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1 Introduction

Basketball is a dynamic sport that demands a combination of skills, agility, and teamwork. Performance analysis is crucial to understanding the strengths and weaknesses of players, particularly when comparing the performance of injured and uninjured athletes. It is characterized by brief, intense bursts of energy that occur often. Basketball calls for particular movement patterns, physiological needs, and energy sources. Repeated sprints make it challenging to maintain the same level of performance over time. Accordingly, basketball players must possess exceptional athleticism in order to exhibit the speed, strength, and power necessary to provide a successful performance with the utmost proficiency. In order to monitor their players and make sure they have the physiological capability needed for the game; coaches must use tests. The purpose of fitness tests is to evaluate the state of each fitness component in athletes in order to identify what needs to be addressed via the training program. Retests are then conducted at certain intervals to see if the athletes' conditions have changed.(Gottlieb et al., 2021). Pre-participation examinations, including musculoskeletal screening and functional performance testing, is an essential part of a multidisciplinary approach to prevent future injuries(Šiupšinskas et al., 2019). To get a better understanding of a player's health, it is essential to incorporate all the ways to ensure they have a good overall performance. And this includes monitoring the movements during training and play, monitoring the psychological health and physical strength. Major challenge in sport is to appropriately prescribe training loads (TLs) to maximize athletes' physical performance while avoiding overtraining and injury during the competitive season(Aoki et al., 2016). The running, jumping, and confrontation in the process of sports are inseparable from the strength quality of athletes, and a good strength quality will have a higher sports effect. Especially for basketball players, because basketball itself is a competitive sport, basketball players will face a lot of physical confrontation in the process of competition. Physical confrontation must rely on good strength quality as support, so special strength training of athletes is very important(Meng, 2022). Psychological factors have shown to be predictors of injury in professional football. However, it seems that this is a two-way relationship, as severe musculoskeletal time-loss injuries have shown to be associated with the onset of symptoms of common mental disorders (CMD)(Kiliç et al., 2018) and it has also been proven that missing practice or competition due to injury was also shown to increase depression symptoms(Cox & Cluphf, 2015).

1.1 Objective of the research

The main goal of this research is to improve our understanding and knowledge of players' health and injury status. Through the combination of various methodologies and approaches, the research aims to obtain a comprehensive knowledge of the numerous factors impacting players' health and injury incidents. This will improve the field of sports science and facilitate the creation of more efficient approaches for maximizing player health and reducing injury risks in the sports industry.

2 Hypothesis

1. Athletes unable to compete in competitions due to injuries tend to have a psychological strain measured by the APSQ questionnaire.
2. Players who have more than 10 percent asymmetry between the two legs have greater risk of injury.
3. The efficiency of movement patterns influences the risk of injuries in sports.
4. Physical performance during training and games which will be measured with monitoring system has an effect on the risk of injuries in athletes.

4 Methodology

4.1 Type of Research: Cross sectional quantitative study

4.2 Place and date of research: Rátgéber Kosárlabda Akadémia, Pecs Hungary

4.3 Target group: 28 Male and Female Basketballers who train in the Academy

- Convenient sampling
- Online survey → 28 respondents (Google form)

4.4 Inclusion criteria (<18 years and currently playing)

4.5 Exclusion criteria (Inconsistent players, players who had had recent injury and have an ongoing rehabilitation)

4.6 Statistical Methods and Variables

Continuous variables are described by using mean $\pm$ SD and 95% confidence interval. Descriptive statistics, CHI test and Spearman correlation were used for statistical analysis of the data. The level of significance was set at $p < 0.05$.

4.6.1 Dependent variable: Movement patterns, FMS, psychological strain

4.6.2 Independent variable: Kinexon, previous match results, injuries

4.6.3 Applied software: The data was analysed using IBM SPSS 28.0 and Microsoft Excel.

4.7 Research Instruments:

Basketball statistics- Each player statistics was derived from Hungarian Basketball Federation and the Injury register of Ratgeber Academy.

Athlete Psychological Strain Questionnaire (APSQ)

The Athlete Psychological Strain Questionnaire (APSQ) stands as a crucial tool in assessing the mental health of elite athletes. Comprising 10 questions, it delves into three key domains: (1) Self-regulation, (2) Performance, and (3) External Coping. The questions touch upon various aspects of an athlete's mental well-being, addressing issues such as difficulties with teammates, motivation, irritability, worry about injury or performance, coping with selection pressures, and concerns about life after sport. (Rice, (2019))

APSQ Questions:

- It was difficult to be around teammates.
- I found it difficult to do what I needed to do.
- I was less motivated.
- I was irritable, angry, or aggressive.
- I could not stop worrying about injury or my performance.
- I found training more stressful.
- I found it hard to cope with selection pressures.
- I worried about life after sport.
- I needed alcohol or other substances to relax.
- I took unusual risks off-field.

Responses to these questions are scored from 1 to 5, representing the frequency of the experience from "none of the time" to "all of the time." The APSQ provides insights into an athlete's mental state, and the scores are categorized into ranges: moderate (15-16), high (17-19), and very high (20+).

Subscales:

The APSQ includes three subscales that further illuminate specific aspects of mental strain:

Self-regulation difficulties: Assessing an athlete's ability to regulate their emotions and behaviours.

Performance concerns: Focusing on worries related to athletic performance.

Externalized coping: Examining the use of external strategies, such as substances or risky behaviours, to cope with stress.

Kinexon Local Positioning System (LPS)

The Kinexon Local Positioning System (LPS) employs Inertial Measuring Units (IMUs) to provide comprehensive performance data for athletes. This wearable device utilizes anchors positioned around the court and sensors attached to athletes' clothing. The IMU's accelerometer and gyroscopes measure acceleration and angular velocity, capturing precise data on players' movements and changes in direction.

Key Features:

Load (External) and Stress (Internal) Data: The system offers a dual perspective by assessing both external load (physical demands on the body) and internal stress (physiological responses).

Millimetre Precision: Kinexon's millimetre-level precision enables accurate player tracking anywhere on the court, facilitating detailed performance analysis.

Counter Movement Jump (CMJ) and Vald Force Desks

The Counter Movement Jump (CMJ) serves as a valuable metric for assessing neuromuscular performance and asymmetries in athletes. The Vald Force Desks, equipped with ForceDecks dual force plates, provide a platform for conducting and analyzing CMJ tests.

CMJ Procedure:

Player Setup: Athletes stand on the ForceDecks with hands on hips, maintaining an upright posture.

Jump Execution: Athletes perform a counter movement by bending down before explosively jumping up.

Landing Softly: Athletes are instructed to land softly and return to a standing position.

Data Collection: ForceDecks automatically detect and record the results, which are then uploaded for in-depth analysis.

ForceDecks Features:

Neuromuscular Performance Measurement: Assessing the efficiency and power of muscular contractions during the jump.

Asymmetry Detection: Identifying any imbalances or differences between the left and right sides of the body.

Insight into Movement Strategies: Offering valuable information on stability, strength, and movement patterns.

5 Results

The study consisted of 28 players, 11 female players and 17 male players: mean $\pm$ SD age of 15.61 ± 1.13 years and weight of 73.05 ± 11.16 kg from Ratgeber Academy basketball club. They all filled the APSQ questionnaire. The highest and the lowest score of the questionnaire in the total score was (mean $\pm$ SD; 21.14 ± 4.48) 34 and 15, respectively. Mean $\pm$ SD of the questionnaire subscales (self-regulation, performance concerns and externalised coping) was 7.64 ± 1.89 , 7.54 ± 2.69 and 5.96 ± 1.07 .

Table 1
Questionnaire Subscales based on injury status

		Mean	Std. Deviation	P-value
Total score	injured	22.23	5.876	0.267
	uninjured	20.20	2.651	
Self-regulation difficulties	injured	7.85	2.340	0.606
	uninjured	7.47	1.457	
Performance concerns	injured	8.23	3.345	0.208
	uninjured	6.93	1.870	
Externalized coping	injured	6.15	1.214	0.393
	uninjured	5.80	0.941	

Injury type

This section outlines various injury types and their corresponding locations among athletes. The predominant injury type is "supination trauma," which is frequently associated with lateral ankle injuries. Other injury types include ligament ruptures, lumbar pain, sprains, and strains,

affecting diverse locations such as the elbow, knee, upper arm, back, and thigh. Additionally, there are instances of Ulnar Collateral Ligament (UCL) strain and partial ligament injuries, contributing to the overall spectrum of injuries observed in the athletes. Injuries were documented in 14 athletes, with lateral ankle supination trauma being the most prevalent. To categorize these injuries, they were further grouped into four main types: supination trauma (n=7), spinal injury (n=1), ligament rupture (n=4), and strain (n=2).

Asymmetry

Asymmetry was set at 10%. 14 athletes had more than 10% asymmetry. The highest asymmetry recorded among an injured athlete was 31.5% and the least recorded was 0.1%.

Asymmetry and injuries

Of the players who were not injured, 21.4% had asymmetry levels greater than 10%, whereas 64.3% of the players who were injured had the same asymmetry. On the other hand, 78.6% of the non-injured group consisted of players with less than 10% asymmetry, while only 35.7% of the injured group did.

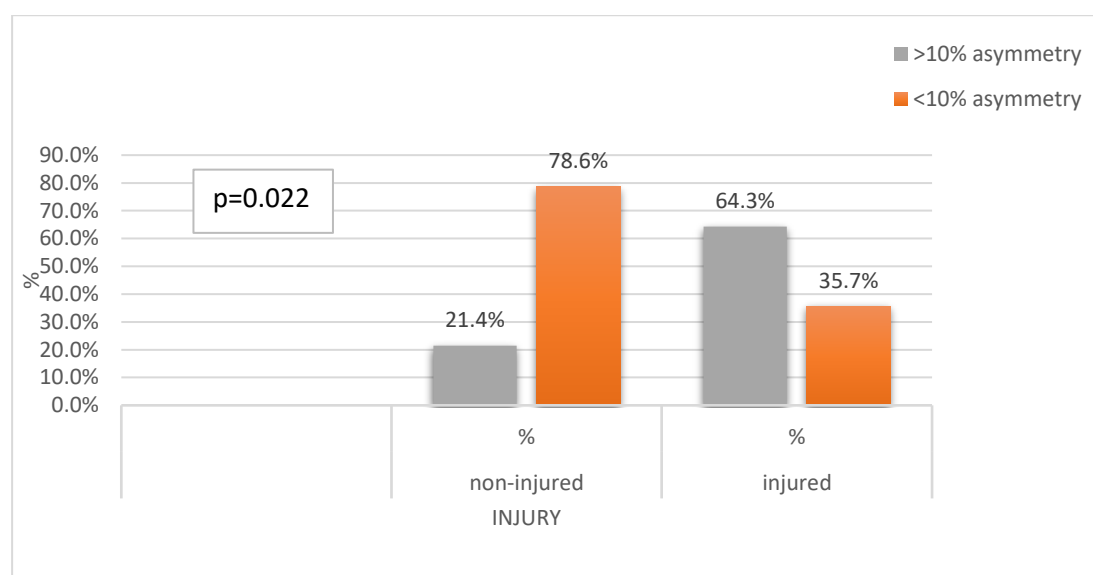


Figure 1

Degree of Asymmetry based on injury status

On-court Performance and injuries

The performance measured were the on-court performance of the athletes. Performance like points scored, failed, middle-distance shots scored and failed and so on were recorded. Injured

players were recoded with 1,00 and uninjured players were recoded with ,00. The table for this section, is placed in the annex.

Players with >10% asymmetry and performance

Athletes with more than 10% asymmetry scored as high as 31.5%. The results of the asymmetry were associated with the on-court performance of the players. Number of total points recorded was a mean value of 20.51 ± 7.50 ($p=0.007$). About the points scored and failed, the mean and SD values were 6.65 ± 2.83 ($p=0.017$) and 11.83 ± 4.24 ($p=0.022$), respectively. Scores of the total near shots analysed was 55.42 ± 10.33 ($p=0.092$). The near shots scored was 0.58 ± 0.28 ($p=1.000$) while the failed near shots was 1.90 ± 0.76 ($p=0.460$). Data of the mean and SD of the total points of the middle-distance shots was 31.60 ± 10.32 ($p=0.235$). The scored and failed data of the middle-distance points recorded was 1.02 ± 0.83 ($p=0.383$) and 3.73 ± 1.76 ($p=0.561$), respectively. Total distance shots among the players with above 10% asymmetry resulted in the values of 25.33 ± 12.85 ($p=0.126$) while for the scored points, it was 8.22 ± 3.10 ($p=0.011$) and for the failed points, 17.44 ± 4.50 ($p=0.031$) was recorded. The next on-court performance was all-shots, in which the values recorded was 46.00 ± 9.49 ($p=0.143$). For all-shots, the scored points were 3.03 ± 1.45 ($p=0.025$), and the failed points, 4.75 ± 1.90 ($p=0.013$). Free throws was the next performance recorded and the mean values were 62.83 ± 10.62 ($p=0.653$). Defensive and offensive rebounds among the players was also recorded and analysed and the mean values were 6.51 ± 2.16 ($p=0.101$) and 2.87 ± 1.31 ($p=0.865$) respectively. All rebounds were 9.36 ± 3.05 ($p=0.342$). Among the basketball players with >10% asymmetry, the mean number of ball steals was 3.84 with a standard deviation of 1.69 ($p=0.008$), lost balls averaged 4.73 with a standard deviation of 1.88 ($p=0.566$), own fault recorded a mean of 3.67 with a standard deviation of 1.12 ($p=0.496$), forced plays had a mean of 4.28 with a standard deviation of 1.47 ($p=0.024$), assists for uninjured players averaged 3.94 with a standard deviation of 2.23 ($p=0.137$), own blocks had a mean of 0.58 with a standard deviation of 0.40 ($p=0.648$), got balls by uninjured athletes were at a mean of 0.49 with a standard deviation of 0.36 ($p=0.717$), and the value of athletes recorded as VAL was a mean of 26.88 with a standard deviation of 8.08 ($p=0.002$).

Players with <10% asymmetry and performance

Athletes with less than 10% asymmetry scored as low as 0.1%. Number of total points recorded was a mean value of 13.43 ± 5.43 . The mean and standard deviation values for points scored and failed were 4.09 ± 2.46 and 8.11 ± 3.82 , respectively. The analysis of total near shots yielded an

average score of 49.00 ± 9.02 . Specifically, the mean for near shots scored was 0.58 ± 0.41 , and for failed near shots, it was 2.30 ± 1.72 . Middle-distance shots had a mean and standard deviation of 26.14 ± 12.71 , with scored and failed points recorded at 0.76 ± 0.72 and 3.24 ± 2.42 , respectively.

For players with lower than 10% asymmetry, total distance shots resulted in values of 17.69 ± 12.53 . Scored points were 5.43 ± 2.30 , and failed points were 13.66 ± 4.23 . The on-court performance for all shots recorded values of 39.81 ± 11.57 . Specifically, scored points for all shots were 1.84 ± 1.21 , and failed points were 2.98 ± 1.61 . Free throws, the next recorded performance, had mean values of 60.19 ± 17.86 . Defensive and offensive rebounds among players were analyzed, resulting in mean values of 5.19 ± 1.94 and 2.97 ± 1.72 , respectively. Overall, all rebounds were 8.15 ± 3.42 .

Among basketball players with less than 10% asymmetry, the mean number of ball steals was 2.41 with a standard deviation of 0.96. Lost balls averaged 4.26 with a standard deviation of 2.22, own fault recorded a mean of 3.99 with a standard deviation of 1.33, forced plays had a mean of 2.99 with a standard deviation of 1.36, assists for uninjured players averaged 2.83 with a standard deviation of 1.61, own blocks had a mean of 0.48 with a standard deviation of 0.73, got balls by uninjured athletes were at a mean of 0.54 with a standard deviation of 0.38, and the value of athletes recorded as VAL was a mean of 16.62 with a standard deviation of 7.62.

Correlations

Basketball player performance measurements and physical characteristics are correlated, and this correlation study offers a thorough understanding of the complex relationships present in the dataset.

Specifically, there was a strong positive correlation between total score and self-regulation ($r = 0.732$, $p < 0.001$), total score and performance ($r = 0.937$, $p < 0.001$), as well as a significant negative correlation between externalized coping and self-regulation difficulties ($r = -0.072$, $p = 0.717$). Also, performance concerns negatively correlated with externalized coping ($r = 0.367$, $p = 0.054$). Additionally, body weight (BW) exhibits a positive correlation with total score ($r = 0.348$, $p = 0.070$). Distance positively correlates with performance ($r = 0.314$, $p = 0.166$), while decelerations negatively correlate with externalized coping ($r = -0.201$, $p = 0.383$).

Specifically, the percentage of near shots demonstrated a significant positive correlation with points ($r = 0.590$, $p < 0.001$) and in % middle distance shots ($r = 0.551$, $p = 0.002$). Furthermore, total score a negative correlation with middle distance shots ($r = -0.274$, $p = 0.158$).

Additionally, externalized coping exhibited a positive correlation with near shots scored ($r = 0.420$, $p = 0.026$) and near shots failed ($r = 0.484$, $p = 0.009$), while BW(kg) with near shots scored showed a negative correlation ($r = -0.203$, $p = 0.300$) also % distance shots with near shots failed ($r = -0.426$, $p = 0.024$). There was a positive correlation between Max speed(km/h) and the percentage of middle distance shots scored ($r = 0.583$, $p = 0.006$), and the negative correlation between middle distance shots scored and defensive rebounds ($r = -0.481$, $p = 0.010$). There was also a correlation between middle distance shots scored and offensive rebounds ($r = -0.418$, $p = 0.027$). These findings provide valuable insights into the interplay between physiological and performance variables in the context of basketball.

There was a positive association between the total points and different shooting statistics. In this case, there was a significant positive connection ($r = 0.985$, $p = 0.000$) between the number of points and the distance shots scored. Failed distance shots throws were positively correlated with the total points ($r = 0.891$, $p = 0.000$). Defensive rebounds (Def) and offensive rebounds (Off) showed positive correlations with all shots ($r = 0.420$, $p = 0.026$) and ($r = 0.373$, $p = 0.050$) respectively. Moreover, there were positive associations shown between different performance indicators and player value (VAL). For instance, there was a significant positive connection ($r = 0.748$, $p = 0.000$) between VAL and scored distance shots. Maximum speed showed a significant positive correlation with total distance shots ($r = 0.537$, $p = 0.012$). Similarly, maximum acceleration showed positive correlations with total distance shots ($r = 0.375$, $p = 0.093$). On the other hand, defensive rebounds revealed a negative correlation with self-regulation ($r = -0.335$, $p = 0.082$). Analysing various shooting statistics, the percentage of near shots (% near shots) had a correlation with offensive rebounds ($r = 0.324$, $p = 0.093$).

In terms of defensive rebounds (Def), it exhibited positive correlations with offensive rebounds (Off) ($r = 0.609$, $p = 0.001$). Player value (VAL) displayed positive correlations with defensive rebounds ($r = 0.516$, $p = 0.005$) and also between free throws and jump height ($r = 0.401$, $p = 0.034$). Also, examining the relationships between maximum speed and free throws ($r = 0.343$, $p = 0.128$), no correlation was found.

Strong positive correlations are seen between the distance travelled during training and different performance variables, particularly with accelerations ($r=0.775$, $p = 0.000$), decelerations ($r=0.861$, $p = 0.000$), and maximum speed ($r=0.713$, $p = 0.000$).

Positive correlations were also observed between the number of decelerations during training and a number of performance measures, including a significant correlation with maximum

speed during training ($r=0.553$, $p = 0.009$), positive correlations with distance ($r=0.861$, $p = 0.000$), jump height ($r=0.713$, $p = 0.000$), and accelerations ($r=0.435$, $p = 0.049$). The maximum speed shows strong positive correlations with acceleration max ($r=0.846$, $p = 0.000$).

Maximum acceleration shows positive correlations with a number of performance indicators, including jump height ($r=0.547$, $p = 0.010$), training distance ($r=0.466$, $p = 0.033$), accelerations ($r=0.281$, $p = 0.221$), and decelerations ($r=0.579$, $p = 0.000$).

Physical performance and injury

Participants in the injured group moved a distance of 4625.73 meters on average ($SD=497.474$, $p=0.137$), which was not statistically different from the non-injured group ($M=4222.20$, $SD=687.397$). The not-injured group had a mean of ($M=58.40$, $SD=4.502$) in terms of training intensity, indicating no significant difference between the two groups. The injured group showed an average distance per minute of ($M=60.00$, $SD=6.325$, $p=0.516$). In terms of accelerations, the group that was injured had a mean that was higher than the group that was not injured ($M=355.40$, $SD=47.640$, $p=0.043$; this difference was statistically significant). In contrast, there was no statistically significant difference in the decelerations during between the injured ($M=379.18$, $SD=57.045$, $p=0.143$) and non-injured ($M=341.50$, $SD=55.674$) groups. The groups who were not injured ($M=24.9370$, $SD=2.30717$) and those that were injured ($M=25.3382$, $SD=1.50723$, $p=0.639$) did not differ significantly in terms of maximum speed. Also, there were no statistically significant differences in the maximum acceleration or maximum deceleration between the injured ($M=3.9918$, $SD=0.38470$, $p=0.674$) and non-injured ($M=3.8710$, $SD=0.46355$) groups for both scenarios.

6 Conclusion

Questionnaire

The Athlete Psychological Scale Questionnaire (APSQ) shed light on the mental and emotional aspects of the athletes. Responses indicated that athletes generally reported low difficulty in being around teammates and completing necessary tasks. However, a notable portion experienced moment of reduced motivation, irritability, and worry about injury or performance. Coping with selection pressures and concerns about life after sport presented challenges for a subset of athletes. A noteworthy finding was that a substantial percentage (46.7%) admitted to using alcohol and other substances to relax. Additionally, a considerable portion of athletes (40%) reported taking unusual risks off the field. In delving deeper into the psychological dynamics revealed by the Athlete Psychological Scale Questionnaire (APSQ), it becomes

evident that athletes navigate a complex landscape of emotions and stressors. The intricate nature of these mental states underscores the need for nuanced and personalized mental health support within athletic environments. Coping mechanisms emerged as a critical aspect, with athletes grappling to manage selection pressures and contemplate life after sport. This suggests the necessity for targeted interventions and resources aimed at bolstering resilience and psychological well-being in these specific domains. The finding that a substantial percentage (46.7%) resorted to using alcohol and other substances for relaxation highlights the importance of fostering healthier coping strategies and providing avenues for stress management. Addressing substance use in sports contexts is crucial not only for athletes' well-being but also for optimizing performance and maintaining a conducive team environment. Moreover, the revelation that 40% of athletes acknowledged taking unusual risks off the field introduces an element of behavioural concern that merits attention. This aspect intertwines with psychological well-being and suggests potential areas for mentorship, education, or support services to guide athletes toward safer decision-making outside the sporting arena. Although no significant difference was found, the mean difference among the injured athletes unable to participate was higher than the uninjured athletes which proves the **first hypothesis**.

Asymmetry

Players with limb asymmetry greater than 10% showed a significantly higher injury rate, with 64.3% of these players experiencing injuries. This finding suggests a potential link between higher asymmetry and increased injury risk, possibly influenced by the aggressive playing style observed in individuals with greater asymmetry levels. The imbalance in physical load distribution might contribute to their heightened susceptibility to injuries. In contrast, 78.6% of non-injured players exhibited asymmetry levels below 10%, indicating a potential protective effect of lower asymmetry. A more balanced distribution of physical load in these players may reduce the likelihood of overexertion or imbalances that lead to injuries. These results emphasize the importance of monitoring limb asymmetry and implementing targeted injury prevention strategies for athletes with significant asymmetry to reduce injury risks.

On-court Performance (movement patterns) and injury

Injured athletes tend to adopt an aggressive offensive style, leading to higher scores but also greater risk indicators, such as missed shots and turnovers. In contrast, uninjured players exhibit a balanced and consistent performance, focusing on defensive strength, effective rebounds, and low-risk offensive strategies. This analysis highlights the interplay between limb asymmetry,

playing style, and injury risk in basketball players, revealing the trade-off between assertive tactics and performance efficiency.

Asymmetry and performance

This study examines basketball players' performance differences based on limb asymmetry, revealing distinct patterns between those with asymmetry greater than 10% and those below 10%. Players with >10% asymmetry demonstrated exceptional scoring ability, with a higher mean total points (20.51 ± 7.50) and superior free throw accuracy (62.83 ± 10.62). They excelled in near and middle-distance shots, while their dynamic playing style emphasized steals, forced plays, and an impressive overall value (VAL) of 26.88 ± 8.08 , highlighting a robust all-around performance. Defensive rebounds showed a positive trend but were not statistically significant.

In contrast, players with <10% asymmetry had a lower mean total points (13.43 ± 5.43) but maintained strong proficiency in near and middle-distance shots. Their free throw accuracy (60.19 ± 17.86) was slightly lower but still commendable. This group displayed a more conservative approach, focusing less on steals and forced plays, with a corresponding overall value (VAL) of 16.62 ± 7.62 .

This detailed and extensive analysis sheds light on the detailed dynamics of on-court performance influenced by limb asymmetry in basketball players, providing valuable insights for coaches, sports scientists, and athletes alike.

Physical Performance and injury

This study compared physical activity metrics and training intensity between injured and non-injured athletes, finding no significant differences in movement distance, training intensity, maximum speed, acceleration, or deceleration between the groups. However, the injured group exhibited a significantly higher mean for accelerations (355.40 vs. 341.50), suggesting that accelerative movements may be linked to an increased injury risk. No significant differences were observed in decelerations, indicating the potential specificity of certain movement patterns in contributing to injuries.

7 Discussion

The APSQ results highlight the comprehensive aspect of athlete well-being as we navigate how complex athlete psychology is. Recognizing and addressing the multifaceted challenges athletes face off the court is vital for creating an environment conducive to both their personal growth and sustained high-performance levels on the basketball court. A comprehensive approach that integrates mental health support, coping skills development, and risk management strategies

will not only contribute to individual athlete flourishing but also enhance the overall health of the team dynamics. Understanding these findings can help develop tailored support systems for athletes. Players with >10% asymmetry may benefit from injury-focused training, while those with <10% asymmetry should maintain balanced regimens to reduce injury risk. Despite their strong performance, the aggressive playing style of high-asymmetry players could increase the risk of overexertion injuries, as injured athletes were shown to have higher workloads and physical demands. From the result of this research, it could be seen that the injured athletes had higher workloads and demands from the sport. Due to this result, it could be said that injured athletes are the better players **(Tim J Gabbett, 2016)**. Additionally, the strain from an unbalanced distribution of physical load due to limb asymmetry might pose a risk to certain muscle groups or joints. Further research is necessary to assess the long-term impact of such asymmetry on injury susceptibility. Athletes with lower levels of asymmetry displayed a more conservative playing style, which may suggest a reduced risk of certain acute injuries associated with aggressive movements. It is crucial to investigate whether the more balanced performance exhibited by these players translates to a lower overall risk of injury over the course of a season. The physiological parameters, including training distances, and speed metrics, also reveal intriguing correlations, offering insights into the physical attributes contributing to overall player performance. Overall, the APSQ provided valuable insights into the psychological experiences of the athletes, highlighting their challenges, concerns, and coping mechanisms. These results can be used to guide interventions and support plans aimed at improving the athletes' mental health and overall performance. Basketball-specific performance metrics, psychological variables, and physiological parameters are all thoroughly analysed to give a better understanding of the complex dynamics affecting player performance. However, the interaction of psychological constructs demonstrates strong correlations, highlighting the connection of performance, self-regulation, and overall score. When it comes to performance metrics, the relationships among different shot types, player movements, and physiological parameters provide useful data. Positive correlations that stand out between offensive and defensive rebounds and all shots demonstrate the range of players' skills are. The significance of defensive impacts in determining overall player value is demonstrated by the positive correlation observed between defensive rebounds and player value (VAL). Ultimately, this comprehensive analysis provides a detailed perspective on the complex dynamics of basketball performance, enriching our understanding of the sport. The examination of physical performance metrics between individuals in the injured and non-injured groups provides a comprehensive perspective on the interplay between injuries and training outcomes. Notably,

despite the absence of statistically significant differences in total distance covered, training intensity, and distance covered per minute between the two groups, certain intriguing patterns emerged, shedding light on the adaptability of athletes in response to injuries. In terms of total distance covered, both the injured and non-injured groups exhibited comparable averages, suggesting that the presence of injuries did not significantly impede participants from maintaining a similar overall level of physical activity during their training sessions. Athletes in both injured and non-injured groups showed similar training efforts, with no significant differences in training intensity, distance covered per minute, or peak performance metrics like maximum speed, acceleration, and deceleration. This indicates a shared commitment to maintaining consistent training routines, regardless of injury status. However, the injured group had a significantly higher frequency of accelerations, suggesting possible adaptations in movement patterns or compensatory strategies. Deceleration frequency was similar between the groups, showing a consistent approach to controlled slowing movements. Summarily, while certain metrics did not exhibit statistically significant differences, the overall training patterns between the injured and non-injured groups remained comparable in terms of total distance covered, training intensity, and distance covered per minute. The heightened number of accelerations in the injured group introduces a compelling avenue for further investigation into how athletes, despite injuries, dynamically modify their movement patterns during training. The findings offer valuable insights into the relationship between injuries and training behaviors, informing strategies for injury prevention and rehabilitation. Injured athletes scored higher in total points, near shots, and middle-distance shots, indicating a potential impact on offensive performance. However, there were no significant differences in defensive metrics, such as rebounds and steals, between injured and uninjured athletes. Interestingly, while injured athletes exhibited higher scores in certain offensive categories, there were no statistically significant differences in defensive metrics such as rebounds and steals. This calls into question the complex connection between defensive performance and injuries. **(Mari Leppänen et al., 2017)** The observed mean values for forced play and assists were significantly higher among injured athletes, indicating a potential shift in team dynamics or playing style. Conversely, `own_blocks` did not show significant differences between the two groups, suggesting that injured athletes were similar in shot-blocking abilities. In addition to statistical findings, practical significance must be considered. These observed differences may be explained by variables like individual player roles, team tactics, and injury types. Furthermore, a cautious interpretation is warranted due to the relatively small sample size and the complexity of basketball dynamics.

In summary, this thorough analysis highlights the interconnection of psychological, physiological, and performance-oriented variables and provides insightful information about the multifactorial nature of basketball performance. These results add to the body of sports science knowledge already in existence and set an example for upcoming studies intended for understanding all aspects of basketball player performance.

8 Limitations and Future Research:

The study's small sample size may have limited the findings, as many significant differences were not observed. The results highlight a potential link between limb asymmetry and injury risk in basketball players, but more research is needed to confirm a causal relationship. Factors like biomechanics, training protocols, and injury history should be considered in future studies. The findings suggest that targeted injury prevention strategies based on individual asymmetry levels could help improve player well-being and extend careers. Limitations, such as unaccounted playing styles, team dynamics, and injury types, could have influenced the results. Future research should explore these factors, along with specific movement patterns, types of acceleration, and individualized training programs, to better understand and reduce injury risks.

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10 Annexes

Table 2
on-court performance in relation to injuries
,00-uninjured, 1,00-injured

		N	Mean	Std. Deviation	p
Points	1,00	14	19.16	7.04	0.045
	,00	14	13.76	6.54	
Scored	1,00	14	5.87	2.89	0.216
	,00	14	4.51	2.81	
Failed	1,00	14	10.44	4.11	0.383
	,00	14	8.97	4.61	
% near shots	1,00	14	54.64	9.64	0.126
	,00	14	48.86	9.74	
Scored	1,00	14	0.74	0.39	0.010
	,00	14	0.41	0.23	
Failed	1,00	14	2.44	1.70	0.248
	,00	14	1.82	0.95	
% middle dist shots	1,00	14	31.31	11.04	0.214
	,00	14	25.66	12.37	
Scored	1,00	14	1.05	0.79	0.214
	,00	14	0.69	0.72	
Failed	1,00	14	3.92	1.75	0.248
	,00	14	2.97	2.44	
% distance	1,00	14	24.57	12.68	0.146
	,00	14	17.36	12.77	
Scored	1,00	14	7.65	2.96	0.066
	,00	14	5.59	2.71	
Failed	1,00	14	16.79	3.89	0.088
	,00	14	13.78	5.02	
% all shots	1,00	14	44.43	9.07	0.354
	,00	14	40.50	12.65	
Scored	1,00	14	2.81	1.42	0.090
	,00	14	1.89	1.33	
Failed	1,00	14	4.43	1.82	0.057
	,00	14	3.05	1.84	
% free throws	1,00	14	62.00	13.69	0.816
	,00	14	60.64	16.69	
Def	1,00	14	5.64	2.26	0.773
	,00	14	5.87	2.02	
Off	1,00	14	2.79	1.42	0.657
	,00	14	3.06	1.68	
All reb	1,00	14	8.41	3.27	0.689
	,00	14	8.92	3.37	
steals_ball s	1,00	14	3.36	1.77	0.237
	,00	14	2.69	1.08	
lost	1,00	14	4.95	2.29	0.214
	,00	14	3.97	1.74	
own_fault	1,00	14	4.06	1.21	0.374
	,00	14	3.64	1.26	
forced	1,00	14	4.16	1.46	0.027
	,00	14	2.91	1.37	
Assists	1,00	14	4.15	2.03	0.019
	,00	14	2.46	1.48	
own - blocks	1,00	14	0.34	0.30	0.105
	,00	14	0.71	0.77	
got	1,00	14	0.55	0.42	0.688
	,00	14	0.49	0.32	
VAL	1,00	14	23.89	9.70	0.100
	,00	14	18.14	8.11	