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# Understanding Flow Experience Among College Basketball Players: The Mediating Role of Perceived Skill–Challenge Balance

Xiaoqing Huang, Jun Lang *

School of Physical Education, Southwest University, Chongqing 400715, China.

Corresponding author: Jun Lang

## Abstract

**Flow experience is a critical psychological state for optimizing athletic performance, yet the mechanisms through which external situational factors facilitate this state among college basketball players remain underexplored. This study investigates the antecedents of flow experience and examines the mediating role of perceived skill–challenge balance within the framework of Flow Theory. Employing a mixed-methods design, the study collected questionnaire data from 100 college basketball players and conducted semi-structured interviews with six experienced coaches. Quantitative analyses, including reliability, correlation, and bootstrap mediation analyses using SPSS 27.0, revealed that coach leadership and support, environmental and resource support, training task design, interpersonal harmony, and team cooperation were all positively associated with flow experience ($r=0.64$-$0.74$, $p<0.01$). Critically, perceived skill–challenge balance significantly mediated these relationships, with indirect effects ranging from 0.0866 to 0.1020 and all 95% bootstrap confidence intervals excluding zero. These findings demonstrate that external situational factors enhance flow experience primarily by strengthening athletes' perception of balance between their skills and task challenges. This study extends Flow Theory to collegiate basketball contexts and offers practical implications for coaches aiming to foster athletes' psychological readiness through optimized training design, supportive environments, and enhanced team dynamics.**

## Keywords

**Flow experience, College basketball players, Flow Theory, perceived skill–challenge balance, mediation analysis.**

## 1. Introduction

With the continuous advancement of the integration of sports and education in China, increasing attention has been devoted to the comprehensive development of college athletes. As collegiate basketball becomes increasingly competitive, athletes are required not only to possess superior physical fitness and technical skills but also to maintain optimal psychological functioning under high-pressure competitive environments. Although coaches and physical education teachers generally emphasize physical conditioning and technical training, psychological preparation remains relatively underdeveloped. Consequently, many athletes perform exceptionally well during training but experience anxiety, nervousness, and performance decline during formal competitions.[1, 3]

Among the various psychological constructs associated with athletic performance, flow experience has received considerable attention in recent decades. Originally proposed by Csikszentmihalyi (1975)[6 7], Flow Theory describes an optimal psychological state in which individuals become fully immersed in an activity, experience complete concentration, perceive a strong sense of control, and perform at their highest potential. Athletes who enter a flow state

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often demonstrate superior decision-making, greater emotional stability, enhanced motor coordination, and improved competitive performance. Consequently, flow experience has become one of the central topics in positive psychology and sport psychology[4, 9].

Previous studies have demonstrated that flow experience is influenced by multiple factors, including individual psychological characteristics, task characteristics, and environmental conditions[8, 10 11]. At the individual level, psychological capital, self-efficacy, intrinsic motivation, and mindfulness have all been reported to facilitate the emergence of flow[2, 8, 20]. At the task level, clear goals, immediate feedback, and an appropriate balance between perceived skills and task challenges are considered essential antecedents of flow[12, 13]. In addition, environmental and social factors, such as coaching behavior, interpersonal relationships, social support, and team climate, have also been identified as important contributors to athletes' psychological states during training and competition[17, 18, 19].

Among these antecedents, perceived skill–challenge balance occupies a central position in Flow Theory[14, 15, 16]. According to Csikszentmihalyi, individuals are most likely to experience flow when they perceive that their skills adequately match the challenges presented by a task[6, 7]. If task demands exceed perceived competence, anxiety is likely to occur; conversely, when perceived skills substantially exceed task difficulty, boredom may emerge. Only when both challenge and skill remain at relatively high and balanced levels can athletes enter an optimal psychological state characterized by complete engagement and peak performance.

Basketball provides an ideal context for examining this theoretical proposition. As a highly dynamic and physically demanding team sport, basketball requires athletes to continuously adjust their technical execution and tactical decisions in response to rapidly changing competitive situations. Throughout a game, players must coordinate complex motor skills while simultaneously coping with defensive pressure, tactical uncertainty, and intense interpersonal interaction. These characteristics make basketball particularly suitable for investigating how perceived skill–challenge balance contributes to the development of flow experience.

Despite the growing body of literature on Flow Theory in sport psychology, several important research gaps remain. First, most previous studies have focused primarily on individual psychological variables, whereas relatively limited attention has been paid to the combined influence of external situational factors and cognitive appraisal processes. Second, empirical evidence specifically involving college basketball players remains scarce, particularly regarding the psychological mechanisms through which coaching support, training design, environmental resources, and team interaction facilitate flow experience. Finally, although skill–challenge balance is widely regarded as the core mechanism underlying flow, relatively few studies have empirically examined its mediating role within a comprehensive theoretical framework.

To address these gaps, the present study develops an integrated conceptual model based on Flow Theory. Specifically, this study investigates how external situational factors—including coach leadership and support, environmental and resource support, training task design, interpersonal harmony, and team cooperation—influence athletes' flow experience through perceived skill–challenge balance. By examining this mediating mechanism, the study seeks to enrich the theoretical understanding of flow formation in collegiate basketball while providing practical guidance for coaches and physical educators seeking to enhance athletes' psychological readiness and competitive performance.

## 2. Literature Review and Research Hypotheses

### 2.1. Flow Theory

Flow Theory, originally proposed by Csikszentmihalyi (1975)[6, 7], has become one of the most influential theoretical frameworks in positive psychology and sport psychology. Flow refers to an optimal psychological state in which individuals become completely immersed in an activity,

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experience intense concentration, maintain a strong sense of control, and derive intrinsic enjoyment from task engagement[14, 15]. Individuals experiencing flow often report distorted perceptions of time and demonstrate peak performance during task execution.

Unlike temporary emotional responses, flow represents a dynamic interaction between individuals and their environments. Rather than being determined solely by personal characteristics, flow emerges when external environmental conditions and internal cognitive evaluations jointly facilitate optimal task engagement. Consequently, Flow Theory has been widely applied in education, organizational behavior, music, rehabilitation, and competitive sports[5, 11, 12].

Within sport psychology, flow has consistently been associated with enhanced athletic performance, improved emotional regulation, increased intrinsic motivation, and greater psychological well-being[4, 8, 20]. Athletes experiencing flow typically exhibit superior concentration, faster decision-making, and greater consistency under competitive pressure[2, 18, 19]. Therefore, understanding the antecedents of flow has become an important research topic in contemporary sports science.

## 2.2. External Situational Factors and Flow Experience

Existing studies suggest that flow experience is influenced not only by athletes' individual characteristics but also by external situational factors surrounding training and competition.

Coaching behavior represents one of the most important environmental influences[17, 18]. Supportive coaching characterized by effective communication, constructive feedback, and emotional encouragement enhances athletes' confidence and facilitates optimal psychological states during performance. Similarly, scientifically designed training tasks that appropriately match athletes' abilities can increase engagement and motivation while reducing unnecessary anxiety[12, 16].

Environmental and resource support also contributes to psychological readiness[1]. High-quality training facilities, sufficient equipment, organizational support, and stable training conditions reduce external distractions and enable athletes to devote greater attentional resources to task execution.

In addition, team interaction—including interpersonal harmony and team cooperation—plays an essential role in team sports[18, 19]. Positive interpersonal relationships foster collective efficacy, mutual trust, and emotional security, thereby creating favorable psychological conditions for the emergence of flow experience.

Collectively, these findings indicate that external situational factors provide the contextual foundation for athletes' optimal psychological functioning. However, previous studies have primarily examined their direct relationships with flow, while the underlying psychological mechanisms remain insufficiently understood.

## 2.3. Perceived Skill–Challenge Balance

Among the various antecedents proposed by Flow Theory, perceived skill–challenge balance is widely regarded as the core cognitive mechanism underlying flow experience[6, 7].

According to Csikszentmihalyi, flow is most likely to occur when individuals perceive that their abilities adequately match the challenges presented by the task[14]. Excessive challenge relative to perceived competence tends to generate anxiety, whereas insufficient challenge often results in boredom[3, 6]. Only when both challenge and skill remain simultaneously high and balanced can individuals maintain complete engagement.

In basketball, perceived skill–challenge balance is continuously influenced by rapidly changing competitive situations. Athletes constantly evaluate whether their technical abilities, tactical understanding, and psychological readiness are sufficient to cope with defensive pressure, offensive opportunities, and unpredictable game situations[17, 19]. Consequently, perceived

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skill–challenge balance represents a dynamic cognitive appraisal rather than a fixed personal characteristic.

Recent studies further suggest that external situational factors influence athletes primarily by shaping these cognitive evaluations[8. 20]. Supportive coaching, effective team communication, appropriate task design, and adequate environmental resources all contribute to stronger perceptions of skill–challenge balance, thereby increasing the likelihood of entering a flow state.

Therefore, perceived skill–challenge balance may serve as the key psychological mechanism linking external situational factors with flow experience.

### 2.4. Research Hypotheses

Based on Flow Theory and previous empirical findings, this study proposes that external situational factors positively influence athletes' perceived skill–challenge balance, which subsequently promotes flow experience.

Accordingly, the following hypotheses are proposed:

H1. Coach leadership and support positively predict perceived skill–challenge balance.

H2. Interpersonal harmony positively predicts perceived skill–challenge balance.

H3. Team cooperation positively predicts perceived skill–challenge balance.

H4. Training task design positively predicts perceived skill–challenge balance.

H5. Environmental and resource support positively predict perceived skill–challenge balance.

H6. Perceived skill–challenge balance positively predicts flow experience.

H7. Perceived skill–challenge balance mediates the relationships between external situational factors (coach leadership and support, interpersonal harmony, team cooperation, training task design, and environmental and resource support) and athletes' flow experience.

## 3. Methods

### 3.1. Research Design

This study adopted a mixed-methods research design, integrating quantitative questionnaire surveys with qualitative semi-structured interviews. The quantitative component was used to examine the relationships among external situational factors, perceived skill-challenge balance, and flow experience, whereas the qualitative interviews were conducted to provide practical insights into the psychological mechanisms underlying athletes' flow experience. The combination of quantitative and qualitative evidence enhanced both the validity and interpretability of the findings.

### 3.2. Participants

The study recruited college basketball players from universities located in Chongqing, Sichuan, and Beijing, China. Participants included both students majoring in physical education and athletes admitted through sports-specialty recruitment programs.

A total of 108 questionnaires were distributed. After excluding incomplete or invalid responses, 100 valid questionnaires were retained for analysis, resulting in a valid response rate of 92.59%.

Participation was voluntary, and all respondents provided informed consent prior to data collection. The questionnaire was completed anonymously, and all collected information was used exclusively for academic research purposes.

### 3.3. Qualitative Interviews

To complement the quantitative findings, semi-structured interviews were conducted with six experienced basketball coaches.

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### 3.3.1. Participant Selection

Purposive sampling was initially adopted to recruit four experienced coaches representing different geographical regions, university types, and coaching backgrounds. Subsequently, snowball sampling was employed to recruit two additional coaches with extensive experience in psychological training.

The six coaches had an average coaching experience of approximately five years, and all had successfully led collegiate teams to provincial-level or higher competitions.

### 3.3.2. Interview Procedure

An interview guide was developed based on Flow Theory and the proposed conceptual framework. Each interview lasted approximately 45 minutes and was conducted in a quiet environment by the first author.

With participants' informed consent, all interviews were audio-recorded and supplemented by field notes.

### 3.3.3. Data Saturation

Interview recruitment was terminated after the sixth interview because no substantially new themes emerged, indicating that theoretical saturation had been achieved.

The interview findings were primarily used to support the interpretation of quantitative results rather than to perform formal qualitative coding.

## 3.4. Measures

The questionnaire was developed based on previous literature, Flow Theory, and expert interview findings.please see table 1.

Table 1.:Reliability Test Results for All Variables

| variable | Number of items | Cronbach's α | Note |
|---|---|---|---|
| Flow experience | 4 | 0.77 | — |
| Coach leadership and support | 2 | 0.66 | — |
| Environmental and resource support | 2 | 0.57 | Correlation coefficient between the two items: 0.401** |
| Interpersonal harmony | 1 | — | Single-item variable |
| Team cooperation | 1 | — | Single-item variable |
| Training task design | 1 | — | Single-item variable |

The questionnaire contained eleven measurement items.

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Questionnaires were distributed both online and offline. Online surveys were administered through the Wen juanxing survey platform, whereas offline questionnaires were completed face-to-face.

### 3.5. Reliability and Validity

Internal consistency reliability was evaluated using Cronbach's alpha coefficients.

The overall questionnaire demonstrated satisfactory reliability (Cronbach's α = 0.792).

The Flow Experience scale showed good reliability (α = 0.77). Coach Leadership and Support demonstrated acceptable reliability (α = 0.66), while Environmental and Resource Support yielded an alpha coefficient of 0.57. Although relatively modest, the inter-item correlation remained statistically significant ($r = .401$, $p < .01$), indicating acceptable consistency for exploratory research.

Because the two items representing team interaction exhibited relatively low correlation, Interpersonal Harmony and Team Cooperation were treated as independent variables in subsequent analyses.

### 3.6. Statistical Analysis

All statistical analyses were conducted using IBM SPSS Statistics 27.0.

Descriptive statistics were first calculated to summarize participant characteristics and the distributions of study variables. Reliability analysis was subsequently performed using Cronbach's alpha coefficients.

Pearson correlation analysis was conducted to examine associations among the study variables.

To test the proposed hypotheses, mediation analyses were performed using the PROCESS macro with 5,000 bootstrap resamples. Indirect effects were considered statistically significant when the corresponding 95% bootstrap confidence intervals did not include zero.

## 4. Results

### 4.1. Descriptive Statistics

Descriptive statistics for the main study variables are presented in Table 2.

Table 2: Descriptive Statistics of All Variables

| | N | Min | Max | Mean | SD |
|---|---|---|---|---|---|
| Flow Experience | 100 | 1.00 | 3.0 | 1.84 | 0.51 |
| Environmental and Resource Support | 100 | 1.00 | 3.0 | 1.80 | 0.58 |
| Coach Leadership and Support | 100 | 1.00 | 3.0 | 1.85 | 0.60 |
| Training Task Design | 100 | 1.00 | 3.0 | 1.82 | 0.71 |
| Team Interaction | 100 | 1.00 | 3.0 | 1.77 | 0.57 |

Among all variables, Coach Leadership and Support demonstrated the highest mean score (M = 1.85, SD = 0.60), followed by Training Task Design (M = 1.82, SD = 0.71), Flow Experience (M =

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1.84, SD = 0.51), Environmental and Resource Support (M = 1.80, SD = 0.58), and Team Interaction (M = 1.77, SD = 0.57).

Overall, the descriptive statistics indicate moderate levels across all study variables.

## 4.2. Reliability and Validity

The internal consistency reliability of the questionnaire was assessed using Cronbach's alpha coefficients.

The overall questionnaire demonstrated acceptable reliability, with a Cronbach's alpha coefficient of 0.792.

The Flow Experience scale exhibited good internal consistency (α = 0.77), whereas Coach Leadership and Support demonstrated acceptable reliability (α = 0.66). Environmental and Resource Support yielded a relatively lower reliability coefficient (α = 0.57); however, the significant inter-item correlation (r = .401, p < .01) suggested acceptable consistency for exploratory research.

Construct validity was evaluated using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's Test of Sphericity.

The KMO value was 0.909, indicating excellent sampling adequacy for factor analysis. Bartlett's Test of Sphericity was statistically significant ($\chi^2$ = 388.75, p < .001), confirming that the data were suitable for subsequent analyses.

## 4.3. Correlation Analysis

Pearson correlation coefficients among the major variables are presented in Table 3.

Table 3:Correlation Analysis

| | Flow Experience | Environmental and Resource Support | Coach Leadership and Support | Team Interaction | Training Task Design |
|---|---|---|---|---|---|
| Flow Experience | 1 | | | | |
| Environmental and Resource Support | 0.700** | 1 | | | |
| Coach Leadership and Support | 0.730** | 0.628** | 1 | | |
| Team Interaction | 0.743** | 0.597** | 0.728** | 1 | |
| Training Task Design | 0.643** | 0.628** | 0.570** | 0.600** | 1 |

Correlation is significant at the 0.01 level (2-tailed).

Furthermore, the independent variables were positively correlated with one another, indicating generally consistent relationships among the proposed antecedents.

## 4.4. Hypothesis Testing

Direct effects were examined using regression analysis.

The results indicated that Coach Leadership and Support significantly predicted Perceived Skill–Challenge Balance (β = 0.5147, p < .01), supporting H1.

Interpersonal Harmony also significantly predicted Perceived Skill–Challenge Balance (β = 0.4940, p < .01), supporting H2.

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Similarly, Team Cooperation significantly predicted Perceived Skill–Challenge Balance ($\beta = 0.4749$, $p < .01$), supporting H3.

Training Task Design significantly influenced Perceived Skill–Challenge Balance ($\beta = 0.4576$, $p < .001$), supporting H4.

Environmental and Resource Support significantly predicted Perceived Skill–Challenge Balance ($\beta = 0.6478$, $p < .01$), supporting H5.

Finally, Perceived Skill–Challenge Balance significantly predicted Flow Experience ($\beta = 0.5666$, $p < .01$), supporting H6.

Therefore, all proposed direct-effect hypotheses received empirical support.

### 4.5. Mediation Analysis

The mediating role of Perceived Skill–Challenge Balance was examined using the PROCESS macro with 5,000 bootstrap resamples.

As presented in Table 4, all indirect effects were statistically significant because the corresponding 95% bootstrap confidence intervals excluded zero.

Specifically, the indirect effect of Coach Leadership and Support on Flow Experience through Perceived Skill–Challenge Balance was 0.0879 (95% CI [0.0269, 0.1618]).

The indirect effects for Interpersonal Harmony, Team Cooperation, Training Task Design, and Environmental and Resource Support were 0.0866, 0.1016, 0.1020, and 0.0999, respectively, with all confidence intervals excluding zero.

These findings provide empirical support for H7, indicating that Perceived Skill–Challenge Balance serves as a significant mediating mechanism linking external situational factors with athletes' Flow Experience.

## 5. Discussion

### 5.1. Interpretation of the Main Findings

The present study examined the mechanisms through which external situational factors influence flow experience among college basketball players. Consistent with the proposed conceptual framework, all external situational factors significantly predicted perceived skill–challenge balance, which subsequently promoted athletes' flow experience. These findings provide empirical support for Flow Theory by demonstrating that athletes' optimal psychological states are shaped not only by individual characteristics but also by the interaction between environmental conditions and cognitive appraisal.

Among the examined antecedents, environmental and resource support exhibited the strongest association with perceived skill–challenge balance. This finding suggests that favorable training conditions, sufficient organizational support, and appropriate sporting resources enable athletes to devote greater attentional capacity to task execution while reducing unnecessary psychological distraction[1]. Consequently, athletes become more likely to perceive an appropriate balance between their own abilities and task demands.

Coach leadership and support also emerged as an important predictor of perceived skill–challenge balance. Coaches provide technical guidance, motivational encouragement, and immediate feedback that help athletes continuously evaluate whether their skills adequately meet competitive challenges[17, 18]. Such cognitive adjustments facilitate athletes' confidence and psychological readiness during both training and competition.

Similarly, interpersonal harmony and team cooperation significantly enhanced perceived skill–challenge balance. Basketball is inherently a cooperative sport requiring continuous communication, tactical coordination, and collective decision-making. Positive interpersonal

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relationships strengthen collective efficacy and reduce interpersonal stress, thereby creating favorable psychological conditions for athletes to maintain complete task engagement[18.19].

## 5.2. Comparison with Previous Studies

The present findings are generally consistent with previous research on Flow Theory and sport psychology.

Previous studies have demonstrated that psychological capital, self-efficacy, mindfulness, and intrinsic motivation contribute positively to athletes' flow experience[2, 8, 29]. The present study extends this literature by highlighting the importance of external situational factors. Rather than focusing exclusively on individual psychological characteristics, our findings suggest that coaching behavior, training design, environmental support, and team interaction collectively shape athletes' cognitive appraisal of skill–challenge balance.

Furthermore, the significant mediating role of perceived skill–challenge balance provides empirical evidence supporting Csikszentmihalyi's theoretical proposition that balanced perceptions of challenge and competence constitute the fundamental psychological condition for the emergence of flow[6, 7]. This mechanism has often been discussed conceptually but has received relatively limited empirical verification among collegiate basketball players.

## 5.3. Theoretical Contributions

This study makes several contributions to the existing literature.

First, it extends Flow Theory from an individual-centered perspective to a broader situational–cognitive framework by integrating external situational factors with cognitive appraisal processes.

Second, the study identifies perceived skill–challenge balance as the central psychological mechanism through which external environmental factors influence athletes' flow experience. This finding contributes to a more comprehensive understanding of flow formation within team sports.

Third, by focusing specifically on college basketball players, the study enriches empirical evidence concerning Flow Theory in competitive team sports, an area that has received considerably less attention than individual sports in previous research.

## 5.4. Practical Implications

The findings also provide several practical implications for coaches and sport practitioners.

First, coaches should design training tasks that dynamically match athletes' current skill levels, thereby maintaining an appropriate balance between challenge and competence[12].

Second, coaching strategies should emphasize constructive feedback, emotional support, and individualized guidance to strengthen athletes' confidence during training and competition[17].

Third, universities and athletic departments should improve environmental resources, including training facilities, equipment, and organizational support, in order to reduce unnecessary external distractions[1].

Finally, psychological skills training, such as mindfulness interventions, attention regulation, and confidence-building exercises, may further enhance athletes' perceptions of skill–challenge balance and facilitate the occurrence of flow experience[2, 20].

## 5.5. Limitations and Future Research

Several limitations should be acknowledged.

First, the sample consisted primarily of college basketball players from several regions of China, which may limit the generalizability of the findings to other populations and competitive levels.

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Second, several constructs were measured using relatively few questionnaire items. Future studies are encouraged to employ more comprehensive measurement scales with stronger psychometric properties.

Third, the cross-sectional research design does not permit causal inference. Longitudinal studies and experimental interventions are needed to further verify the dynamic relationships among external situational factors, perceived skill–challenge balance, and flow experience.

Finally, future research may integrate objective performance indicators, physiological measurements, and observational data with self-report questionnaires to obtain a more comprehensive understanding of athletes' flow experience.

## 6. Conclusion

This study developed and empirically tested an integrated model explaining the formation of flow experience among college basketball players. Grounded in Flow Theory, the proposed framework demonstrated that external situational factors—including coach leadership and support, environmental and resource support, training task design, interpersonal harmony, and team cooperation—significantly influenced athletes' flow experience through perceived skill–challenge balance.

Among these relationships, perceived skill–challenge balance emerged as the central psychological mechanism linking external environmental conditions with athletes' optimal psychological states. The findings therefore provide empirical support for Flow Theory while extending its application to collegiate team sports.

From a theoretical perspective, this study contributes to the existing literature by integrating environmental influences and cognitive appraisal processes into a unified analytical framework. Unlike previous studies that primarily emphasized individual psychological characteristics, the present research demonstrates that flow experience is jointly shaped by external situational conditions and athletes' cognitive evaluations of skill–challenge balance.

From a practical perspective, the findings suggest that coaches and sport practitioners should adopt athlete-centered training strategies by dynamically adjusting task difficulty, strengthening coaching support, improving team cohesion, and optimizing training environments. These approaches may facilitate athletes' flow experience and ultimately enhance competitive performance.

Although the present study provides valuable empirical evidence, future research should employ larger and more diverse samples, longitudinal research designs, and multidimensional measurements to further clarify the dynamic mechanisms underlying flow experience in competitive sports.

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