The Correlation Between Competitive State Anxiety and The Frequency of Unforced Errors in The Serving Technique of Badminton Athletes

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ABSTRACT (English)

Background: In badminton, the serve is the only technique that is entirely under the athlete's control, yet ironically it is often the source of unforced errors (UE) in competitive situations. **Research Objectives**: This study aims to analyze the correlation between competitive state anxiety and the frequency of unforced errors in the serving technique of badminton athletes. Specifically, this study examines the relationship between three dimensions of anxiety (cognitive, somatic, and self-confidence) and the number of serving UE. **Methods**: This study used a quantitative, correlational design. The sample (n=20) comprised badminton athletes (aged 17-22 years) selected via purposive sampling from an intensive training club. Anxiety data were collected using the Competitive State Anxiety Inventory-2 (CSAI-2). Unforced error (UE) data were collected via direct observation during simulated matches. The objects of study in this research are the backhand serve technique and the forehand serve technique, so that both serve variations will be observed comprehensively. Analysis used the Pearson Product-Moment correlation. **Results**: The results of the study show (1) A positive and significant correlation between cognitive anxiety and UE service ($r = 0.680$, $p < 0.01$); (2) A positive and significant correlation between somatic anxiety and service UE ($r = 0.552$, $p < 0.05$); and (3) A negative and significant correlation between self-confidence and service UE ($r = -0.721$, $p < 0.01$). These findings indicate that the mental and physical components of anxiety have a strong relationship with service performance. **Conclusion**: The main conclusion is that a significant relationship exists between competitive anxiety and unforced service errors. As hypothesized, increased anxiety (cognitive and somatic) was closely related to more service errors, while high self-confidence was related to fewer errors.

Keywords: Competitive Anxiety; Unforced Errors; Serving, Badminton; Sports Psychology

ABSTRAK (Bahasa Indonesia)

Latar Belakang: Servis dalam bulutangkis adalah satu-satunya teknik yang sepenuhnya berada dalam kontrol atlet, namun ironisnya sering menjadi sumber *unforced errors* (UE) dalam situasi kompetisi. **Tujuan Penelitian**: Penelitian ini bertujuan untuk menganalisis korelasi antara tingkat kecemasan kompetitif (*competitive state anxiety*) dengan frekuensi *unforced errors* pada teknik servis atlet bulutangkis. Secara spesifik, penelitian ini menguji hubungan antara tiga dimensi kecemasan (kognitif, somatik, dan kepercayaan diri)

dengan jumlah UE servis. **Metode**: Penelitian ini menggunakan metode kuantitatif dengan desain korelasional. Sampel penelitian (n=20) adalah atlet bulutangkis (usia 17-22 tahun) yang diambil menggunakan teknik *purposive sampling* dari sebuah klub pelatihan intensif. Data kecemasan kompetitif dikumpulkan menggunakan kuesioner *Competitive State Anxiety Inventory-2* (CSAI-2). Data *unforced errors* servis dikumpulkan melalui pengamatan langsung saat atlet berpartisipasi dalam pertandingan simulasi. Para peneliti menganalisis dan mencatat setiap servis yang dilakukan oleh atlet selama berlangsungnya pertandingan. Analisis data dilakukan menggunakan uji korelasi *Pearson Product-Moment*. **Hasil**: Hasil penelitian menunjukkan (1) Korelasi positif dan signifikan antara kecemasan kognitif dengan UE servis ($r = 0,680$, $p < 0,01$); (2) Korelasi positif dan signifikan antara kecemasan somatik dengan UE servis ($r = 0,552$, $p < 0,05$); dan (3) Korelasi negatif dan signifikan antara kepercayaan diri dengan UE servis ($r = -0,721$, $p < 0,01$). **Kesimpulan**: terdapat hubungan yang signifikan antara kecemasan kompetitif dan kesalahan servis yang tidak disengaja. Seperti yang dihipotesiskan, peningkatan kecemasan (kognitif dan somatik) terkait erat dengan lebih banyak kesalahan servis, sementara kepercayaan diri yang tinggi terkait dengan lebih sedikit kesalahan.

Kata kunci: Kecemasan Kompetitif, *Unforced Errors*, Servis, Bulutangkis, Psikologi Olahraga

INTRODUCTION

Badminton is one of the fastest racket sports in the world, requiring a complex combination of physical abilities (speed, agility, strength) and mental readiness (focus, decision-making, stress resistance) (Yılmaz, 2022). In a badminton match, each rally begins with a serve (Carboch & Smocek, 2020).

Serving plays a unique role in badminton (Qiu,2022). Unlike other strokes that are reactive to the opponent, serving is a closed skill (Liu & Liu, 2019). Athletes have complete control over the timing, preparation, and execution of the stroke without direct intervention from the opponent. Theoretically, due to its controlled nature, the serve should be one of the techniques with the highest level of consistency (Adi et al., 2022).

However, in practice, especially in high-pressure competitive situations, unforced errors in badminton serves often occur (Indarto et al., 2023). These errors, such as the shuttlecock failing to cross the net, landing outside the legal service area, or committing a fault, give free points to the opponent and can disrupt the athlete's psychological momentum (J. Li et al., 2024).

Failure in closed skills is often caused not only by technical deficiencies, but also by psychological factors (Christensen et al., 2015). One of the main factors is competitive anxiety, which is defined as a negative emotional response to stressful situations in sports (Fletcher & Arnold, 2016). Specifically, competitive state anxiety is the momentary anxiety experienced by athletes immediately before or during a competition (Kumar et al., 2017).

This anxiety has two main components: cognitive anxiety (worry, negative thoughts, doubt) (Feng et al., 2022) and somatic anxiety (perception of physical symptoms such as heart palpitations, muscle tension, sweaty palms) (May et al., 2014). High levels of anxiety, especially somatic anxiety, can interfere with the fine motor coordination and muscle control that are essential for performing accurate serves (Tobias & Ito, 2021).

Although the general relationship between anxiety and performance has been extensively studied, specific research quantifying the relationship between anxiety scores (using validated instruments) and the frequency of specific technical errors (serves) in badminton in Indonesia is still limited. Although the general relationship between anxiety and performance has been widely explored, specific research that quantitatively examines the association between anxiety levels (measured using validated instruments) and the frequency of technical errors particularly serving errors in badminton remains limited. Therefore, this

study aims to answer the question: "Is there a correlation between competitive anxiety levels (CSAI-2) and the frequency of unforced errors in the serving technique of badminton athletes?"

METHOD

Design

This study uses a quantitative approach with a correlational study design to examine the relationship between the independent variable (competitive anxiety) and the dependent variable (frequency of unforced service errors).

Participants

The population in this study was badminton athletes in Nganjuk. The sample was taken using purposive sampling with the following criteria: (1) Active registered athletes, (2) Aged between 17 and 22 years (late youth/early adult category), and (3) Regularly participating in competitions at least at the district level. Based on match history data, the athlete has been confirmed to have experience competing in district-level events/championships. Based on these criteria, a sample of 20 athletes (14 male and 6 female) was obtained.

Instruments and data measurements

Competitive Anxiety (Variable X): Measured using the Competitive State Anxiety Inventory-2 (CSAI-2) questionnaire developed by Martens et al. (1990) and adapted into Indonesian. This questionnaire consists of 27 items that measure three subscales: Cognitive Anxiety (9 items), Somatic Anxiety (9 items), and Self-Confidence (9 items). Respondents completed the questionnaire 30 minutes before the service test in a simulated match condition.

Unforced Errors Serves (Variable Y): Data on unforced errors (UE) was collected through direct observation while athletes participated in simulated matches. Researchers analyzed and recorded every serve made by athletes during the duration of the match. A serve was categorized as an unforced error if it: (a) hit the net and did not land in, (b) landed outside the opponent's service area, or (c) was a service fault.

Procedure

Researchers gathered athletes and explained the research procedure, requesting informed consent. Athletes performed standard warm-ups. Thirty minutes before the serve test began (to create a "waiting for competition" atmosphere), athletes completed the CSAI-2 questionnaire. Athletes performed 20 serves on a standard court under the supervision of researchers and coaches. Researchers recorded the number of UE from 20 serve opportunities for each athlete.

Data analysis

The collected data were analyzed using SPSS version 25. Descriptive statistics (mean, standard deviation) were used to describe the data. Hypothesis testing used the Pearson Product-Moment correlation test to determine the direction and strength of the relationship between variables. The significance level was set at $\alpha = 0.05$.

RESULTS

Anxiety and unforced error data from 20 athletes (14 male, 6 female) were collected and analyzed. Descriptive data showed that the average cognitive anxiety score was 25.40 (out of a maximum score of 36), somatic anxiety was 22.10 (out of 36), and self-confidence was 28.50 (out of 36). The average number of unforced errors made by athletes from 20 service attempts was 4.10 times.

Table 1. Descriptive Statistics of Research Subject Characteristics

No.	Variables	Mean (M) ± Standard Deviation (SD)
1	Age (Years)	19.35 ± 1.78
2	Height (Cm)	169.40 ± 5.25
3	Weight (Kg)	63.55 ± 4.90

The results of the Pearson correlation test to examine the relationship between each dimension of anxiety and the frequency of unforced service errors are presented in detail in Table 1 below.

Table 2. Results of Pearson Correlation Test between Competitive Anxiety Dimension and Frequency of Unforced Service Errors (n=20)

No.	Variables	r-value	p-value
1	Cognitive Anxiety	0.680	0.001
2	Somatic anxiety	0.552	0.012
3	self-confidence	-0.721	0.000
4	Unforced Errors Serves (out of 20 attempts)	-	-

*Note: Significant at α= 0,05.

DISCUSSION

The results of this study confirm the hypothesis that competitive anxiety has a significant correlation with failure to serve in badminton. These findings are in line with attentional control theory, in which anxiety (especially cognitive anxiety) interferes with the allocation of athletes' attentional resources (Ren et al., 2022). Serving is a skill that should be automated. However, when athletes are anxious, they begin to "overthink" (paralysis by analysis), which disrupts the automation of movements and leads to basic technical errors.

The strong correlation between cognitive anxiety (r = 0.680) and service UE shows that mental factors ("What if I fail?") have a greater influence than physical factors. A strong correlation suggests that cognitive factors significantly contribute to service failure. This is particularly relevant for serves, where there is no time pressure from the opponent. Athletes have time to think, and if those thoughts are negative, their performance will be disrupted (Khoirunisa et al., 2024).

Somatic anxiety (r = 0.552) also correlates significantly. Physical symptoms such as tense shoulder and arm muscles will damage the "feel" that is crucial for a precise short serve. A slightly trembling hand can change the angle of the racket by a fraction of a degree, which is enough to make the shuttlecock get caught in the net or fly too high (Patel & Panchal, 2024).

The most notable finding was a strong negative correlation with self-confidence (r = -0.721). This indicates that self-confidence may act as a protective factor or "buffer" against the negative effects of anxiety (Williams et al., 2021). Confident athletes, although they may also feel tension (somatic), tend to interpret it as readiness ("ready to compete") rather than a threat (anxiety). They focus on successful execution, not on potential failure (A.Stephen et al., 2022).

The practical implications of these findings are clear for coaches. In addition to repeatedly practicing serving techniques, coaches must integrate Psychological Skills Training (PST) (Nazari, 2024). Techniques such as positive self-talk (to counter cognitive anxiety), progressive muscle relaxation (to manage somatic anxiety), and visualization (to build confidence) should be part of the training routine to prepare athletes to face the pressure of serving at critical points (Li et al., 2024).

This study has limitations, particularly the small sample size (n=20) and the fact that the test situation was only a simulation, not an official competition. Future studies could use a larger sample and measure anxiety and UE during actual tournaments.

CONCLUSION

Based on data analysis and discussion, it can be concluded that there is a significant relationship between athletes' psychological conditions and their badminton service performance. Specifically, a strong and significant positive correlation was found between cognitive anxiety and the frequency of unforced service errors, as well as a moderate and significant positive correlation between somatic anxiety and unforced errors. Conversely, self-confidence showed a strong and significant negative correlation with the frequency of these errors. This indicates that increased anxiety, whether in the form of negative thoughts or physical symptoms, is closely related to an increase in service failures, while high self-confidence acts as a protective factor. Therefore, psychological interventions to manage anxiety and build self-confidence are highly recommended to improve the consistency of athletes' serves. Therefore, instead of relying solely on general psychological interventions, this study specifically recommends that coaches incorporate *pressure-based serve training*, in which athletes practice serving under simulated competitive consequences (e.g., point penalties or performance thresholds). This targeted approach aligns with the finding that anxiety increases the likelihood of serving errors, and training under controlled pressure conditions can help athletes adapt to stress and improve serve consistency.

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CONFLICT OF INTEREST

The authors declare that there are no known conflicts of interest, either financial or non-financial, that could influence the results or interpretation of this reported research.

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