# Plan Overview

*A Data Management Plan created using DMPonline*

**Title:** Biomechanical and Physical Demand of Acceleration Performance in Field-Based Sport Athletes

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**Template:** DCC Template

**Project abstract:**

The aim of this project is to investigate the relationship between kinetics and kinematics during jumping, isometric testing, and acceleration performance in team sport athletes. Understanding how force production, movement efficiency, and specific sports demand influence sprint performance can help identify key performance indicators. This research seeks to enhance the way athletic performance is assessed, particularly during the acceleration phase of sprinting. To achieve this aim, the project will: 1. Collect and analyze kinetic data from jump tests and isometric tests. 2. Capture kinematic data during sprint acceleration using 4k 120fps camera. 3. Compare performance metrics between athletes with different sprint strategies to identify biomechanical and neuromuscular factors influencing performance. 4. Evaluate the test-retest reliability of jump, isometric, and sprint performance metrics in team sport athletes. The objectives of the project are: 1. Investigate the test-retest reliability of common force plate test and sprint performance in team sport population. 2. To identify key biomechanical factors that differentiate team sports athletes with varying sprint strategies. 3. To explore the relationship between force production (jump and isometric tests) and sprint performance metrics.

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# Biomechanical and Physical Demand of Acceleration Performance in Field-Based Sport Athletes

## Data Collection

### What data will you collect or create?

The project will collect **kinematic, kinetic, and anthropometric data** from field-based sport athletes.

- **Kinetic data**: Ground reaction force recordings from a dual force plate system (Hawkin Dynamics) sampled at 1000 Hz, exported as .csv files. Variables include jump height, rate of force development, peak force, impulse, and symmetry measures.
- **Kinematic data**: High-speed video recordings of sprint accelerations (4k, 120 fps) captured in .mp4 format, later digitised and analysed for spatiotemporal variables (step length, step frequency, contact time, flight time).
- **Questionnaire/assessment data**: Baseline information such as age, mass, height, training history, activity status, and injury history, collected via Microsoft Forms and stored in .xlsx or .csv format.
- **Derived data**: Processed datasets generated during analysis (e.g., reliability indices, correlation outputs, regression models). These will be saved in .xlsx and .sav (SPSS) or .RData formats.

**Data volumes and formats:**

- Force plate .csv files: approx. 1–5 MB per participant per session.
- Video recordings: ~200–400 MB per sprint trial, depending on duration.
- Questionnaire data: <1 MB per participant.
- Derived datasets: <50 MB total.

Data formats are chosen for compatibility with widely used software (Excel, SPSS, R, MATLAB, Python). Raw video will be compressed for storage but kept at sufficient resolution for analysis. All data will be stored on the University OneDrive (encrypted, backed up automatically), with anonymised datasets uploaded to a permanent open-access repository (e.g., Dryad) at project completion.

### How will the data be collected or created?

How will the data be collected or created?
Data will be generated during **laboratory- and field-based testing sessions**.

- **Collection procedures:**
  - Force plate data acquired using Hawkin Dynamics proprietary software and exported to .csv.
  - Sprint kinematics captured using calibrated high-speed cameras; calibration will involve standard markers and distances to ensure accuracy.
  - Baseline data and consent collected via Microsoft Forms, automatically time-stamped and linked to anonymised participant IDs.
- **Community data standards:** Where possible, biomechanical standards will be followed (e.g., International Society of Biomechanics [ISB] recommendations for kinematic definitions, reliability statistics reported using ICC and CV%).

- **Organisation and naming conventions:**
  - Each participant allocated a unique anonymised ID (e.g., ATH001, ATH002).
  - Folder structure:
    /Data /Raw /ForcePlate/ATH001/ /Video/ATH001/ /Questionnaire/ATH001/ /Processed /ATH001/ /Analysis /Statistics/
  - Filenames will include participant ID, test type, and date (e.g., ATH001_CMJ_2025-08-28.csv).
  - Version control managed through OneDrive with change history; processed datasets will be logged in a README file documenting transformations.
- **Data quality control:**
  - Force plates and cameras will be calibrated before each session.
  - Each test will be repeated at least three times, with up to five attempts if errors occur.
  - Consistency will be ensured using a standardised warm-up (RAMP protocol) and test order randomisation.
  - Data entry validation is built into Microsoft Forms (e.g., numerical ranges, mandatory fields).
  - Peer review of initial datasets by supervisors to confirm accuracy of extraction and coding.
  - A data logbook will document calibration checks, anomalies, exclusions, and analysis decisions.

## Documentation and Metadata

### What documentation and metadata will accompany the data?

Documentation and Metadata

To ensure the data can be **read, interpreted, and reused** both during and after the project, multiple layers of documentation and metadata will be created and maintained.

**1. Core documentation:**

- **Readme files**: Each dataset will have an accompanying README.txt or README.md file containing:
  - Dataset title, creator (PhD researcher), supervisors, institution.
  - Date of data collection and date of export.
  - Contact details for responsible researcher.
  - Conditions of access and reuse (licensing and embargo details).
  - File naming conventions and folder structure.
- **Data dictionary/codebook**: For questionnaire and assessment data, a data dictionary will define each variable (e.g., “Mass = participant body mass in kg, measured using calibrated digital scale”), including units, coding schemes, valid ranges, and missing data codes.
- **Methodology documentation**: A written description of data collection methods (force plate calibration, camera setup, sprint testing protocols, warm-up procedures, trial repetition rules). This will align with ISB biomechanical reporting standards.

**2. Metadata standards:**

- **Dublin Core metadata elements** will be used for dataset-level metadata, as these are widely recognised and supported by repositories like Dryad and Figshare. Core elements include: Title, Creator, Subject, Description, Publisher, Contributor, Date, Type, Format, Identifier, Source, Language, Relation, Coverage, and Rights.

- **Biomechanics-specific standards**: Variable definitions will follow ISB recommendations for joint kinematics and kinetics (e.g., definition of step length, ground contact time, force-time variables). Reliability statistics will follow published frameworks (e.g., ICC, CV%, SEM as per Koo & Li, 2016).

**3. Capturing and storing metadata:**

- Metadata will be compiled in structured .xlsx or .csv files alongside the datasets, and embedded where possible (e.g., SPSS .sav labels, R .RData objects with documented variable names).
- Each dataset uploaded to an open repository will include repository-required metadata (e.g., keywords, funder details, DOI link).
- Version-controlled documentation will be stored in the /Documentation folder of the project directory, ensuring that all updates to metadata and procedural information are logged.

**4. Long-term usability:**

- Documentation will ensure that external researchers can understand data collection context, definitions of derived metrics (e.g., peak power, jump height calculation method), and any preprocessing applied.
- All metadata will be recorded in plain, non-proprietary formats (.txt, .csv, .xlsx) to ensure long-term readability.

## Ethics and Legal Compliance

### How will you manage any ethical issues?

Ethical Issues

**1. Informed consent for preservation and sharing**

- All participants will provide written informed consent prior to testing.
- The consent form clearly states that anonymised data will be preserved and may be shared via open-access repositories (e.g., Dryad) for the purposes of transparency, replication, and future research.
- Participants are informed that no identifiable information will ever be included in public datasets, and they may withdraw at any time before anonymisation is complete.

**2. Protection of participant identity**

- Each participant will be assigned a unique anonymised code (e.g., ATH001, ATH002).
- Personal identifiers (name, email, consent forms) will be stored separately from research data in encrypted University OneDrive folders.
- Once force plate and kinematic data are exported, they are automatically stripped of names and labelled only by anonymised ID.
- All reporting (thesis, publications, repository datasets) will only use anonymised codes.

**3. Handling sensitive data securely**

- Initial screening forms (age, mass, injury history, activity status) will be collected via Microsoft Forms and automatically stored on the University of Salford’s secure cloud storage (OneDrive, encrypted, access-restricted).
- Personal data (consent forms, contact details) will be stored separately from research data and

only accessible to the lead researcher and supervisors.
- Data transfer from devices (force plate tablet, cameras) will occur directly to the secure OneDrive system; no data will remain on local devices once transfer is confirmed.
- Data will not be stored on USB sticks or personal hard drives unless encryption and university policy require short-term backup (e.g., during field testing).

**4. Ethical approvals and oversight**

- All procedures are subject to approval by the University of Salford Ethics Committee, in accordance with institutional policy and UK GDPR.
- Data handling follows the Caldicott Principles and the Data Protection Act 2018.
- A Data Protection Checklist (Appendix 5 of the ethics submission) ensures compliance.

**5. Long-term considerations**

- Anonymised datasets only will be archived in open repositories.
- Identifiable data (consent forms, screening information) will be securely destroyed after the retention period specified by University policy.

**How will you manage copyright and Intellectual Property Rights (IPR) issues?**

Copyright and Intellectual Property Rights (IPR)

**1. Ownership of data**

- The primary data (force plate outputs, sprint kinematics, questionnaire responses, and derived datasets) will be collected by the lead researcher as part of the PhD project.
- In accordance with University of Salford policy, copyright and IPR in data generated by the project will be owned by the University, with the researcher recognised as the data creator.
- Supervisors are acknowledged as contributors but do not hold separate IPR in the raw data.

**2. Licensing for reuse**

- Anonymised datasets deposited in an open-access repository (e.g., Dryad) will be released under a **Creative Commons Attribution (CC BY 4.0)** licence, which allows reuse, redistribution, and adaptation provided the dataset is appropriately credited.
- Any accompanying documentation (e.g., data dictionaries, README files) will carry the same licence to maximise reusability and transparency.

**3. Use of third-party data**

- This project does not rely on external third-party datasets. All data will be generated directly from testing procedures.
- Where published definitions or biomechanical standards are used (e.g., ISB standards, reliability thresholds), they will be cited appropriately but are not subject to additional IPR restrictions.

**4. Restrictions and timing of sharing**

- To protect the researcher’s right to publish first, anonymised data will only be made openly available **after the completion of the PhD thesis and associated journal articles** .
- No patents are anticipated from this project, and therefore no embargo beyond the publication period will be required.
- Raw video footage that could identify participants will not be shared publicly due to ethical and privacy restrictions; only anonymised derivative data (digitised kinematics, spatiotemporal

variables) will be archived.

## Storage and Backup

### How will the data be stored and backed up during the research?

Data Storage and Backup

**1. Storage capacity and infrastructure**

- All research data will be stored on the **University of Salford's OneDrive system**, which provides institutionally managed, secure, and encrypted cloud storage.
- The University storage has sufficient capacity for all raw and processed data, including large video files (~200–400 MB per sprint trial). No additional paid storage services are anticipated.

**2. Backup strategy**

- OneDrive provides **automatic, real-time backup** with version history, ensuring that files can be restored to earlier versions if required.
- At least two secure copies of all datasets will be maintained:
  - Primary working copy on University OneDrive (encrypted, backed up by IT Services).
  - Secondary encrypted copy on an institutional encrypted laptop or desktop used for analysis.
- No raw or identifiable data will be stored on unencrypted USB drives or external hard disks unless temporarily required for field collection. If so, these will be encrypted and deleted after successful transfer.

**3. Responsibility for backup and recovery**

- The lead researcher (PhD candidate) will be responsible for ensuring data are uploaded to the secure OneDrive system immediately following collection.
- IT Services at the University of Salford are responsible for maintaining server-side backup, version history, and recovery systems.

**4. Recovery in the event of an incident**

- In the event of accidental data deletion, corruption, or device failure, recovery will be achieved by restoring the most recent backup copy from OneDrive's version history.
- For critical incidents (e.g., full system failure), recovery will be supported by University IT Services using institutional disaster recovery procedures.
- A data log will record when backups are confirmed, particularly after each testing session, ensuring no gaps in storage continuity.

### How will you manage access and security?

Access and Security

**1. Risks to data security and management**

- Risks include unauthorised access to identifiable personal data (e.g., names on consent forms), accidental loss or theft of devices used during field testing (e.g., tablets, cameras), or interception

of data transfer.
- These risks will be mitigated through encryption, secure storage systems, access controls, and immediate transfer of data to University-managed systems.

**2. Controlling access**

- All digital data will be stored on the **University of Salford's secure OneDrive system** , which complies with institutional data protection policies and is encrypted in line with **ISO 27001** standards.
- Access will be restricted to the lead researcher and supervisory team. Permissions will be role-based, ensuring only approved individuals can view raw or processed datasets.
- Identifiable personal data (consent forms, contact details) will be stored in a separate encrypted folder from anonymised research data.

**3. Secure access for collaborators**

- Collaborators within the supervisory team will access data via **OneDrive's managed sharing system**, using University accounts with multi-factor authentication (MFA).
- No data will be transferred via unsecured channels such as personal email or public file-sharing platforms.
- An audit trail of file access will be maintained automatically within OneDrive's system, enabling monitoring of who accessed which files and when.

**4. Safe transfer of field data**

- Data collected in the field (force plate trials, video files) will be stored temporarily on encrypted devices (e.g., Hawkin Dynamics tablet, camera SD card).
- Immediately after each session, files will be transferred to the University OneDrive account via secure Wi-Fi or a direct encrypted connection.
- Once upload is confirmed, local copies will be deleted from the field device to minimise the risk of data loss or theft.
- A transfer log will be kept noting date, time, and confirmation of secure upload.

**5. Compliance and standards**

- All handling of personal data will comply with the **UK GDPR**, the **Data Protection Act 2018**, and University of Salford policies.
- Security measures (encryption, MFA, ISO 27001-aligned systems) ensure confidentiality, integrity, and availability of all datasets throughout the project lifecycle.

## Selection and Preservation

### Which data are of long-term value and should be retained, shared, and/or preserved?

Long-term Value, Retention, and Preservation

**1. Data requiring retention or destruction (legal/regulatory obligations)**

- **Personal and identifiable data** (e.g., signed consent forms, participant contact details, health screening questionnaires) will be retained securely for the minimum period required by the University of Salford's data retention policy (normally **5 years after project completion** ) and then permanently destroyed.

- This ensures compliance with **UK GDPR** and the **Data Protection Act 2018**, protecting participants' rights.

**2. Data of long-term research value**

- **Anonymised force plate data** (.csv) and **derived performance metrics** (e.g., jump height, rate of force development, sprint spatiotemporal variables) will be preserved as they have clear long-term value for:
  - Replication and validation of study findings.
  - Meta-analyses and benchmarking studies in biomechanics.
  - Future methodological comparisons in sport science.
  - Teaching and training datasets for biomechanics and sports performance analysis.
- **Anonymised kinematic datasets** (digitised step length, contact time, stride frequency) will be preserved; raw video files will not be archived due to identifiable content and large storage demands. Instead, only extracted and anonymised spatiotemporal variables will be retained.
- **Data dictionaries, README files, and methodological documentation** will be preserved alongside the datasets to ensure usability by future researchers.

**3. Criteria for selection of other data to keep**

- Datasets will be assessed based on their **scientific reuse potential**, quality, and ease of anonymisation.
- Only anonymised, well-documented, and complete datasets will be preserved in open repositories. Interim/poor-quality or incomplete test files will be discarded once final datasets are verified.

**4. Duration of retention and preservation**

- **Research data of long-term value** will be archived indefinitely in a recognised open-access repository (e.g., Dryad, Figshare, or institutional repository). These repositories provide persistent identifiers (DOIs), long-term preservation, and guaranteed accessibility.
- **Working datasets and intermediate files** will be retained securely on University systems for at least **10 years post-thesis submission**, in line with good research practice.
- **Identifiable data** (consent forms, health forms) will be destroyed once the retention period lapses, with destruction recorded in a data management log.

**What is the long-term preservation plan for the dataset?**

Long-term Preservation Plan

**1. Repository selection**

- All anonymised datasets of long-term value (force plate outputs, processed kinematic metrics, data dictionaries, and accompanying documentation) will be deposited in a recognised open-access repository such as **Dryad**, **Figshare**, or the **University of Salford Institutional Repository (USIR)**.
- These repositories provide stable infrastructure, long-term curation, and persistent identifiers (DOIs) that ensure data are permanently findable and citable.

**2. Costs**

- Dryad charges a data publishing fee (~$150 USD per dataset at the time of writing). Figshare and USIR typically do not charge for deposits by University-affiliated researchers.

- The selected repository will depend on institutional guidance at the time of deposit, balancing visibility, cost, and compliance with funder/university policy. No additional costs beyond normal research activity are anticipated, but time has been costed in for dataset preparation.

**3. Preparation and documentation**

- Datasets will be curated before deposit, including:
  - Conversion into open, non-proprietary formats (e.g., .csv, .txt) where feasible.
  - Removal of all identifiers to ensure full anonymisation.
  - Preparation of **README files**, **data dictionaries**, and methodological documentation describing variables, units, protocols, and reliability metrics.
  - Assignment of metadata using community standards (Dublin Core, ISB biomechanical reporting recommendations).
- Only complete and quality-checked datasets will be preserved; interim files or raw video containing identifiable information will not be included.

**4. Longevity of preservation**

- Once deposited, datasets will be archived indefinitely within the repository.
- An embargo period may be applied to ensure that the researcher can first publish the PhD thesis and associated journal articles. After embargo expiry, data will be openly accessible under a **Creative Commons licence (CC BY 4.0)**.
- Preservation will guarantee that future researchers, educators, and practitioners can access the anonymised data for replication, secondary analysis, or teaching.

## Data Sharing

### How will you share the data?

Data Sharing

**1. Discovery and visibility**

- Anonymised datasets will be deposited in a recognised open-access repository (e.g., **Dryad**, **Figshare**, or the **University of Salford Institutional Repository [USIR]** ), ensuring they are indexed, searchable, and discoverable via academic databases and search engines.
- Each dataset will be assigned a **persistent identifier (DOI)**, enabling citation in journal articles, the PhD thesis, and future publications.

**2. Audience and conditions of access**

- Data will be openly accessible to the wider research community, including biomechanics researchers, sports scientists, and educators.
- Datasets will be licensed under **Creative Commons Attribution (CC BY 4.0)**, allowing reuse and adaptation provided proper credit is given to the original creator(s).
- Raw video files containing identifiable participant features will not be shared publicly; instead, anonymised derived datasets (kinematic and kinetic variables) will be deposited.

**3. Sharing mechanism**

- Data will be shared primarily via the selected repository, which will handle both access and long-

term preservation.
- No direct handling of individual data requests will be necessary, except in cases where collaborators require controlled access to additional supporting material not suitable for public release.

**4. Timing of data release**

- Data will be made available after the completion of the PhD thesis and the publication of the main peer-reviewed outputs.
- If required, an **embargo period (e.g., up to 12 months post-thesis submission)** will be applied to protect the researcher's right to publish first.

**5. Acknowledgement of reuse**

- Repository metadata and licensing conditions will specify that users citing or reusing the dataset should reference both the dataset DOI and the original associated publications.
- This ensures recognition of the researcher's contribution while encouraging responsible secondary use.

**Are any restrictions on data sharing required?**

Restrictions on Data Sharing

**1. Expected restrictions**

- **Identifiable data** (e.g., raw video recordings in which participants can be visually identified, consent forms, and health screening data) cannot be shared publicly due to confidentiality and GDPR requirements.
- Only **anonymised and derived datasets** (force plate metrics, kinematic variables, questionnaire outputs stripped of identifiers) will be deposited for long-term sharing.
- No intellectual property restrictions are anticipated, as all data are generated by the researcher and do not rely on third-party proprietary datasets.

**2. Overcoming or minimising restrictions**

- Restrictions will be mitigated through **anonymisation** (unique participant codes, removal of names, exclusion of identifiable video).
- Where full open access is not feasible, metadata describing the restricted files will still be provided in repositories so that users understand what data exist and why access is limited.
- In the case of collaborators requiring non-public supporting material, a **controlled access agreement** (e.g., data sharing agreement under University of Salford policy) may be used to regulate access securely.

**3. Exclusive use period**

- Exclusive use of the data will be required until the completion of the PhD thesis and the publication of key journal outputs.
- This embargo period is expected to last up to **12 months post-thesis submission**, ensuring the researcher has first right to publish. After this period, anonymised datasets will be released under open licence.

**4. Data sharing agreements**

- For open-access repositories (Dryad, Figshare, USIR), no formal data sharing agreements are necessary beyond repository licence terms.

- If data are shared directly with collaborators prior to public release, a **data sharing agreement or NDA** will be used to set conditions on confidentiality, permitted use, and acknowledgement.

## Responsibilities and Resources

### Who will be responsible for data management?

Responsibilities for Data Management

**1. Overall responsibility**

- The **lead researcher (PhD candidate, Achmed Syahlintang)** will be responsible for implementing the Data Management Plan (DMP), ensuring that it is followed throughout the project, and updating it if procedures or policies change.

**2. Specific responsibilities**

- **Data capture:** The lead researcher will oversee all data collection (force plate trials, kinematic recordings, questionnaires), ensuring adherence to ethical protocols and accurate recording of participant information.
- **Metadata production and documentation:** The lead researcher will prepare data dictionaries, README files, and methodological documentation. Supervisors will review documentation to confirm accuracy and compliance with community standards.
- **Data quality assurance:** The lead researcher will manage calibration of equipment, repeated measurements, and verification of datasets. Supervisors (Prof. Paul Comfort and Dr. Paul Jones) will provide oversight and peer review of selected datasets to ensure accuracy.
- **Storage and backup:** The lead researcher will be responsible for uploading all data to the University of Salford's secure OneDrive system immediately after collection. The University IT Services will maintain automatic backups and recovery processes.
- **Data archiving and sharing:** The lead researcher will curate, anonymise, and prepare datasets for long-term archiving in Dryad, Figshare, or the University of Salford Institutional Repository (USIR). Supervisors will advise on timing of data release to ensure alignment with thesis and publication strategy.
- **Compliance with institutional policies:** The lead researcher will ensure adherence to University of Salford policies, UK GDPR, the Data Protection Act 2018, and open science requirements. Supervisors will provide oversight to confirm compliance.

**3. Collaborative responsibilities**

- As the research is conducted solely within the University of Salford, no consortium or external partner data management agreement is required.
- If additional collaborators are engaged (e.g., MSc/BSc students assisting in data collection), they will not hold ownership of data but will receive training to ensure secure handling and immediate transfer of data to the lead researcher.

### What resources will you require to deliver your plan?

Resources Required

**1. Expertise and training**

- The lead researcher (PhD candidate) has existing expertise in biomechanics testing, motion capture, and force plate analysis, as well as experience in data management and statistical analysis.
- Supervisors will provide oversight on methodology, statistical approaches, and data reporting.
- No additional specialist expertise is required; however, the lead researcher will attend any University of Salford workshops on research data management, GDPR compliance, and use of open-access repositories to ensure best practice is maintained.

**2. Hardware and software**

- **Hardware**:
  - Force plate system (Hawkin Dynamics) and high-speed cameras are already available through the University of Salford.
  - Standard University IT infrastructure (encrypted laptop/desktop, secure OneDrive storage) is sufficient for data storage and analysis.
- **Software**:
  - Hawkin Dynamics proprietary software (included with equipment licence) for force plate data collection.
  - Microsoft Forms and Excel for questionnaire and baseline data.
  - Statistical packages (SPSS, R, MATLAB, or Python), already supported under institutional licences.
  - No exceptional or additional software purchases are anticipated.

**3. Repository and archiving costs**

- The final anonymised datasets will be deposited in an open-access repository.
  - **USIR (University of Salford Institutional Repository)** : no cost to deposit.
  - **Figshare**: free institutional version may be available.
  - **Dryad**: charges a publishing fee (~$150 USD per dataset). If Dryad is selected, this cost will either be absorbed by institutional arrangements or budgeted into the project's final dissemination costs.
- Time has been accounted for at project close to prepare datasets, metadata, and documentation for repository submission (estimated **1–2 weeks**).

**4. Summary**

- Existing institutional resources are sufficient for storage, analysis, and backup.
- Minor additional resources may be required for open-access repository deposit fees if Dryad is used.
- The main resource requirement is **time** for dataset preparation, anonymisation, and documentation at the conclusion of the PhD.