerance for frustration or impulsiveness, which is not ideal characteristics of PE teachers when interactions with students. Blatný et al. (2015) research pointed out that high neurotic teachers are unable to establish effective interaction with students. Kim and MacCann (2018) research confirms that neurotic teachers constantly experience job burnout because of emotional fatigue. Stults-Kolehmainen and Sinha's (2014) research shows that most PE teachers are highly resistant to stress and are able to relieve their stress using appropriate methods. Collie and Martin (2016) argue that teachers with acumen traits who are capable of predicting students' mistakes and preemptively adopt measures to mitigate the negative ramifications. The results of this study are in line with the fact that most PE teachers who were 31 to 40 years old and 6 to 15 years of work experience belong to the sensitive and cautious type. This is similar to the neuroticism and conscientiousness of the Big Five personality traits.

The third cluster, Kim et al. (2018) confirms that students expect the teacher's teaching attitude, should reduce unstable emotional reactions, and show more pleasant expressions in the classroom. Berkovich and Eyal's (2021) research confirmed that PE teachers' emotional stability can improve teacher effectiveness. Valente et al. (2019) researched and pointed out that teacher emotion is positively correlated with student achievement. Emotional stability seems particularly relevant in PE lessons, for example because of diverse learning environments with often unclear outcomes, which require intensive interaction or trust between teachers and students. In addition, the high degree of stress resistance of PE teachers may be conducive to adapting to the sports environment, such as the influence of noise during exercise or the sound of students' conversation (Cheung, 2020; von Haaren-Mack et al., 2020). The results of the study are consistent with PE teachers who are over 41 years old and more than 16 years of work experience belong to the moderate and peaceful type.

This is similar to the agreeableness of the Big Five personality traits.

Among the Big Five personality traits of PE teachers in elementary school, agreeableness was the highest. Among the three types of personality clusters, the moderate and peaceful type had the largest number of respondents. The results of this study were consistent with the views of many scholars (Barlett & Anderson, 2012; Costa & McCrae, 2011; Iancu et al., 2018; Kim et al., 2018; Michael et al., 2021). In addition, there are complex factors in personality traits, such as teachers' social ability, empathy, perseverance, socialization, independence, reflective ability, responsibility, etc., all exist in personality traits, but each teacher's personality traits are different, and the apparent behavior varies (Schnitzius et al., 2019). According to Kim and MacCann (2018), social competence refers to the ability to interact with and build relationships with others, and teachers with this trait can build strong trusting relationships with students. Klassen and Tzu (2014) pointed out that teachers with empathy can recognize students who have difficulty learning some motor skills and try to solve the confusion of students' learning. Oroz et al. (2015) believe that a teacher with perseverance will struggle and stand up through adversity, and teachers with perseverance will do everything to teach each student. Deng et al. (2020) believe that PE teachers often participate in various school activities, and these environments and situations may shape the socialization characteristics of PE teachers. Romer et al. (2018) pointed out that teachers with independence trait do not rely on others to complete tasks, they are self-aware and self-driven. Kola (2021) pointed out that reflective teachers can look back and learn from experience, and teachers with this trait often reflect on their own practices and make continuous improvements (Aina et al., 2015). Khalilzadeh and Khodi (2021) research found that teachers' conscientious personality traits have positive impact on students' intrinsic motivation.

In addition, there is also research on the type of teachers preferred from the students' point of view. De Feyter et al. (2012) found that the most important personality traits of liked teachers are agreeableness, emotional stability and openness. However, disliked teachers have such personality traits as suspiciousness and antagonism toward others and emotional instability (De Feyter et al., 2012). Finally, no matter from the Big Five personality traits or the three cluster categories, the participants unanimously agreed that agreeableness or moderate and peaceful type belonged to the personality traits of PE teachers in elementary school in Taiwan.

Conclusion

PE courses cultivate children's healthy development, including their mind, body, and spirit, which is especially important for elementary students. According to literature and

related studies, the Big Five personality traits of PE teachers in elementary school tend to be agreeable, and the three cluster personality types are mainly moderate and peaceful type, indicating that most PE teachers are emotionally calm, regular, and optimistic attitude. The content of the PE teacher's class includes action guidance, sports ethics, and sports knowledge. Students learn from imitation, so teachers should lead by example. In the future your students may not remember the motor skills you teach, but they will always remember teacher's image and traits. Therefore, as current or future PE teachers, they should show good personality traits in the workplace, so that students can learn good sportsmanship, respectfulness, empathy, and compassion. Finally, the study has some limitations. The sample cannot represent all primary school PE teachers in Taiwan, and there are still restrictions on the inferences of PE teachers in remote areas and different systems. In addition, the questionnaire surveys cannot differentiate between the emotions, situations, and subjective cognitions of the respondents at the time of their responses, which may cause errors in the analysis of the results of this study.

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Availability of Data and Materials

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