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Relationships Among Personality Traits, Gender Roles, Goal Orientations, and Psychological Resilience in Adolescent Athletes: A Network Analysis Study

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Abstract

Background: Psychological resilience is a crucial psychological trait that influences the ways individuals cope with adversity and challenges, playing an important role in their adaptation and development. Personality traits, gender roles, and goal orientation may serve as significant protective factors for psychological resilience. Based on this, the present study adopts methods such as network analysis and mediation modeling to comprehensively explore the relationships among the above variables, aiming to provide corresponding strategies and recommendations for intervention approaches to psychological resilience.

Methods: A total of 650 adolescent athletes completed questionnaires assessing the Big Five personality traits, gender roles, psychological resilience, and goal orientation. Network analysis was utilized to visualize the interconnections among variables, while mediation analysis examined the chain mediating effects of gender roles (masculinity) and goal orientation (task orientation) on the relationship between personality traits (extraversion) and psychological resilience.

Results: The network analysis revealed stronger intra-variable connections compared to inter-variable connections. Key cross-dimensional associations included: "agreeableness" with "femininity," "masculinity" with "task orientation," "extraversion" with "masculinity," and "personal competence" with "task orientation." Task orientation demonstrated the highest bridge expected influence (BEI), serving as the central hub in the network. The mediation model confirmed the mediating roles of masculinity and task orientation, indicating that agreeableness indirectly influences psychological resilience through these factors.

Conclusion: Personality traits, gender roles, psychological resilience, and goal orientation in youth athletes collectively form a dynamically interconnected network. Among them, agreeableness, through its bridging role between masculine and task-oriented traits, integrates the functions of both, thereby improving psychological resilience. This finding also provides intervention strategies for enhancing psychological resilience in youth athletes. These associative and exploratory findings warrant further verification through causal research.

Keywords: Personality Traits; Gender Roles; Psychological Resilience; Goal Orientation; Network Analysis

1 Introduction

Against the backdrop of the deepening implementation of the “Double Reduction” policy and the comprehensive advancement of the “Sport for Nation” and “Healthy China” strategies, enthusiasm for and participation in youth sports continue to surge, bringing unprecedented attention to the development of the talent pipeline for competitive sports. As a unique demographic bridging school-based sports and professional athletics, adolescent athletes not only carry the expectations of achieving national glory but also face significant psychological challenges from the dual pressures of academics and training. Intensive training, fierce competition, performance fluctuations, and identity confusion during a period of rapid physical and psychological development collectively constitute multiple adversities in their developmental process[1][2]. Psychological resilience, as a critical psychological resource that enables individuals to maintain adaptation and growth amidst stress and setbacks, plays a decisive role in whether adolescent athletes can effectively cope with challenges, sustain their mental health, and ultimately achieve sustainable development in their athletic careers. However, current practices in sports psychology tend to focus on skill training and post-competition counseling, while a systematic and interactive understanding of the intrinsic protective factors for psychological resilience in this population remains insufficient. Consequently, how to scientifically identify and cultivate psychological resilience has become a pressing issue to be addressed in the fields of physical education and athletic training.

Driven by this practical need, sports psychology has increasingly focused on the antecedent mechanisms of psychological resilience. Resilience does not arise in a vacuum; rather, it is the product of dynamic interactions between an individual’s internal traits and their external environment. Within this framework, goal orientation (e.g., a tendency towards task mastery versus ego-involvement) guides an athlete’s cognitive and motivational patterns when facing challenges[3]. stable personality traits (e.g., neuroticism, agreeableness, conscientiousness) form the foundation of their emotional and behavioral responses[4]. and gender roles (e.g., masculinity, femininity, androgyny) may modulate their stress-coping strategies at the level of social expectations and self-construction[5]. These psychological constructs are interrelated, collectively weaving a complex network that influences the adaptive capacity of adolescent athletes.

However, existing research has predominantly examined the linear relationships between isolated variables and resilience, or has treated resilience as a monolithic

construct. Such approaches have failed to deconstruct its multidimensional nature and explore the specific associations between its various facets (e.g., personal competence, tolerance of negative affect, acceptance of change, sense of control, and spiritual beliefs) and distinct antecedent variables. More critically, within the "psychological trait ecosystem" comprised of goal orientation, personality traits, and gender roles, which factors act as the core hubs that activate the entire network and exert the greatest influence? Through what pathways and with what intensity do these central nodes connect to the different dimensions of resilience? Unveiling this network structure is the key to transforming fragmented knowledge of protective factors into systematic, evidence-based intervention programs. Therefore, the central research questions of this study are: Within the psychological trait network of adolescent athletes, which variables (e.g., specific goal orientations, personality dimensions, or gender role types) are the most highly connected and influential core nodes? And what is the strength and direction of the edges (associations) linking these core nodes to the various dimensions of psychological resilience?

Research addressing these questions has made considerable progress, yet significant gaps remain. On one hand, numerous studies have confirmed the positive promoting effects of protective factors, such as an optimistic personality and a task-oriented goal orientation, on psychological resilience[6][7]. Concurrently, other research has indicated that the impact of academic performance on psychological resilience varies across different gender groups among university students[8]. On the other hand, network analysis, as an emerging psychometric approach, offers a powerful tool for revealing complex interactions among variables. It has been applied to studies on characteristics of adolescent depressive symptoms[9], demonstrating its advantage in identifying core symptoms or traits. However, the application of a network analysis perspective to the study of psychological resilience in adolescent athletes remains scarce.

As a key psychological resource for coping with adversity, the development of psychological resilience is closely associated with various intrinsic protective factors. A substantial body of research has confirmed that positive personality traits are a crucial cornerstone of resilience. For instance, personality dimensions such as optimism and agreeableness have been repeatedly shown to significantly enhance an individual's psychological resilience, helping them maintain adaptation and growth under pressure[6]. Goal orientation, particularly task orientation (i.e., focusing on skill mastery and self-improvement), is also considered a key motivational factor

that promotes resilience by guiding individuals to view challenges as learning opportunities rather than threats[7]. Furthermore, external resources like social support systems (e.g., from family and friends) can buffer the negative impact of academic stress on psychological resilience[10]. Differences in mental health may be related to socially constructed gender roles rather than biological sex, with masculine roles associated with enhanced resilience and feminine roles linked to greater vulnerability[11]. However, these studies have typically treated psychological resilience as a holistic or unidimensional construct. Few have simultaneously placed multiple intrinsic traits—such as goal orientation, diverse personality dimensions, and gender roles—within a single framework to examine how they synergistically influence the different facets of resilience (e.g., "personal competence," "tolerance of negative affect," "acceptance of change," "sense of control," and "spiritual beliefs").

Finally, traditional variable-centered statistical methods, such as regression analysis and structural equation modeling, have limitations in revealing complex interactions among multiple variables. In recent years, the network analysis of psychological traits, an emerging approach based on graph theory, has been widely applied in clinical and health psychology. This method conceptualizes psychological traits or symptoms as "nodes" in a network and their correlations or conditional dependencies as "edges." By visualizing the network structure and calculating centrality indices (e.g., strength centrality), it can intuitively identify the core nodes that are most highly connected and influential. This approach has shown unique advantages in studying the complex systems of psychopathology and health-related traits. For example, while Wei Jialin et al. (2025) utilized latent profile analysis and regression to explore the heterogeneity of depressive symptoms in adolescents and its association with sleep quality and psychological resilience[9], Wang Rui et al. (2024) directly employed complex network analysis to identify the core sources of stigma affecting the psychological resilience of adolescents with Type 1 diabetes[12]. Furthermore, a study by NÖzdemir (2019) focused on elite athletes, examining the characteristics of their psychological resilience[13]. Network analysis not only aids in understanding the direct associations between symptoms or traits but also reveals the underlying core mechanisms that maintain psychological states, thereby providing targets for precise interventions. However, the systematic application of network analysis to the adolescent athlete population, particularly to integrate and analyze the network relationships among goal orientation, personality traits, gender roles, and

the multidimensional structure of psychological resilience, remains a gap in the literature.

2 Materials and Methods

2.1 Participants

This study employed a stratified cluster random sampling strategy. Data were collected in January 2026 from students aged 12-18 at six municipal sports schools in Jiangsu Province. Online questionnaires were administered and collected via the Wenjuanxing platform. The research team first coordinated with the teachers of each class to briefly introduce the study's purpose and academic value to the students. Subsequently, teachers randomly selected students from their classes to participate and distributed the questionnaire link through class WeChat groups. To minimize potential herd behavior or social desirability bias from teacher involvement, the survey instructions specifically emphasized the principles of anonymity and voluntary participation, thereby effectively enhancing the authenticity of the data and the representativeness of the sample. To avoid ceiling or floor effects in the analysis, the following criteria were established to invalidate questionnaires: (1) completion time of less than 120 seconds, and (2) a repeated response pattern in more than 80% of the items[14]. All research procedures strictly adhered to the ethical principles for human subjects as outlined in the Declaration of Helsinki and received approval from the Ethics Committee of the Faculty of Psychology, Beijing Normal University. Prior to completing the questionnaire, all participants read and provided written informed consent. The measurement instruments used in this study covered core dimensions including demographic variables, personality traits, goal orientation, gender roles, and psychological resilience. Of the 700 questionnaires collected, 650 were deemed valid after excluding incomplete or invalid responses, yielding an effective response rate of 92.85%. Details are presented in **Table 1**.

Table 1 Summary of Data Collection

	Male（n=342）	Female（n=308）	Total/Proportion
Grade 5	36	33	69
Grade 6	48	46	94
Grade 7	40	46	86
Grade 8	40	49	89
Grade 9	48	38	86
Grade 10	56	28	84
Grade 11	39	31	70

Grade 12	35	37	72
Total/Proportion	342/47.9%	308/52.1%	650/100%

2.2 Instruments

2.2.1 Gender Role Inventory

This study utilized the College Student Role Inventory (CSRI-50), which was adapted and translated from Bem's Sex Role Inventory by Liu Dianzhi and Huang Huixin[15]. The scale consists of 50 items divided into three parts: Masculinity, Femininity, and a Neutrality subscale. Responses are rated on a 7-point Likert scale, ranging from 1 ("Completely Disagree") to 7 ("Completely Agree"). In the present study, the Cronbach's alpha coefficient for this scale was 0.83.

2.2.2 Big Five Inventory - Short Form (BFI-S)

The Big Five Inventory-2 Short Form (BFI-2-SF)[16] is a brief assessment tool developed based on the Five-Factor Model (FFM) of personality. The scale is designed to quickly assess the five core dimensions of personality: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism. Developed by Soto and John in 2017 as a psychometrically optimized version of the full BFI-2, the BFI-2-SF reduces the number of items to 15 (three items per dimension), significantly shortening the administration time to approximately 3-5 minutes while maintaining good structural validity. The scale uses a 6-point Likert self-report format (1 = "Strongly Disagree" to 6 = "Strongly Agree") and includes behavioral statements such as "I come up with new ideas" (Openness to Experience). In the present study, the Cronbach's alpha coefficient for this scale was 0.85.

2.2.3 Psychological Resilience Scale

This study utilized the Chinese version of the Connor-Davidson Resilience Scale (CD-RISC)[17], which was originally developed by Connor and Davidson (2003) and later revised by Xiao Nan and Zhang Jianxin (2007). The CD-RISC is one of the most widely used instruments for assessing psychological resilience, both domestically and internationally, and has demonstrated good reliability and validity. The Chinese version of the CD-RISC has a unidimensional structure consisting of 25 items. The scale employs a 5-point Likert scoring method, ranging from 0 ("Never") to 4 ("Almost always"). Item 20 is reverse-scored. A total score is calculated by summing all items, with a possible range of 0 to 100. higher scores indicate a greater level of psychological resilience. In this study, the Cronbach's α coefficient of the scale was 0.945..

2.2.4 Task and Ego Orientation in Sport Questionnaire (TEOSQ)

The Task and Ego Orientation in Sport Questionnaire (TEOSQ) was originally developed by Duda and Nicholls in 1992. The Chinese version of the questionnaire, translated and validated by Chinese scholars Chen Jian and Si Gangyan[18], was used in this study. The scale consists of 13 items across two dimensions: Task Orientation (7 items) and Ego Orientation (6 items). It utilizes a 5-point Likert scale for scoring. The Chinese version has been shown to have good reliability and validity when applied to university and middle school student populations. To date, the TEOSQ has been widely used in both athlete and general student populations. In the present study, the internal consistency coefficient (Cronbach's alpha) for this scale was 0.89.

2.3 Data Analysis

This study used SPSS 29.0 for descriptive statistics and mediation analysis, while network analysis was conducted using R software (version 4.2.1). The primary analytical approach was psychological network analysis. This method was chosen to address the core research questions, which involve exploring the complex interactive network structure between multiple psychological traits (personality, gender roles, goal orientation) and the multidimensional facets of resilience in adolescent athletes, and identifying the core hub variables within this network. Traditional variable-centered statistical methods (e.g., regression analysis) are often insufficient for fully revealing the non-linear, holistic association patterns among multiple variables. In contrast, psychological network analysis conceptualizes each psychological trait as a "node" and the partial correlations between variables as "edges" connecting these nodes (representing positive or negative associations). By visualizing the network and calculating a series of graph-theoretical indices (e.g., strength centrality), this approach can intuitively and quantitatively depict the interdependencies among traits and precisely identify the most highly connected and influential core nodes. Therefore, this method can directly and effectively answer the research questions: "Which variables are the core nodes?" and "What is the strength and direction of the associations between these nodes and the various dimensions of resilience?" Furthermore, this study employs "Bridge Expected Influence" (BEI) as a key metric to identify and quantify the role of bridge nodes that connect different psychological constructs. BEI measures the strength of direct connections from one node to nodes in other communities, reflecting its potential to facilitate or hinder the transmission of effects between distinct functional clusters (e.g., connecting a gender role cluster with a team cohesion cluster). A higher absolute BEI value indicates a more significant bridging role, meaning the node can be a potential conduit for

positive influence or a critical pathway for risk propagation. Accordingly, data for all variables were collected simultaneously via a structured questionnaire to construct and analyze a network model reflecting the conditional dependencies among the psychological traits of adolescent athletes.

2.3.1 Network Estimation

First, we constructed and visualized the Personality Traits-Gender Roles-Psychological Resilience-Goal Orientation network using the EBICglasso function from the qgraph package in R. The network was estimated using a Gaussian Graphical Model (GGM)[19]. The model included the 14 dimensions from the four scales as network nodes, with the connections between them represented as "edges." The thickness of an edge indicates the strength of the partial correlation between the two nodes, with blue edges representing positive correlations and red edges representing negative correlations. To ensure the stability and interpretability of the network structure, we used the nonparametric Pearson partial correlation matrix of the items as the input data for the GGM. The optimal regularization parameter was then determined using the graphical lasso (glasso) algorithm and the Extended Bayesian Information Criterion (EBIC)[20].

2.3.2 Centrality, Bridging, and Predictability

Based on the dimensional design of the scales, we performed an a priori modular partition of the network to ensure that nodes within each module served the same measurement construct. Specifically, the 14 dimensions from the Personality Traits-Gender Roles-Psychological Resilience-Goal Orientation network were divided into four modules: the Gender Role module (Masculine Role, Feminine Role), the Personality Trait module (Agreeableness, Extraversion, Openness, Conscientiousness, Neuroticism), the Psychological Resilience module (Personal Competence, Tolerance of Negative Affect, Acceptance of Change, Control, and Spiritual Influences), and the Goal Orientation module (Task Orientation and Ego Orientation).

We calculated four centrality metrics—betweenness, closeness, strength, and Expected Influence (EI)—using the bootnet package in R to identify key nodes within the network structure and to determine the dimensions that play a core driving role in the gender roles, personality traits, psychological resilience, and goal orientations of adolescent athletes. Furthermore, to assess the nodes that connect different communities, we employed one-step Bridge Expected Influence (BEI)[21]. This metric quantifies the sum of direct connection strengths from a given node to all

nodes outside its own community, with calculations considering only direct connections that bridge the Gender Role, Personality Trait, Goal Orientation, and Psychological Resilience communities. The BEI was calculated using the bridge function from the networktools package in R, aiming to identify the core bridge nodes that connect the systems of gender roles, personality traits, goal orientation, and psychological resilience. Finally, node predictability was quantified using the mgm package in R. This metric measures the proportion of variance in a node that can be explained by all of its neighboring nodes in the network[22]

2.3.3 The Stability and Accuracy of Network Structure

To examine the stability and accuracy of the network structure, we assessed the stability of the centrality indices and the accuracy of the edge weights. The stability of node centrality was tested using the case-dropping bootstrap method, with the correlation-stability (CS) coefficient calculated from 5,000 bootstrap samples. Following the recommendations of Epskamp et al.[19], a CS coefficient should be no lower than 0.25 and should ideally exceed 0.50. The accuracy of the edge weights was evaluated using a non-parametric bootstrap, with 95% confidence intervals (CIs) calculated for each edge from 5,000 bootstrap samples; narrower CIs indicate more accurate edge weight estimates. Furthermore, the variability of both nodes and edges was also analyzed using a non-parametric bootstrap (5,000 samples) to ensure the reliability of the results. The CS coefficient is a key indicator for assessing the robustness of network inference. A higher CS value ($\geq$0.50) is particularly crucial when designing interventions based on central nodes, as it significantly enhances the credibility and replicability of the intervention strategies.

2.3.4 Network Comparison

To test for differences in network structure between male and female athletes, we conducted an analysis using the NetworkComparisonTest (NCT) package in R[23]. This method involves three primary tests: the Network Structure Invariance test (which compares the overall structural differences between the two networks), the Global Strength Invariance test (which compares the difference in the sum of all edge weights in the networks), and the Edge Weight Invariance test (which compares the differences in specific edge weights between the networks).

Results

3.1 Common Method Bias Test and Descriptive Statistics

Harman's single-factor test[24] was conducted to assess common method bias in the data. The results showed that the first factor accounted for 27.731% of the total

variance, which is below the 40% critical threshold. This indicates that the study is free from severe common method bias.

3.2 Descriptive Statistics and Analysis of Variance

Descriptive statistics and independent samples t-tests were conducted on a sample consisting of 650 participants. Statistically significant gender differences were observed in openness, masculinity, personal competence, tolerance of negative emotions, acceptance of change, and total control scores ($p = 0.026$, 0.001, 0.001, 0.002, 0.001, and 0.001, respectively. all $p < 0.05$). However, no significant differences were found in extraversion, agreeableness, conscientiousness, neuroticism, femininity, spiritual beliefs, self-direction, or task orientation ($p = 0.841$, 0.974, 0.106, 0.400, 0.111, 0.659, 0.171, and 0.077, respectively).

According to Kline's[25] criteria, questionnaire data can be considered approximately normally distributed when skewness and kurtosis values fall within ±3 and ±10, respectively. As all items met these conditions, the data were deemed suitable for further analysis. Detailed results are presented in **Table 2**.

Table 2 Descriptive statistics and analysis of variance(N=518)

	Overall (N=650)	Male (N=342)	Female (N=308)	F	P	n^2	McDonald's w	Skew	Kurt
Ext	9.57±1.626	9.55±1.548	9.58±1.71	1.688	0.841	0	-0.002	-0.007	1.12
Agr	10.84±2.011	10.84±1.956	10.84±2.073	1.066	0.974	0	-0.002	0.176	-0.297
Cns	10.24±1.936	10.1±1.882	10.38±1.986	0.822	0.106	0.005	0.003	0.466	-0.043
Nrt	8.49±2.129	8.41±2.157	8.57±2.099	0.117	0.4	0.001	-0.001	-0.176	0.259
Opn	9.81±1.681	9.66±1.69	9.98±1.658	0.026	0.032	0.009	0.007	0.478	0.583
Mir	77.91±14.978	80.42±15.038	75.17±14.45	2.574	<.001	0.031	0.029	0.49	-0.291
FmR	77.92±13.704	77±13.843	78.92±13.508	0.249	0.111	0.005	0.003	0.517	-0.311
PrC	28.83±6.017	29.7±6.004	27.89±5.898	0.829	<.001	0.023	0.021	0.124	-0.383
TNE	23.66±4.576	24.26±4.514	23±4.561	0.38	0.00	0.01	0.017	0.424	0.465

				2	2	9			
AcC	16.75±3.348	17.29±3.351	16.17±3.251	2.215	<.001	0.028	0.026	0.264	0.408
SoC	10.27±2.327	10.7±2.285	9.81±2.286	0.863	<.001	0.037	0.035	0.242	-0.021
SpB	6.36±1.5	6.39±1.538	6.33±1.461	1.239	0.659	0	-0.002	0.249	0.446
EgO	20.61±3.614	20.81±3.717	20.38±3.492	1.206	0.171	0.004	0.002	0.464	0.637
TsO	25.91±4.402	26.24±4.429	25.56±4.353	0.005	0.077	0.006	0.004	0.135	0.049

Note:

Ext: Extraversion;Agr: Agreeableness;Cns: Conscientiousness;Nrt: Neuroticism;Opn: Openness;Mir: Masculinity; FmR: Femininity; PrC: Personal Competence;TnE:Tolerance of Negative Affect; AcC:Acceptance of Change SoC:Sense of Control; SpB: Spiritual Beliefs; EgO:Ego Orientation; TsO:Task Orientation.

3.3 Correlation Analysis

Figure 1 displays the correlation matrix among the variables. In the figure, red indicates a positive correlation, blue indicates a negative correlation, and white represents a weak correlation. The results show that within the same dimensions, the personality traits of Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness are significantly intercorrelated. Neuroticism, however, shows a significant negative correlation with the other dimensions within the personality trait domain. Among these, a strong positive correlation was found between Conscientiousness and Agreeableness ($r = 0.45$). Within the gender role dimension, a strong positive correlation exists between Male Role and Female Role ($r = 0.80$). In the psychological resilience dimension, a moderate positive correlation is observed between Personal Competence and Tolerating Negative Emotions ($r = 0.78$), while a moderate positive correlation is also present between Sense of Control and Spiritual Beliefs ($r = 0.39$). In the goal orientation dimension, a strong positive correlation was found between Task Orientation and Ego Orientation ($r = 0.69$). Across all variables, the strongest correlation was observed between Personal Competence and Sense of Control ($r = 0.81$).

Furthermore, between different dimensions, Extraversion showed a moderate positive correlation with Male Role ($r = 0.34$), while Neuroticism showed a

moderate negative correlation with Female Role (r = -0.24). Conscientiousness was moderately and positively correlated with Personal Competence (r = 0.29), whereas Neuroticism was moderately and negatively correlated with Personal Competence (r = -0.34). Male Role had a strong positive correlation with Tolerating Negative Emotions (r = 0.57), as did Female Role (r = 0.49). Sense of Control was moderately and positively correlated with Task Orientation (r = 0.47). Neuroticism was negatively correlated with variables across all dimensions. Overall, the heatmap clearly illustrates the strength and direction of the associations among the variables, providing an essential foundation for the subsequent statistical analyses.

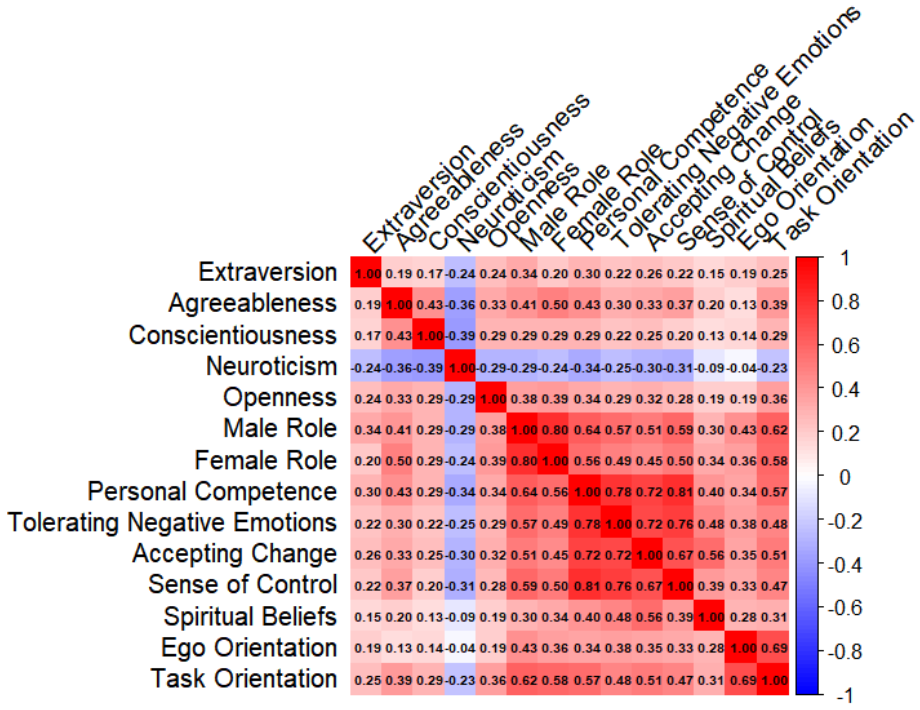


Figure 1. Partial Correlation Coefficients Between Different Nodes

3.4 Network Analysis

3.4.1 Network Edge Structure and Density

The network edge structure, shown in Figure 2, indicates that the network for adolescent athletes consists of 52 non-zero edges out of a possible 91, resulting in a network sparsity of 0.42. This suggests that the network connectivity is moderate, being neither too dense nor too sparse.

3.4.2 Topological Structure Analysis of the Network

We constructed a network model comprising 14 nodes with a maximum of 91 potential connections. The results showed that the network contained 52 edges, representing 57.14% of all possible edges, with a mean weight of 0.049. The analysis indicated that within the personality trait dimension, the strongest association was

between “Agreeableness” (Agr) and “Conscientiousness” (Cns). Within the psychological resilience dimension, the most significant association was between “Personal Competence” (PrC) and “Sense of Control” (SoC). Furthermore, a key cross-community association was identified between “Male Role” (MIR) and “Task Orientation” (TsO). For specific details, see **Figure 2**.

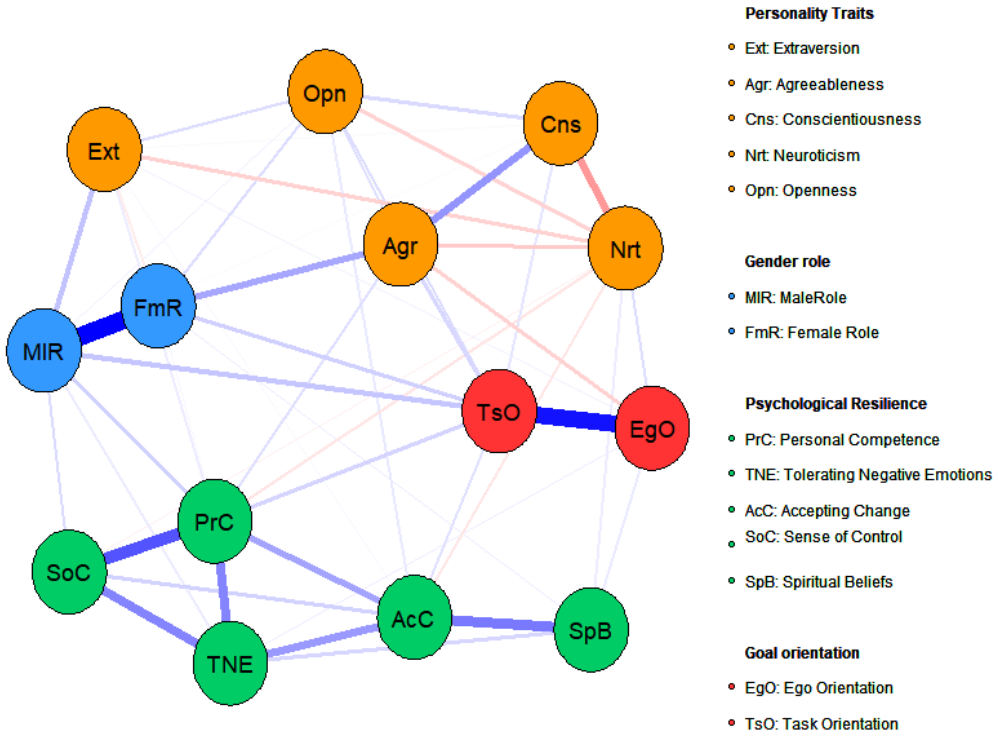


Figure 2. Network Structure of Personality Traits, Gender Role, Psychological Resilience, and Goal Orientation

3.4.3 Node Centrality Indices and Bridge Symptoms

Figure 3 and **Table 3** display the values for each network node in terms of strength, closeness centrality, betweenness centrality, and expected influence (EI). In the psychological resilience network, the “Personal Competence” node exhibited higher betweenness centrality and strength than other nodes, indicating that it plays a crucial role and acts as a key “bridge” for the transmission of information or influence within the network. In the gender role network, the “Masculine Role” node showed higher closeness centrality than other nodes, suggesting it can reach other nodes more quickly, reflecting the node’s “reachability” or “speed of influence propagation.” In the goal orientation network, the “Task Orientation” node demonstrated stronger expected influence, implying that changes in this node may have a substantial impact on the entire network, which highlights its importance in maintaining network function. In the personality trait network, the “Agreeableness”

node showed higher values than other nodes across all centrality metrics.

Figure 4 displays the bridge expected influence (BEI) values for each node within the four networks. Task Orientation exhibited the highest BEI in the goal orientation network, Masculine Role showed the strongest BEI in the gender role network, Personal Competence demonstrated the strongest BEI in the psychological resilience network, and Agreeableness displayed the highest BEI in the personality trait network. Across the entire network, Task Orientation had the highest bridge strength, indicating that it acts as a "bridge" between Masculine Role and psychological resilience. This finding is consistent with Social Cognitive Theory, as masculine role norms create social pressure, while task orientation provides a positive coping mechanism, ultimately fostering the development of psychological resilience.

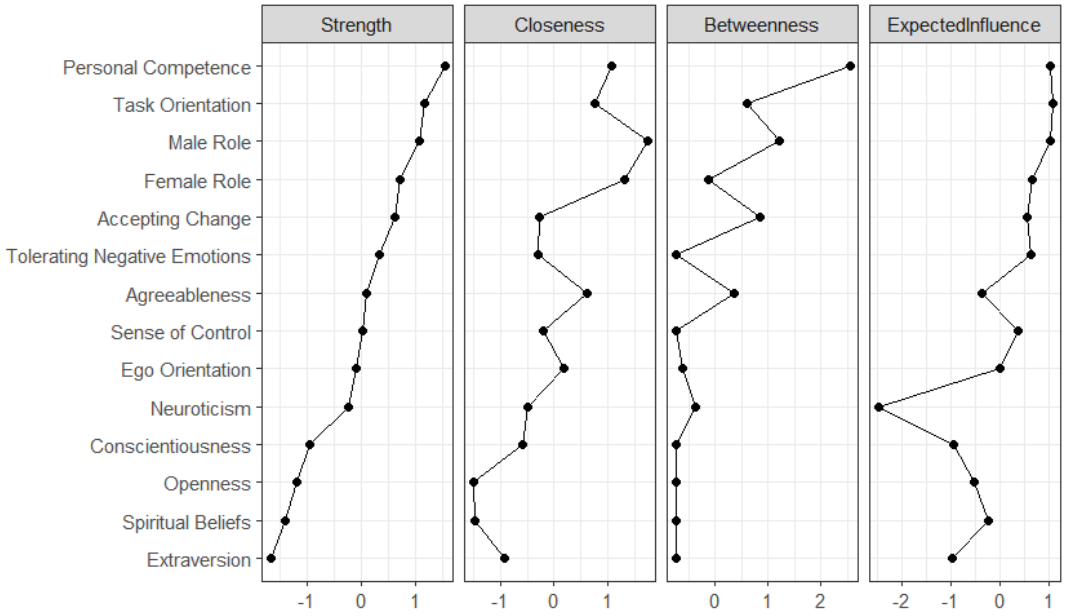


Figure 3. Comparison of Strength, Closeness Centrality, Betweenness Centrality, and Expected Influence Across Nodes

Table 3. Z-score Standardization

Node	Strength	Betweenness	Closeness	ExpectedInfluence
Extraversion	-1.66214870	-0.74007591	-0.91492424	-0.95372964
Agreeableness	0.09659000	0.35697779	0.60830599	-0.36144210
Conscientiousness	-0.95883811	-0.74007591	-0.58394730	-0.93553992
Neuroticism	-0.23776256	-0.37439134	-0.47870830	-2.46117680
Openness	-1.19277650	-0.74007591	-1.49547891	-0.52860518
Male Role	1.06233739	1.21024178	1.74168939	1.03146045

Node	Strength	Betweenness	Closeness	ExpectedInfluence
Female Role	0.72235075	-0.13060163	1.32733105	0.68300670
Personal Competence	1.53945644	2.55108519	1.08605521	1.04625421
Tolerating Negative Emotions	0.32586392	-0.74007591	-0.30071363	0.65489132
Accepting Change	0.61408985	0.84455721	-0.27599610	0.57230039
Sense of Control	0.03039291	-0.74007591	-0.18989863	0.37679833
Spiritual Beliefs	-1.40164922	-0.74007591	-1.47963159	-0.22841016
Ego Orientation	-0.09989591	-0.61818105	0.19283028	0.02177832
Task Orientation	1.16198974	0.60076750	0.76308678	1.08241408

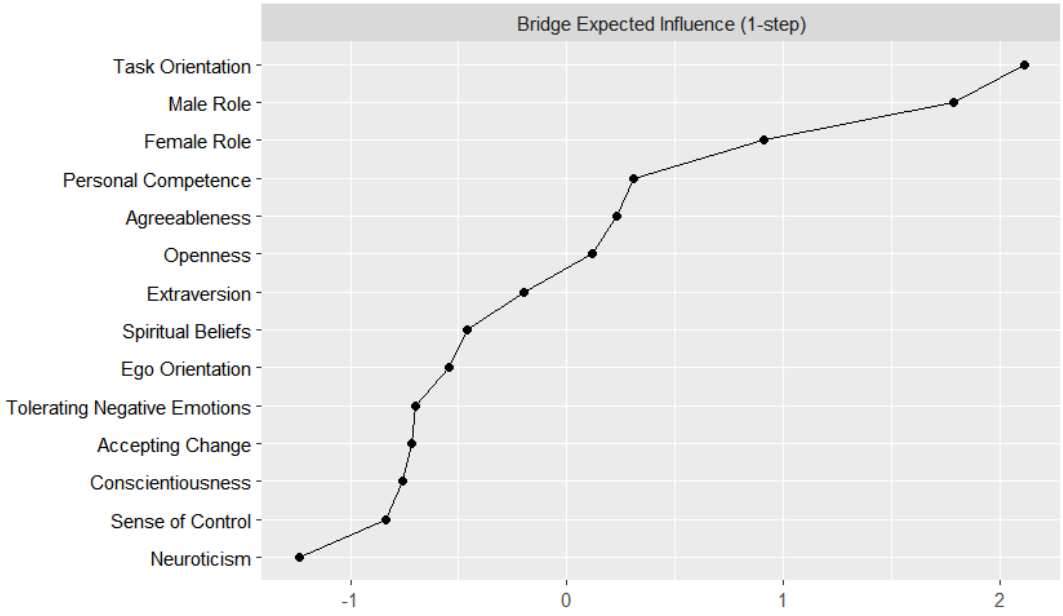


Figure 4. Bridge Expected Influence of Each Node

3.4.4 Network Stability

Figures 5 and 6 present the results of the network stability analysis using the case-dropping bootstrap method. The correlation stability coefficient for edges (CS-coefficient), strength, bridge strength, and expected influence (EI) was 0.749, while the CS-coefficient for closeness centrality was 0.438. These results indicate that the core structure of the network—particularly the edges, strength, bridge strength, and expected influence—demonstrates good stability. The main conclusions remain robust even after dropping up to 75% of the sample.

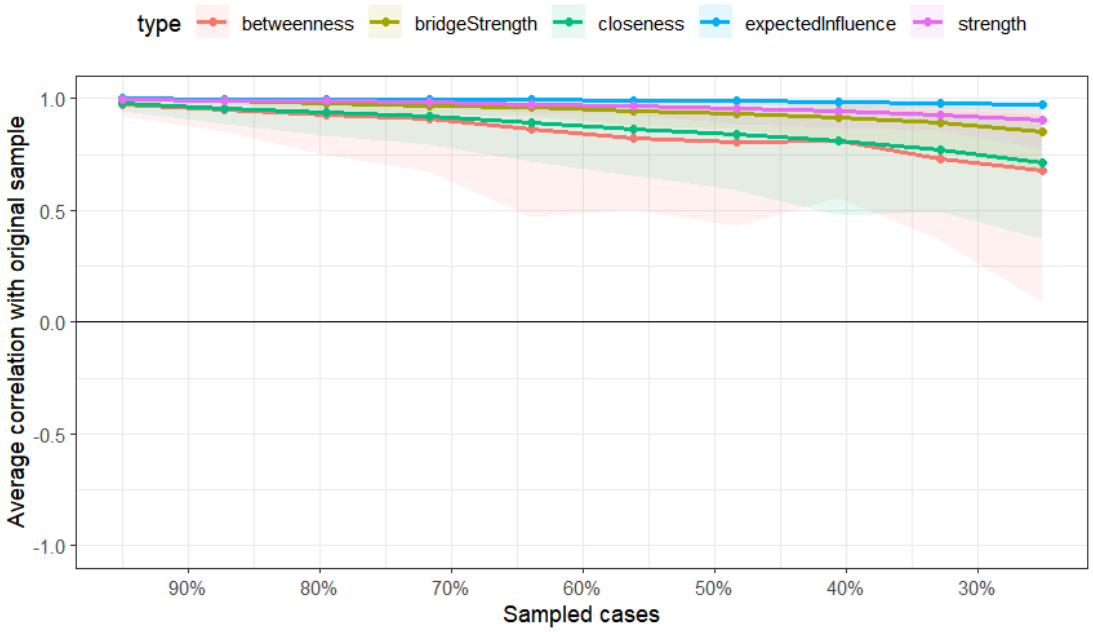


Figure 5. Correlation between Node Centrality Indices and the Original Sample at Different Subsampling Proportions

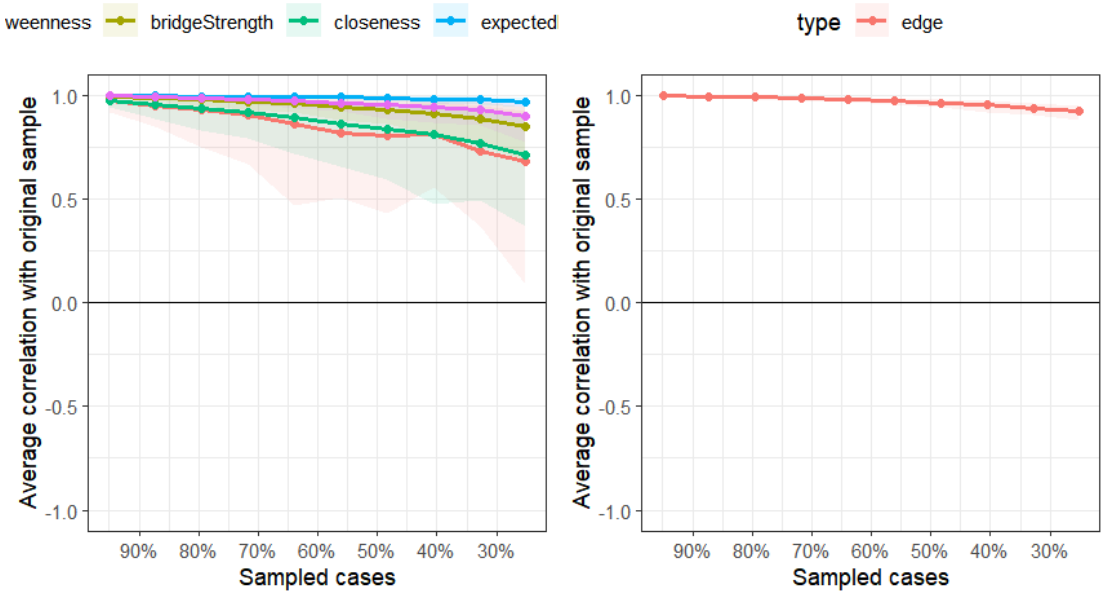


Figure 6. Comparison of Network Metric Stability: Correlation Analysis Between Metrics and the Original Sample at Different Subsampling Proportions

3.4.5 Network Stability

We employed the Network Comparison Test (NCT) to examine differences in the psychological network structures between the two groups. First, the Network Invariance Test indicated that there was no significant difference in the overall network structure between the groups (M = 0.212, p = 0.226). However, a highly significant difference was observed in the overall network connectivity strength (S =

0.760, p = 0.008), with one group showing a significantly higher Global Expected Influence (Global EI = 4.877) than the other (Global EI = 4.117). To further investigate the source of this difference, we conducted local tests. The results of the edge weight invariance test showed that no single connection differed significantly between the two groups (all p > 0.05). Similarly, the centrality invariance test revealed no significant differences in the node strength centrality between the groups (all p > 0.05). In summary, these findings suggest that while the overall network layout is similar for both groups, one group's network is more densely connected internally. This difference in overall strength does not stem from a specific path or a single core node, but may instead be attributed to the cumulative effect of small, subtle, system-wide differences. For details, see **Figure 7**.

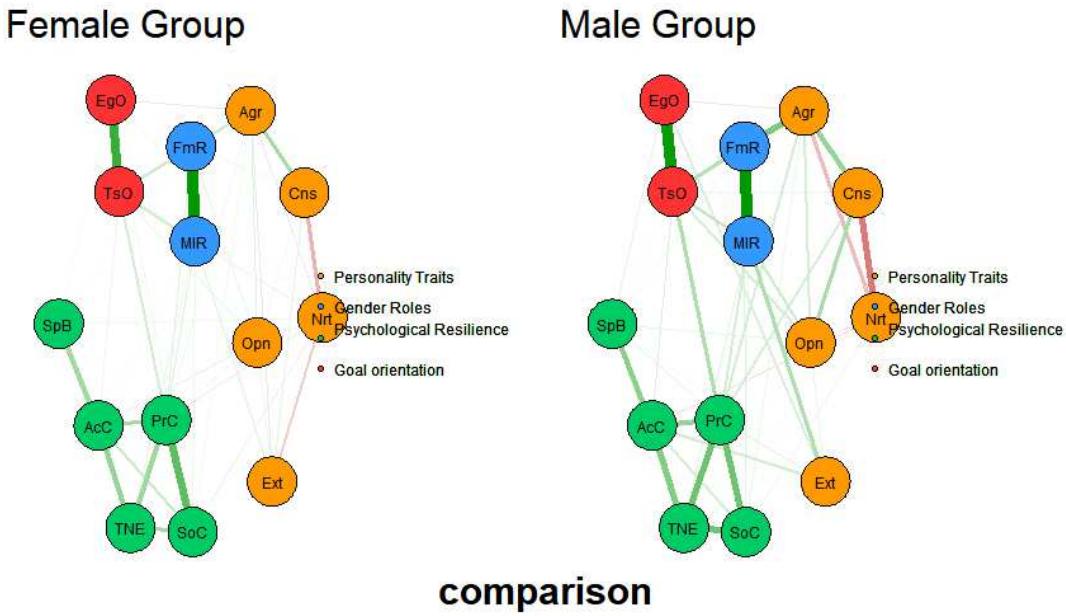


Figure 7. Comparison of Network Structures by Gender

3.5 Mediation Analysis

The results of the mediation analysis are presented in **Table 4**. The personality trait (Agreeableness) had a significant direct effect on psychological resilience (effect = 0.124, 95% CI [0.053, 0.194]), accounting for 31.63% of the total effect, indicating a significant direct association between these variables. The analysis also revealed three significant indirect pathways. The indirect effect through the path "Personality Trait (Agreeableness) → Gender Role (Masculinity) → Psychological Resilience" was 0.167 (95% CI [0.117, 0.221]), accounting for 42.60% of the total effect (0.392). Similarly, the indirect effect via the path "Personality Trait (Agreeableness) → Goal Orientation (Task Orientation) → Psychological Resilience"

was 0.044 (95% CI [0.020, 0.073]). The serial mediation path "Personality Trait (Agreeableness) → Gender Role (Masculinity) → Goal Orientation (Task Orientation) → Psychological Resilience" produced an indirect effect of 0.057 (95% CI [0.035, 0.083]), which accounted for 14.54% of the total effect. As all confidence intervals excluded zero, all indirect effects were statistically significant. **Figure 8 and Table 4** illustrate the mechanism through which the personality trait (Agreeableness) influences psychological resilience.

Table 4. Results of Bootstrap Mediation Effect Analysis

Effect	Paths	Effect size	Boot SE	Boot CI Lower	Boot CI Upper	Effect size/%
Total effect	—	0.392	0.040	0.314	0.470	—
Total indirect effect	—	0.091	0.023	0.044	0.137	68.36%
Direct effect	AGR→PR	0.124	0.036	0.053	0.194	31.63%
Indirect effect 1	AGR→MIR→PR	0.167	0.027	0.117	0.221	42.60%
Indirect effect 2	AGR→TSO→PR	0.044	0.014	0.020	0.073	11.22%
Indirect effect 3	AGR→MIR→TSO→PR	0.057	0.012	0.035	0.083	14.54%

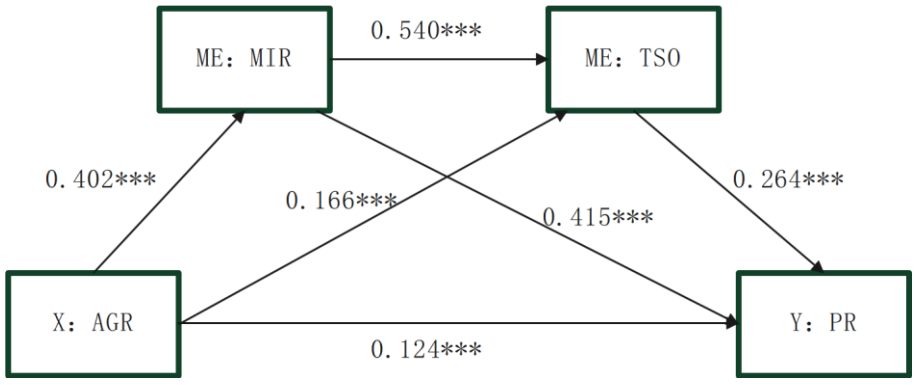


Figure 8. Schematic Diagram of the Path Structure for the Effect of Agreeableness on Psychological Resilience

4 Discussion

This study employed network analysis to systematically investigate the structural relationships among personality traits, gender roles, goal orientation, and

psychological resilience in adolescent athletes, with a specific focus on the mediating roles of masculinity and task orientation. Through this research, we aimed to deepen the understanding of the associations between these variables or, at the very least, offer a new cognitive perspective. Emerging psychological methods, such as network analysis, provide a novel lens for describing, conceptualizing, understanding, and enhancing psychological resilience.

4.1 Cross-Sectional Network Analysis of Personality Traits, Gender Role, Goal Orientation, and Psychological Resilience

This study constructed a network structure model to investigate the associations among personality traits, gender roles, goal orientation, and psychological resilience in adolescent athletes. The findings revealed that the strongest associations were within variables, while cross-variable associations were relatively weaker—a pattern consistent with Multivariate Systems Theory. This theory posits that individuals are complex systems composed of subsystems (e.g., cognitive, affective, motivational), which are highly coordinated internally but require specific "interfaces" for communication between them. Notably, the four strongest cross-variable associations identified were between "Feminine Role" and "Agreeableness," "Masculinity" and "Task Orientation," "Masculinity" and "Extraversion," and "Personal Competence" and "Task Orientation." Although the associations between variables were generally weak, these specific links reveal a potential mechanism by which personality traits, gender roles, and goal orientation influence different dimensions of psychological resilience through meaningful pathways, providing potential targets for mechanistic research and intervention strategies.

4.2 The Effect of Personality Traits on Psychological Resilience

In this study, which examined personality traits as external factors influencing psychological resilience, we observed the following results: Agreeableness was a significant positive predictor of psychological resilience, whereas Neuroticism was a significant negative predictor. This reveals the differential impacts of different dimensions of personality on the psychological resilience of adolescent athletes[26]. Previous research has found that resilience is negatively associated with neuroticism and positively associated with agreeableness[27]. Building on this, individuals high in agreeableness may generally be more cooperative, empathetic, and helpful. These traits enable them to more easily gain social support and build strong interpersonal relationships in team sports, which are crucial resources for coping with stress and recovering from setbacks. In contrast, individuals high in neuroticism are more

prone to experiencing negative emotions such as anxiety, anger, and depression, and exhibit greater emotional volatility. When faced with training pressure, competitive losses, or interpersonal conflicts, they are more likely to become trapped in a cycle of negative emotions, depleting their psychological energy and consequently exhibiting lower resilience.

4.3 The Mediating Role of Gender Role

Our study found a close association between agreeableness and masculine traits. From a sociocultural perspective, traditional views of the ideal male often assign the roles of "protector" and "provider." This role requires not only strength and decisiveness but also a sense of responsibility, cooperativeness, and a degree of affability to build stable support networks in family and society. Consequently, highly agreeable traits (e.g., trustworthiness, cooperativeness, compassion) may be perceived as a mature and responsible expression of masculinity[28]. Concurrently, research by Khosbayar et al. (2022) found a significant positive correlation between agreeableness and resilience[29]. The reason agreeable individuals exhibit resilience in adversity is primarily that their energy enables them to approach conflict with a positive attitude, and their motivation is also derived from their support groups[30][31]. Furthermore, research by Affleck et al. (2018) showed that actively attempting to rebuild one's masculine identity, such as by taking on leadership roles in community organizations, helps enhance resilience and improve mental health[32].

Based on this, agreeableness serves as a starting point, providing individuals with abundant social energy and the motivation to cope with conflict constructively, which forms the foundation of psychological resilience. However, this outward-focused energy is not directly transformed into resilience; rather, it is mediated through the crucial mechanism of constructing and expressing masculine traits. This process of strengthening identity is itself a profound exercise in resilience, requiring individuals to grow continuously as they take on responsibilities and face challenges. Ultimately, the sense of control, purpose, and recognition from support groups gained through the construction of a masculine identity collectively reinforce psychological resilience, enabling greater recovery and adaptability in the face of adversity.

According to Social Learning Theory, highly agreeable individuals are adept at building harmonious interpersonal relationships, which gives them the opportunity to observe and imitate "male role models" who achieve success through cooperation rather than dominance. When they exhibit similar collaborative behaviors, they

receive social approval, which reinforces this "relational" form of masculinity. In this process, they not only mimic behaviors but also internalize coping strategies, such as "proactively seeking social support" and "seeking win-win solutions." This problem-solving model, based on social support, is key to psychological resilience. Therefore, the shaping of masculine traits is, in itself, a socialized learning process for psychological resilience.

4.4 The Mediating Role of Task Orientation

Through bridge analysis, we found that task orientation plays a key bridging mediating role within the network. As shown in the figure, task orientation has the highest bridge expected influence (1-step) value, indicating that it serves a crucial mediating function in connecting different nodes across the network. This finding implies that task orientation effectively links other psychological traits to the core outcome variable, acting as a key conduit for transmission and integration within the network. Furthermore, our mediation analysis revealed that task orientation mediates the relationship between agreeableness and psychological resilience. This is consistent with previous research. For instance, Watson, J. M. (2012) found a positive correlation between agreeableness and overall mastery goal orientation, as well as with the "mastery-approach" component[33]. Concurrently, prior studies have shown that individuals who pursue learning goals (i.e., are task-oriented) maintain higher levels of motivation and persistence when facing difficulties, which is a key manifestation of psychological resilience[34]. Therefore, an individual with high agreeableness, when confronted with stress, is more likely to adopt a task-oriented strategy (focusing on problem-solving and seeking cooperation). The effective implementation of this strategy ultimately enhances their psychological resilience, making them more resilient and better adapted to adversity.

4.5 The Chain Mediating Effect of Gender Role and Task Orientation

This study also reveals that agreeableness not only has a direct impact on psychological resilience but also exerts a serial mediating effect through masculine traits and task orientation. According to the Five-Factor Model theory, personality traits influence adaptive outcomes through mediating processes[35]. Specifically, highly agreeable traits (e.g., trustworthiness, cooperativeness, compassion) may be perceived as a mature and responsible expression of masculinity. Research has confirmed that masculine traits prompt individuals to adopt task-oriented coping strategies when facing stress—that is, to directly solve problems[36]. Task orientation, in turn, is one of the core behavioral mechanisms of psychological resilience[37][38].

Therefore, we proposed and validated a serial mediation model: agreeableness enhances the tendency to adopt a task-oriented coping style by strengthening an individual's identification with masculine role traits, ultimately elevating their level of psychological resilience. This pathway is also indirectly supported by the conclusions of a meta-analysis on the relationship between personality and coping[39]. In summary, this study not only verifies the direct positive effect of agreeableness on psychological resilience but, more importantly, uncovers an underlying pathway: agreeableness enhances the adoption of task-oriented coping tendencies by strengthening identification with masculine role traits, which in turn boosts psychological resilience.

4.6 Limitations

This study has several limitations. First, the research relied on self-report data, which may be susceptible to social desirability bias or the influence of transient emotional states, thereby limiting the objectivity of the results. Second, due to its cross-sectional design, this study can only reveal concurrent associations among variables and cannot establish temporal causal relationships between them. Third, although the sample included adolescent athletes, it did not encompass other groups, such as general primary and secondary school students. Fourth, despite verifying the mediating roles of masculinity and task orientation, the association between agreeableness and psychological resilience may involve more potential mediating variables (e.g., self-efficacy, emotion regulation), rendering the explanation of the underlying mechanisms incomplete.

5 Conclusion

This study systematically explored the complex relationships among personality traits, gender roles, goal orientation, and psychological resilience in adolescent athletes using network analysis and mediation modeling. The results of the network structure analysis indicated that task orientation and masculinity both exhibited high bridge expected influence, serving as key nodes connecting different psychological constructs. Further mediation analysis revealed that agreeableness not only directly and positively predicted psychological resilience but also exerted an indirect effect through the chain mediation pathway of "agreeableness → masculinity → task orientation → psychological resilience." From this perspective, psychological resilience in adolescent athletes is not determined by a single factor but is instead a systemic product of the interaction among personality traits, gender roles, and goal orientation. This finding provides empirical insights for interventions targeting

psychological resilience: by focusing on the cultivation of agreeable behavioral patterns, reinforcing positive attributes of masculine roles (such as sense of responsibility and cooperativeness), and enhancing task orientation, the development of psychological resilience in adolescent athletes may be promoted. Future research could adopt longitudinal designs to further examine the directional relationships among these variables, thereby refining relevant models of the formation mechanisms of psychological resilience.

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