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# **MATCH WORKLOAD, TRAVEL, AND INJURIES IN ELITE WOMEN'S FOOTBALL**

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## **1. BACKGROUND**

The recent growth of women's football has increased the physical demands on players, potentially increasing their susceptibility to injury. A recent literature review indicated that lower limb injuries were the most frequent injury location in elite women's football, with muscle & tendon injuries, and joint and ligament injuries the most frequent type of injury. This literature review confirms the latest anecdotal reports related to the substantial prevalence of hamstring and anterior cruciate ligament (ACL) injuries in elite women's football. These injuries are generally induced by the combination of multiple intrinsic and extrinsic contributing factors. Intrinsic contributing factors include among others age, muscle strength, joint stability and previous injury, while extrinsic contributing factors can include playing surface, weather conditions and workload. Identifying and subsequently modifying these contributing factors are crucial to prevent injury and thus secure players' availability.

FIFPRO's Player Workload Monitoring (PWM) tool displays data of elite women's and men's football players with regard to three extrinsic contributing factors to injury, namely match workload, rest and international travel. Therefore, the question arises whether an association can be established between these contributing factors and injury in elite women's football.

## **2. OBJECTIVE**

The objective of this project was threefold, namely to explore over the 2021/2022 and 2022/2023 seasons the differences in match workload and international travel between injured elite female footballers and non-injured elite female footballers.

## **3. METHODOLOGICAL APPROACH**

### **3.1 Design and participants**

An observational case-control study was conducted over the 2021/2022 and 2022/2023 football seasons. Participants consisted in the elite female footballers who (i) were included in the FIFPRO PWM tool, (ii) competed in either the Division 1 Feminine, FA Women's Super League, Frauen Bundesliga or Primera División Femenina, and (iii) played for their national team. Participants who were injured in either season formed the injury group, and non-injured participants formed the control group (1:2 match for league).

### **3.2 Contributing factors**

#### *Match workload*

Match workload for the 2021/2022 and 2022/2023 seasons was collected from the FIFPRO PWM tool and operationalised as follows:



- Number of match appearances (club and national team; friendlies and competition);
- Number of match appearances in the starting eleven (club and national team; friendlies and competition);
- Number of minutes played (club and national team; friendlies and competition);
- Number of rest periods of less than 3 days between appearances;
- Number of rest periods of less than 5 days between appearances;
- Number of critical zone matches (two matches played with less than 5 rest days in-between, and more than 45 minutes played in both matches).

#### *International travel*

International travel for the 2021/2022 and 2022/2023 seasons was collected from the FIFPRO PWM tool and operationalised as follows:

- Number of hours spent flying;
- Number of kilometres travelled;
- Number of time zones crossed.

### **3.3 Injuries**

Injury data for the 2021/2022 and 2022/2023 seasons was collected from a publicly available data source (soccerdonna.de). The injury location, type, and severity were recorded according to the consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries and the football-specific extension of the International Olympic Committee consensus statement: methods for recording and reporting of epidemiological data on injury in sport 2020. In order to secure the validity of the injury data collected, two verification steps were conducted, namely (i) each injury was verified through press releases or social media posts (club and national team) and/or (ii) a survey was sent to the injured participants.

### **3.4 Analyses**

The analyses were performed for overall injuries, as well as for ACL and hamstring injuries. The cumulative values of both match workload and international travel variables were calculated for each injury over a 28-day period preceding the injury date. For the control (non-injured) group, the cumulative values of both match workload and international travel variables were calculated over the same 28-day period than the injury group. Descriptive statistics for all variables were conducted (e.g., injury incidence rate per thousand playing hours). Comparisons between the injury and control group were explored via independent t-tests (statistical significance set at 0.05) and the related magnitude of the differences interpreted as trivial, small, moderate, large, very large and extremely large.

## **4. RESULTS**

### **4.1 Participants' characteristics**

A total of 139 elite female footballers were included in the analyses, of whom 58 were injured at least once over the 2021/2022 and 2022/2023 seasons. The mean age, match workload and travel for all players across the two seasons are presented in Table 1. A total of 84 injuries were collected, resulting in an injury incidence rate of 6.19 injuries per 1,000 match hours. The most frequent injury locations



were the knee (32%) and the thigh (29%). Twelve injuries were ACL injuries (14%) and 19 hamstring injuries (23%), resulting in injury incidence rates of 0.92 and 1.45 injuries per 1,000 match hours, respectively. All participants' characteristics are presented in Table 1, as well as their workload, international travel and injuries.

**Table 1. Average age and 28-day match workload and international travel of all players**

| Variables                            | 2021-2022<br>(n=56) | 2022-2023<br>(n=122) | Total<br>(n=139) |
|--------------------------------------|---------------------|----------------------|------------------|
| Age                                  | 25                  | 26                   | 26               |
| Minutes Played (min)                 | 275                 | 317                  | 304              |
| Appearances (n)                      | 3.6                 | 4.0                  | 3.9              |
| Appearances in Starting Eleven (n)   | 3.1                 | 3.4                  | 3.3              |
| Unused Substitute (n)                | 0.1                 | 0.4                  | 0.3              |
| Rest Time (min)                      | 586                 | 575                  | 579              |
| Less than 3 Days between Matches (n) | 0.4                 | 0.4                  | 0.4              |
| Less than 5 Days between Matches (n) | 1.8                 | 1.8                  | 1.8              |
| Critical Zone Matches (n)            | 1.2                 | 1.4                  | 1.4              |
| Distance Travelled (km)              | 3826                | 3706                 | 3742             |
| Travel Time (hrs)                    | 313                 | 310                  | 311              |
| Time Zones Crossed (n)               | 2.7                 | 2.3                  | 2.4              |

*min, minutes; n, number; km, kilometres; hrs, hours*

#### **4.2 Overall injuries: differences in match workload and international travel**

Differences in match workload and international travel between the injury and control group for overall injuries are presented in Table 2. Analyses showed that injured elite female footballers were exposed to a higher number of rest periods of less than 5 days between matches than non-injured players in the 28-day period preceding the injury date. No other statistically significant difference was found between the injury and control group.

**Table 2. Overall injuries: differences in match workload and international travel between the injury and control group**

| Variables                            | Injury group | Control group | Interpretation |
|--------------------------------------|--------------|---------------|----------------|
| Minutes played (min)                 | 314          | 300           | Trivial        |
| Appearances (n)                      | 4.2          | 3.7           | Small          |
| Appearances in starting eleven (n)   | 3.6          | 3.2           | Small          |
| Unused substitute (n)                | 0.3          | 0.3           | Trivial        |
| Rest time (min)                      | 571          | 583           | Small          |
| Less than 3 days between matches (n) | 0.4          | 0.4           | Trivial        |



|   |            |            |               |
|---|------------|------------|---------------|
| <b>Less than 5 days between matches (n)</b> | <b>2.2</b> | <b>1.6</b> | <b>*Small</b> |
| Critical zone matches (n)                   | 1.5        | 1.3        | Trivial       |
| Distance travelled (km)                     | 3,025      | 4,100      | Trivial       |
| Travel time (hrs)                           | 259        | 337        | Trivial       |
| Time zones crossed (n)                      | 2.0        | 2.6        | Trivial       |

*min, minutes; n, number; \* statistically significant at  $p < 0.05$ ; km, kilometres; hrs, hours*

#### **4.3 ACL injuries: differences in match workload and international travel**

Differences in match workload and international travel between the injury and control group for ACL injuries are presented in Table 3. Analyses showed that elite female footballers who injured their ACL were exposed to a higher number of matches, lower number of rest time and a higher number of rest periods of less than 5 days between matches than non-injured players in the 28-day period preceding the ACL injury date. Elite female footballers who injured their ACL were also exposed to a higher travelled distance, a higher travelled time and a higher number of time zones crossed than non-injured players in the 28-day period preceding the ACL injury date. No other statistically significant difference was found between the injury and control group for ACL injuries.

**Table 3. ACL injuries: differences in match workload and international travel between the injury and control group**

| <b>Variables</b>                            | <b>Injury group</b> | <b>Control group</b> | <b>Interpretation</b> |
|---|---------------------|----------------------|-----------------------|
| Minutes played (min)                        | 366                 | 301                  | Small                 |
| <b>Appearances (n)</b>                      | <b>4.8</b>          | <b>3.5</b>           | <b>*Moderate</b>      |
| Appearances in starting eleven (n)          | 4.3                 | 3.2                  | Small                 |
| Unused substitute (n)                       | 0.2                 | 0.3                  | Small                 |
| <b>Rest time (min)</b>                      | <b>558</b>          | <b>587</b>           | <b>*Moderate</b>      |
| Less than 3 days between matches (n)        | 0.3                 | 0.2                  | Small                 |
| <b>Less than 5 days between matches (n)</b> | <b>2.5</b>          | <b>1.4</b>           | <b>*Moderate</b>      |
| Critical zone matches (n)                   | 2.1                 | 1.3                  | Small                 |
| <b>Distance travelled (km)</b>              | <b>5,012</b>        | <b>2,875</b>         | <b>*Moderate</b>      |
| <b>Travel time (hrs)</b>                    | <b>420</b>          | <b>242</b>           | <b>*Moderate</b>      |
| <b>Time zones crossed (n)</b>               | <b>3.5</b>          | <b>1.9</b>           | <b>*Moderate</b>      |

*min, minutes; n, number; \* statistically significant at  $p < 0.05$ ; km, kilometres; hrs, hours*

#### **4.4 Hamstring injuries: differences in match workload and international travel**

Differences in match workload and international travel between the injury and control group for hamstring injuries are presented in Table 4. No statistically significant difference was found between the injury and control group for hamstring injuries.



**Table 4. Hamstring injuries: differences in match workload and international travel between the injury and control group**

| Variables                            | Injury group | Control group | Interpretation |
|--------------------------------------|--------------|---------------|----------------|
| Minutes played (min)                 | 344          | 388           | Small          |
| Appearances (n)                      | 4.7          | 4.8           | Trivial        |
| Appearances in starting eleven (n)   | 4.1          | 4.1           | Trivial        |
| Unused substitute (n)                | 0.3          | 1.3           | Small          |
| Rest time (min)                      | 558          | 556           | Trivial        |
| Less than 3 days between matches (n) | 0.6          | 0.7           | Small          |
| Less than 5 days between matches (n) | 2.6          | 2.6           | Trivial        |
| Critical zone matches (n)            | 1.6          | 1.9           | Trivial        |
| Distance travelled (km)              | 1,280        | 5,616         | Small          |
| Travel time (hrs)                    | 124          | 450           | Small          |
| Time zones crossed (n)               | 1.2          | 3.6           | Small          |

*min, minutes; n, number; \* statistically significant at  $p < 0.05$ ; km, kilometres; hrs, hours*

## 5. CONCLUSIONS

- Instances of less than 5 days between matches in elite women's football were significantly higher in the injured group compared to the non-injured group.
- Elite female footballers who sustained ACL injuries made more appearances, had more instances of less than 5 days between matches, and had less rest time in the 28 days prior to the injury than the non-injured players.
- Elite female footballers who sustained ACL injuries also travelled further, for longer and crossed more time zones than the non-injured players.
- There were no meaningful differences between the elite female footballers who sustained hamstring injuries and the non-injured players.

## 6. KEY RECOMMENDATIONS

- A better-balanced match calendar in elite women's football should be coordinated among all international and national stakeholders, striving to provide players with healthy playing conditions.
- As in men's football, match congestion is associated with higher number of injuries (especially ACL injuries) in elite female footballers.
- Additional recovery should be provided to elite female footballers who are exposed to travel fatigue and jet lag, their return to training and competition process being guided by certified (medical) professionals.
- Next to match workload, training workload as well as in- and off-season breaks should be considered in order to provide elite female footballers with healthy playing conditions.