**Application Form**

**Research Grant**

**SUMMARY SHEET**

# Please read the General Information and Guidelines for Research Grants and then complete this application form.

|  |  |
| --- | --- |
| **Grant applying for** | SEEDING GRANT 2015 |
| **Name of Chief Investigator (Applicant)** | Liam James Robinson |
| **Postal address** | 21/947 Mount Alexander Road, Essendon, VIC, 3040 |
| **Telephone** | |  |  | | --- | --- | |  |  | | **Mobile:** 0413034270 |  | |  |  | |
| **Email** | |  |  | | --- | --- | | **Work:**  liam@melbournesportsphysiotherapy.com.au |  | | **Home: (primary)**  Liam.james.robinson@gmail.com |  | |
| **APA Member No** | 80656 – Since 2012 |
| **APA National Group Member (if applicable)** | Sports, MSK |
| **Research area** | Muscle fatigue characteristics in in academy rugby union players |
| **Research Project Title** | Neuromuscular, physiological and perceptual responses to linear vs. multidirectional high intensity running sessions in academy rugby union players. |
| **Funding requested: (Preference)**  **(Ideal/If ‘A’ unsuccessful)** | 1. $ 6781.30 B) $5551.70 C) $4895 |
| **Administering Organisation**  **(contact person must not be Applicant)** | |  |  | | --- | --- | | **Name of contact person:** | Prof. Aaron Coutts (Project Supervisor)  Professor in Sport & Exercise Science | | **Name of institution:** | University of Technology, Sydney (UTS) | | **Postal address for contact person:** | Faculty of Health  University of Technology, Sydney  P.O. Box 123,  Broadway, NSW, 2007 | | **Email of contact person:** | Aaron.Coutts@uts.edu.au | | **ABN of institution:** | 77 257 686 961 | |
| **Project ID** *(PRF office use only)* | |  |  |  | | --- | --- | --- | | Number: |  | | | Seeding: | Tagged: | Ethical Approval: | |

**Application Form**

**Clinical Research Grant**

# NB: Please complete this application in Size 11 Arial or Helvetica Font

**Project Identification:**

|  |  |
| --- | --- |
| **Name of Chief Investigator (Applicant):** | Liam James Robinson |
| **Project ID** *(PRF office use only)* |  |

**1. Research Area (Please specify with reference to guideline 1):**

|  |
| --- |
| Sports Physiotherapy |

**2. Project title** *(Please provide**a short descriptive title of no more than 30 words)*

|  |
| --- |
| Neuromuscular, physiological and perceptual responses to linear vs. multidirectional high intensity running sessions in academy rugby union players. |

**3. Is this study part of a project for a tertiary qualification?**

*(If yes, please state the qualification, the university, when the enrolment commenced and whether part time or full time.)*

|  |
| --- |
| **Yes –**  *Qualification:* MSc Sports Physiotherapy  *University:* University of Bath, UK (Distance Learning - 3 – 5 years Part Time)  *Enrolment:* September 2012 (on track for 3 year completion)  *Notes:*  This research project is part of my MSc Sports Physiotherapy course and makes up the final 18 credits of this course. It is a compulsory part of the award of the MSc in which I must design and complete a suitable and viable research project on a topic of my choice, and present it back in article form to the University in order to be assessed for the final 18 credits. Passing this module, in line with 2 other modules for this year will ultimately lead to the award of a MSc Sports Physiotherapy.  The MSc course code is: *THHL-ADM18* and the module (research project) outline has been included in the ***appendix*** of this application. |
|  |

**4.** **Has ethical approval for this project been obtained/applied for?**

**Yes**  **No**  **N/A**

***(Please provide written confirmation when available)***

As part of my ‘Sports Physiotherapy Research Project’ module (18 credits), The 3rd (& final) year also includes a compulsory 6 credit module entitled ‘Research Project Design (RPD)’ (course code *HL50077* and is also included in the attached **appendix**) which I have been working through since September 2014. It is university policy (Bath University) that the RPD module must be passed in order to proceed onto the research project module (18 credits).

Over the last 5 months I have therefore sought potential research supervisors as I looked to refine my topic area and design my proposed project. During this time I undertaken skype sessions, meetings, emails and have submitted 2 draft proposals to the University of Bath which have been assessed by my supervisors and provided back to me with relevant feedback.

On the 4th March 2015, I then submitted a 3000 word final proposal of my research project to the University of Bath and it can be found via this [link](https://skydrive.live.com/redir?resid=71D6CEFE7A5CD032!20545). This constitutes the end of the RPD module.

On the 17th March 2015, I received confirmation from the University of Bath that my proposal was granted a ‘[*pass’*](https://onedrive.live.com/redir?resid=71D6CEFE7A5CD032!24945&authkey=!ABD8FrJyZMlRmBY&ithint=file%2cdocx) and that I have received the 6 credits for the RPD module. This now allows me to proceed onto the sports physiotherapy research project module (18 credits) of which the first stage is that of seeking ethical approval.

The online university environment which I work on (Moodle) will now (March-April) take us though a 2 week module/discussion forum which will allow us to converse with the lead university research tutors on how to now go about seeking ethical approval for our research projects. This is now the stage at which I am at. I am only as far as university has allowed us to be at this stage.

In seeking feedback from university tutors and my current research supervisors, I have been informed that this project should not encounter any issues from an ethical point of view. From a time line point of view, I am hoping to submit for ethics in mid-April and be in a position to commence data collection come June/July 2015.

I will be submitting for ethical approval to HRECs at the University of Bath and, through facilitation by my 3rd supervisor (Aaron Coutts, Sydney), I will also be submitting for ethical approval to HRECs at UTS, Sydney in order to satisfy ethics. This I feel will also facilitate any dissemination at the conclusion of the project.

**5. Project summary:**

*(In* ***no more than 200 words,*** *outline the research question, methodology and significance of the project to physiotherapy and the general community.)*

|  |
| --- |
| *Research Question:*  Does the inclusion of accelerations, decelerations and changes of direction alter the physiological, neuromuscular and perceptual response to a typical rugby high intensity exercise running programme?  *Methodology:*  Using a randomized, repeated measures crossover design, ~25 male Australian academy rugby players will perform two running protocols; A (Linear) and B (Multidirectional) 8 days apart. Measures of muscle function (i.e. knee flexion, extension, shallow range eccentric hamstrings and adductor squeeze) will be recorded before and immediately after both protocols. Blood lactate concentration ([La]), rating of perceived effort (RPE), heart rate (HR), perceptual measure of fatigue and movement characteristics via a 10Hz GPS system will also be recorded. Subjects will run at maximal speed during 30m shuttles set up in accordance to either protocol A or B. Each 30m of running will be followed by 30m walking at <1m/s. Subjects will run a total distance of 1500m and neuromuscular markers will be reassessed at 48 hours.  *Significance:*  Despite much being known regarding the gross demands of field sports, little is understood regarding how fatigue markers respond in a rugby environment inclusive of multiple changes of direction.  It is hoped that the findings might enable coaches/trainers to better understand the loads imposed on the body by multidirectional movements, ultimately presenting potential implications for future specific training prescriptions. |
|  |

**6. Project Investigators and Personnel:**

**Chief Investigator (Applicant) and Associate Investigator(s):**

|  |  |  |
| --- | --- | --- |
| **Role** | **[Title] [First name] [Last name]** | **[Department], [School], [Organisation]** |
| **Chief Investigator (Applicant)** | Mr. Liam James Robinson | MSc Sports Physiotherapy Student – The University of Bath, UK.  Private Practice: Melbourne Sports Physiotherapy, Melbourne, VIC.  Academy Physiotherapist: Rabodirect Melbourne Rebels Rugby Union Club |
| **Associate Investigator 1 (Lead Supervising Investigator)** | Dr. Craig Twist | Sport and Exercise Sciences, University of Chester, United Kingdom. |
| **Associate Investigator 2**  **(Bath Internal Supervisor)** | Dr. Keith Stokes | Department for Health, The University of Bath, United Kingdom. |
| **Associate Investigator 3**  **(Australia Based Supervisor – Administering Organisation)** | Prof. Aaron Coutts | Faculty of Health, University of Technology (UTS), Sydney, Australia. |

**Personnel:**

**(Although the below have agreed to help, this will be confirmed closer to the time of data collection, as im unable to yet confirm dates due to waiting on ethical approval) – (There will be no issues gaining 3 x helpers for this project) – All the below are colleagues of some form in my current positions. I am not seeking a formal paid research assistant for this project.**

|  |  |  |
| --- | --- | --- |
| **Role** | **[Title] [First name] [Last name]** | **Qualifications** |
| **Chief Investigator, Lead Researcher** | Mr. Liam James Robinson | BSc (Hons) Physiotherapy, Dip Sports Physiotherapy, ACPSM (Silver), APAM, SMA |
| #**Helper 1** (small fee paid if possible) | Mr. Brendan Whelan | \*MSc Strength & Conditioning |
| #**Helper 2** (small fee paid if possible) | Miss. Ashley Bigaran | \*MSc Strength & Conditioning |
| #**Helper 3** (small fee paid if possible) | Mr. Sam Howe | \*PhD Student, Analytics, Load |

### 7. Project Proposal:

# 7.1 Project Outline

*Please take* ***no more than******3000 words*** *to write a project outline using the following headings:*

*Background, Significance, Research aims, Methods, Statistical analysis, Feasibility, References.*

***Applications exceeding the word limit will not be assessed.***

|  |
| --- |
| **Background:** |
| Rugby union is a sport characterised by repeated, high-intensity work periods of relatively short duration (Duthie, Pyne & Hooper, 2003: Duthie et al, 2006). At the elite level, while the development and implementation of an effective training programme is deemed essential with regards to both rehabilitation and preparation purposes to meet the physical demands of the sport (Gamble, 2004), the complexity in its delivery lies within establishing a correct balance between its volume and content.  Aspects of high-intensity intermittent efforts (HIE) performed within short distance running tasks are often interspersed throughout team sport training (Gabbett et al., 2012). The inclusion of game specific HIE such as accelerations, decelerations and changes of direction (COD) however come at a cost given they bring about both immediate and prolonged symptoms of fatigue (Hader et al., 2014). Defined as sensations of tiredness and associated decrements in muscular performance and function (Abiss & Laursen, 2005), fatigue is well understood as a multidimensional process resulting from activity. While previous work has increased our understanding of the gross demands of field sports (Gregson et al, 2009), much of the available research has only supplied data describing the physiological and metabolic costs of such exercise (Dellal et al, 2009: Buchheit et al, 2010: Alaphilippe et al, 2012).  With lower limb muscle activation having been previously reported to increase during COD tasks compared with straight-line (Beiser, Lloyd & Ackland, 2003), there still remains a failure to fully consider the additional potential fatigue effects of combined COD, acceleration & deceleration occurrences such as may be used within typically prescribed HIE. Despite Akenhead et al. (2014) presenting a novel piece touching on similar concerns, the absence of a valid neuromuscular fatigue measure has made it difficult to quantify the influence of COD in conjunction with acceleration and deceleration and thus any implementation into practice has stuttered.    As knee joint stabilisation during COD and HIE is achieved through responsive muscle activity (Beiser, Lloyd & Ackland, 2003; Hader et al, 2014), neuromuscular fatigue as a result of prolonged HIE has been postulated to potentially play a role in the promotion of extreme lower biomechanics stemming from the resultant suboptimal muscle activation (Sanna & O’Connor, 2008). Eccentric muscular contractions as present during periods of HIE decelerations are also well documented as being a potent stimulus towards the inducing of gains to the neuromuscular system (Hortobogyi et al, 1996) and thus the effects of such combined exercise prescriptions such as discussed may help bridge the complexity in establishing balance between volume, content and potential for injury.  A more thorough understanding of the multidimensional fatigue responses towards typically prescribed HIE programs could therefore have important implications for future specific training prescriptions. Accordingly, the aim of this study is to investigate the neuromuscular, physiological and perceptual responses towards two types of modified HIE running sessions typically used in rugby training environments. In addition, it is hoped that potential findings may enable coaches and trainers to find an effective balance between potential improvements in performance and potential for injury during prescription. |

|  |
| --- |
| **Significance:** |
| As stated in project summary above - |

|  |
| --- |
| ***Research aims:*** |
| The aim is to investigate the neuromuscular, physiological and perceptual responses to two types of modified high intensity running sessions typically used in rugby training environments. |
| *Research Objective(s):* |
| * To examine specifically if measures of neuromuscular fatigue are influenced when compared between two types of modified high intensity running sessions typically used in rugby training environments: i.e. linear (L) vs. shuttle run with multiple changes of direction (COD). * To examine if measures of blood lactate concentration ([Bla]), rating of perceived exertion (RPE) and heart rate (HR) are different between high intensity linear and multidirectional running protocols. * To assess the delayed neuromuscular fatigue response of isometric knee flexion, extension, low range eccentric hamstrings and groin squeeze at 24-48 hours post assessment/protocol. |

|  |
| --- |
| **Methods:** |
| ***Statement of Methods***:  Quantitative Study: -  Taking quantitative measures for the data collection will generate significant numeric data that can be ordered, added together and/or counted to define frequencies from the data observation. Quantitative investigations facilitate the search for ‘distinguishing characteristics’ within the data and as a result, this method is well suited towards this particular project’s primary aims. The data generated from this type of approach will allow for more descriptive statistical analysis and thus broadens the way the data can be handled, analysed and interpreted.  Design Strengths: -  A randomised repeated measures crossover design will use the same subjects for each trial of the research whilst maintaining a controlled environment. These aspects both aim to minimize participant bias and aid confidence in the potential findings.  Using a randomised repeated measures crossover design means that there is less chance of natural variation between individuals being responsible for the skewing of any results due to all participants completing all aspects of the testing in the design (A and B). This method therefore requires fewer participants and resources and would be most practical given the nature and aims of the project. No learning effect will take place that could then influence findings given A will differ to B.  ***Bias Consideration:***  Selection bias: -  All participants will be from selected from the same squad (u20s) and usually train together at the same level (Australian academy rugby union). This will minimize any selection bias, and will make findings relevant towards other similar populations. The sample will thus be representative of the population that these results will look to influence.  Observer or measurement bias:  Measurements will be taken using previously validated measuring equipment that has will be calibrated according to the manufactures instructions before use during this project.  Equipment to be used by the main assessor will include:   * Baseline© Push/Pull Dynamometer & Pressure Cuff Sphygmomanometer,   The main researcher (myself) will be the only assessor for all neuromuscular measures of strength, minimizing any assessor bias. The main researcher is a 7 year post-graduate in physiotherapy and often uses dynamometry/sphygmomanometer measurements in both sports and private clinic.  Dynamometry strength assessments via the ‘Baseline© Push/Pull Model’ will be assessed in accordance to the process described in:   * ‘Whitely (2012). Correlation of isokinetic and novel hand-held dynamometry measures of knee flexion and extension strength testing. Journal of Science and Medicine in Sport, 15, p444-450’   Pressure cuff Sphygmomanometer assessment for groin squeeze will be conducted in line with the process outlined in:   * ‘Delahunt, E., Kennelly, C., McEntee, B.L., Coughlan, G.F., Green, B.S. (2011). The thigh adductor squeeze test: 45 of hip flexion as the optimal test position for eliciting adductor muscle activity and maximum pressure values. Manual Therapy, 16: 476-480’   Participants:  Approximately ~25 male Australian academy rugby union players will be selected from the same rugby club academy.  Exclusion Criteria:  • All players will be assessed prior to any inclusion for injury and selection for potential invitation will ultimately rely on the main author (7 years post graduate physiotherapist) clearing the players via a formal, in-use (within club), musculoskeletal (MSK) assessment.  • Only players that would otherwise be involved in full contact/non-restricted/non-modified training sessions at the time which the study is being conducted will be selected as invitees for participation.  • Any player not given permission by the club will also be excluded, despite them being eligible based on MSK assessment. The parent club will have ultimate say on inclusion of the player in the outlined study.  Inclusion Criteria:  • The player must be within the u20s academy squad for the 2015 season and must have had MSK clearance from the assessing physiotherapist prior to being invited for consideration of participation.  • Participant must also have clearance from the club prior to being invited – (after MSK screening has been completed)  Recruitment Procedures:  All players are registered members of the emerging player’s academy group at which the main author works ad-hoc (PT) (Super Rugby Club). Permission to invite members of the group to participate in this research has been granted by the club.  All registered academy players (~30) will be addressed by the main researcher (lead academy physiotherapist) in advance as to the research project proposal. At this stage, the academy players will receive a short presentation by the lead researcher. Subjects will then be asked to volunteer for the project prior to a defined date if they feel they would like to take part. The initial phase of subject recruitment will be that of identifying willing subjects and commence Musculoskeletal Screening (MSK). Subjects will therefore be required to volunteer and then consent (via informed consent form) to phase 1 of subject recruitment (MSK screen for research purposes only).  From those consenting volunteers, a MSK screen will be completed by the lead researcher. After MSK screening is complete, those players who then still meet the inclusion criteria will be again addressed and invited to volunteer for the second part of the research project and complete testing.  Allocation to groups:  A randomised repeated measures crossover design will be used.  For those participants who attend the familiarisation day, the order of performance for the data collection days will be assigned randomly via drawing numbers. In ascending number order, each participant will then be given an arrival time at the data collection setting (as noted previously). Participant order and time of arrival is to remain the same for (A) and (B). This is to limit the effects of the circadian variations on the measured variables, particularly on HR measures.  Setting:  The setting will be that of the normal academy training location for the u20s group. All data will be collected at the address: IKON Park, Royal Parade, Carlton, Melbourne, VIC, Australia. This address will also be used for all the pre-assessment MSK screening and trial days before participants complete Protocols A and B (Data Collection).  A maintained grass rugby pitch, used throughout the year by the u20s squad, will be used for all running protocols. Environmental conditions including temperature, humidity & wind direction will be recorded prior to the commencement of any running.  ***Procedures & Equipment:***  Neuromuscular Assessment (**A**):  Via: Baseline© Electronic Push/Pull dynamometer Model 12-0343 and rated to 225 kg (Fabrication Enterprises Inc., NY, USA).  Neuromuscular Assessment (**B**):  Via: Commercially available (Welch Alyn) Sphygmomanometer: Pre-Inflated to 20mm Hg.  Blood Lactate:  Via: Lactate Pro/Plus Portable Analyser – (Arkray Inc, Japan).  RPE:  Via; BORG 6-20 & Session RPE 1-10  GPS:  Via: 10Hz GPS units (MinimaxX s5, Catapult Innovations, Scoresby, VIC, Australia)  ***Data Collection materials and procedures:***  Familiarisation Day:  Accepted participants will arrive at a pre-arranged familiarisation day to be organised by the main researcher. Here, each participant will undertake a mock assessment of the all the procedures to be used on the official testing day. The aim of this is to familiarise the participants with the equipment and measuring techniques prior to the official days of data collection.  Neuromuscular Assessment: (**A**)  A hand held dynamometer (Baseline© Electronic Push/Pull dynamometer Model 12-0343) will be used for neuromuscular assessment of isometric quadriceps contraction at 30◦ of knee flexion seated, isometric hamstrings contraction at 30◦ of knee extension seated, and shallow range eccentric hamstrings contraction between 45◦ and 15◦ of knee flexion prone. This equipment will be calibrated prior to use and will be conducted by the main researcher only.  Official Testing Days:  After arrival and registration, each participant, in time order will report to a team member. Participants will then give additional consent on the day and then begin a standardized 10 minute warm-up procedure designed by a strength and conditioning coach (helper 2). Participants neuromuscular assessments will then begin in the procedure as outlined below. This procedure will take place immediately after the 10 minute warm up (prior to any running) and then at 4 minutes post completion of the shuttle run program (as [BLa] will be taken at 3 minutes post).   1. Isometric knee extension:   With the patient sat on the edge of a ready prepared plinth, the dynamometer will be switched on and be ready to use in ‘tension peak’ mode. The dynamometer belt will then be wrapped around the distal shank at the level of the malleoli with the bed height and attached dynamometer belt being adjusted so that knee flexion angle is 30◦ and belt is perpendicular to shank. A goniometer measurement will ensure that the starting position is 30◦ knee extension.  On instruction, the athlete will attempt to extend the knee maximally for a period of approximately 3s which will be timed by a helper. The main researcher will ensure all equipment remains in place during the test, and will then note the dynamometry value after the 3s exertion. The same test will be repeated 3 times with the maximum value being recorded.   1. Isometric knee flexion:   With the patient sat on the edge of a ready prepared plinth, the dynamometer will be switched on and be ready to use in ‘tension peak’ mode. The dynamometer belt will then be wrapped around the distal shank at the level of the malleoli with the bed height and attached dynamometer belt being adjusted so that knee flexion angle is 30◦ and belt is perpendicular to shank. A goniometer measurement will ensure that the starting position is 30◦ knee extension.  On instruction, the athlete will attempt to maximally flex the knee which will be isometrically resisted by the main researcher for approximately 3s. This time will be monitored by the helper. The same test will be repeated 3 times with the maximum value being recorded.   1. Eccentric knee flexion:   With the patient lying prone on the ready prepared plinth, the dynamometer will be switched on and be ready to use in ‘compression peak’ mode. The dynamometer belt will then be wrapped around the distal shank in line with the malleoli.  The patients starting position will be 45◦ of knee flexion in prone, which will be measured by a helper whilst the main researcher maintains the dynamometer position as shown in the below picture. On instruction, the athlete will attempt to perform a maximal isometric contraction for approximately 2s and is then instructed to extend the shank through to the final position of 15◦ knee extension. During this motion, the dynamometer will be pulled eccentrically and move through approximately 30◦ of knee extension to the final position of 15◦ knee extension. The main researcher will take note of the final value and the same test will be repeated 3 times with the maximum value being recorded.      **Test time:5 -7 min for completion of all measures**  Neuromuscular Assessment: (**B**)  Official Testing Days:  Upon completion of neuromuscular assessment (**A**), participants will then be required to perform the thigh adductor squeeze test immediately after. Participants will be requested to lie in the supine position upon the provided plinth and the main researcher will facilaite placing the participant’s hips in the position of 45° hip flexion and knees at 90° of flexion. Both these angles will be measured by the main researcher using a goniometer. As discussed, this method used is adapted from the paper by Delahunt et al (2011) and is in line with best practice.  The sphygmomanometer will be pre-inflated to 20mmhg as outlined by Delahunt. Once the patient is comfortable and the researcher is ready, the sphygmomanometer cuff will be placed between the knees of the supine participant.  On instruction, the participant will be asked to squeeze the cuff as hard as they can. The main researcher will monitor the reading and record the value. The main researcher will then repeat the same test 3 times with the maximum value being recorded.  Test Time: 2 minutes  Blood Lactate ([BLa]) Analysis:  [BLa] will only be required to be taken once during both Prog A and Prog B, at 3 mins post completion of the running protocol.  Using the lactate analyser, participants will provide a 5µl capillary blood sample from a fingertip for analysis of blood lactate concentration ([BLa]). The suitability and reproducibility of this analyzer has been previously established throughout the physiological range of 1.0 – 18.0 mmol.L−1.    Test Time: 2 minutes  Rate of Perceived Exertion (RPE):  Participants will be asked to express their rate of perceived exertion at pre-determined times during the data collection days for A and B. These times are outlined below.  6-20 Scale RPE:  Prior to Warm Up  Post Warm Up  At active recovery walk (30s) on the 300m, 600m and 1200m and 1500m (completion) mark.  1-10 Session RPE:  15 minutes post completion of running protocol.  At completion, a team helper will then commence a stopwatch timer for the given participant. The participant will then undergo [BLa] assessment at 3 minutes post completion of the running program, and then neuromuscular assessment A and B immediately after. Session RPE will be asked for after both these are then complete.  GPS:  A single GPS unit will be used, with this aiding in minimising any inter-device reliability issues. Physical movement patterns during each running protocol will be measured using the GPS device. Measurements of distance, speed (peak and average), acceleration, and deceleration will be monitored and recorded via the manufacturer’s software on a laptop being operated by the GPS Co-ordinator. |
|  |

|  |
| --- |
| **Statistical Analysis:** |
| All data is to be assessed with both Microsoft Excel and SPSS so that data can be expressed in terms of standard deviation (SD) and means. The normality distribution of the data will be examined using an appropriate statistical test (Shapiro-Wilk) and homogeneity of variance will be verified using again an appropriate test (Levene test).  After confirming normal distribution, a paired t-test will likely be used to analyse the pre & post neuromuscular assessment findings along with heart rate and rate of perceived exertion responses.  A one-way analysis of variance (ANOVA) with repeated measures will then be used (likely) to compare all values obtained in the 2 running protocols (A) and (B) upon completion of (B) with statistical significance being set at p≤0.05. In addition an order of testing will also be assessed for, aiding the statistical analysis and discussion. |

**Word Count: 2944**

**Excluded from word count:**

|  |
| --- |
| **References:** |
| Abiss, C. R. & Laursen, P. B. (2005). Models to explain fatigue during prolonged endurance cycling. *Sports Medicine*, 35, 865–898.  Akenhead, R., French, D., Thompson, K. G., & Hayes, P.R. (2014). Physiological consequences of acceleration during shuttle running. International Journal of Sports Medicine,  Alaphilippe, A., Mandigout, S., Sébastien, R., Bonis, J., Courteix, D., & Duclos, M. (2012). Longitudinal follow up of biochemical markers of fatigue throughout a sporting season in young elite rugby players. *Journal of Strength & Conditioning Research*: 26, 12, 3376–3384.  Brooks, J.H.M., Fuller, C.W., Kemp, S.P.T., & Reddin, D.B. (2005). Epidemiology of injuries in English professional rugby union: part 2 training Injuries, *British Journal of Sports Medicine*, 39: 767-775  Buchheit, M., Bishop., D., Haydar, B., Nakamura, F.Y., & Ahmaidi, S. (2010). Physiological responses to shuttle repeated-sprint running, International Journal of Sports Medicine, 31: 402 – 409  Delahunt, E., Kennelly, C., McEntee, B.L., Coughlan, G.F., & Green, B.S. (2011). The thigh adductor squeeze test: 45 of hip flexion as the optimal test position for eliciting adductor muscle activity and maximum pressure values. *Manual Therapy*, 16: 476-480.    Dellal, A., Keller, D., Carling, C., Chaouachi, A., Wong, D., & Chamari, K. (2009). Physiological effects of directional changes in intermittent exercise in soccer players, *Journal of Strength & Conditioning Research*, 24, 12; 3219-3226.  Duthie, Pyne & Hooper, (2003). Applied physiology and game analysis of rugby union. *Sports Medicine*, 33: 973-991.  Duthie, Pyne, Marsh & Hooper, (2006). Sprint patterns in rugby union players during competition. *Journal of strength and conditioning research*, 20: 208 – 214.  Gamble, P. (2004). A skill-based conditioning games approach to metabolic conditioning for elite rugby football players. *Journal of Strength and Conditioning Research*, 18(3), 491-497.  Hader, K., Mendez-Villanueva, A., Ahmaisi, S., Williams, B. K., & Buchheit, M. (2014). Changes of direction during high-intensity intermittent runs: neuromuscular and metabolic responses, *BMC Sports Science, Medicine and Rehabilitation*, 6:2  Mitchell, M.L., & Jolley, J.M. (2009). Research Design Explained (7th Ed.). Belmont, CA: Wadsworth Cengage Learning  Sanna, G., & O’Connor, K.M. (2008). Fatigue related changes in stance leg. Clinical Biomechanics, 23, 7, 946–954.  Sirotic, A.C., and Coutts, A.J. (2007). Physiological and performance test correlates of prolonged, high intensity, intermittent running performance in moderately trained women team sport athletes. *Journal of Strength and Conditioning Research,* 21(1),138–144  Whiteley, R., Jacobsen, P., **x**  Phillip Jacobsen  [Search for articles by this author](http://www.jsams.org/action/doSearch?searchType=authorLookUp&author=Jacobsen,%20Phillip&prod=HA)  Affiliations   * Aspetar Orthopaedic and Sports Medicine Hospital, Qatar   Prior, S., **x**  Simon Prior  [Search for articles by this author](http://www.jsams.org/action/doSearch?searchType=authorLookUp&author=Prior,%20Simon&prod=HA)  Affiliations   * Aspetar Orthopaedic and Sports Medicine Hospital, Qatar   Skazalski, C., Otten, R., & Johnson, A (2012). Correlation of isokinetic and novel hand-held dynamometry measures of knee flexion and extension strength testing. *Journal of Science and Medicine in Sport*, 15, 444-450. |

**Word Count (References): 400 (& not included in previous word count)**

# 7.2 Project Milestones:

*List up to seven project milestones, ensuring each milestone is measurable. Use the table format provided to briefly show your work plan for achieving each project milestone. The work plan should include the actions, key performance indicators and deadlines for each milestone. Examples provided in red font may be used as a guide. Please overtype these examples with your own.*

*Please note: If your application receives funding from the PRF, this information will be the milestones and deadlines you report against for your progress and final reports to the PRF.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Milestone 1: Apply for ethics, Finalise protocols, Recruit trial staff. | | | | | | |
| Action (What will be done?) | | **Key Performance Indicator** (How will you determine if milestone has been achieved?) | | **Deadline** | | |
| Research Ethics Module Begins - | |  | | April 1st 2015 | | |
| Submit for ethical approval | | Submission of ethics forms via Bath University directed Moodle (Online Learning Environment)  Submission of ethics forms via University Technology, Sydney (via 3rd Supervisor) | | April 30th 2015 (latest) | | |
| Obtain ethical clearance | | Ethical approval letters received from; The University of Bath, UK and UTS, Sydney. | |  | | |
| Recruit project staff | | Confirm project staff (helpers) - (Helper #1, #2 & #3). | | After Ethics approved – as can then finalise dates to proceed | | |
| Finalise protocols | | Final versions of protocol to be approved by Lead Supervisor (Dr. Craig Twist) and Australian Based Supervisor (Prof. Aaron Coutts) – deliver feedback and refined work to PRF. | | Commence once ethics submitted - | | |
| Register trial | | Trial has been registered with ANZTCR (<http://www.anzctr.org.au>) | | Has been completed (24.3.15 (in appendix) | | |
| Milestone 2: Project introduction, Gain Volunteers, Musculoskeletal Screens Completed. (Assuming Ethics Approved) - | | | | |
| Action (What will be done?) | | **Key Performance Indicator** (How will you determine if milestone has been achieved?) | | **Deadline** |
| Project introduction presentation by lead researcher to the desired population (u20s playing group) | | Arrange date with club (after ethical approval) to gather u20s to discuss potential study (short presentation) | | Mid May |
| Request for volunteers | | Issue project information and written consent forms to the group after project introduction presentation. | | Mid May |
| Deadline for volunteer to 1st stage (Musculoskeletal Screen) | | Deadline on information and consent forms | | End May |
| Organise Musculoskeletal Screening for those who volunteer | | Completion of all Musculoskeletal Screening and compilation of results. | | Start June (complete in 2/3 days) |

|  |  |  |
| --- | --- | --- |
| Milestone 3: Confirm Volunteers, Distribute additional consent/confidentiality forms to those who meet eligibility, Schedule & host familiarisation day | | |
| Action (What will be done?) | **Key Performance Indicator** (How will you determine if milestone has been achieved?) | **Deadline** |
| Discuss MSK screening data to parent club and confirm those who meet eligibility for further participation | Schedule meeting with club head of performance to discuss MSK screening data and confirm those who meet eligibility for further participation | Start June |
| Contact eligible volunteers and send out further data protection/confidentiality/written consent forms for part 2 of the project (running of protocols). | Distribute additional information, data protection/confidentiality/written consent forms to those eligible. Set deadline to return all information. | Mid June |
| Schedule project familiarisation day (1/2 day) | Confirm date to host project familiarisation day (1/2 day) with club (facilities) and helpers (#1,#2, #3) | Mid June |
| Contact all remaining confirmed participants re. Confirmed date for project familiarisation day. | Send out all information to remaining confirmed participants on confirmed start times/dates/location of project familiarisation day. | Mid June |
| Host familiarisation day | Host familiarisation day | Mid-end June (End of Senior Club Season) |

|  |  |  |
| --- | --- | --- |
| Milestone 4: Data Collection | | |
| Action (What will be done?) | **Key Performance Indicator** (How will you determine if milestone has been achieved?) | **Deadline** |
| Schedule Data Collection day for Protocol A | Schedule ground facilities use with the club –  Confirmation from club for use of field allocation. | Start July |
| Complete Data Collection day for Protocol A | Project Data Collection (Protocol A) – Complete. | Start July |
| Schedule Neuromuscular marker follow up assessment at 48 hours post completion Protocol A | Lead Researcher to organise times for subjects and complete neuromuscular assessment (10 mins each participant) | Start July |
| Schedule Data Collection day for Protocol B | Schedule ground facilities use with the club – 8 days later  Confirmation from club for use of field allocation. | 8 days later (July) |
| Complete Data Collection day for Protocol B | Project Data Collection (Protocol B) – Complete. | -- |
| Schedule Neuromuscular marker follow up assessment at 48 hours post completion Protocol B | Lead Researcher to organise times for subjects and complete neuromuscular assessment (10 mins each participant) | -- |
| Data Collection Complete | Lead Researcher to alert PRF that data collection has been completed. | End of July (Latest) |

|  |  |  |
| --- | --- | --- |
| Milestone 5: Data Analysis and Formatting | | |
| Action (What will be done?) | **Key Performance Indicator** (How will you determine if milestone has been achieved?) | **Deadline** |
| Data analysis and compiling | Use GPS Helper to extract GPS data and compile all additional data into protected files (SPSS/Office Etc).  Arrange Skype sessions with lead researcher,  Exchange emails with all supervisors on progress and refine data analysis. | End August |

|  |  |  |
| --- | --- | --- |
| Milestone 6: Study Write Up | | |
| Action (What will be done?) | **Key Performance Indicator** (How will you determine if milestone has been achieved?) | **Deadline** |
| Study Write Up | Continue with writing the study up  Arrange Skype sessions with lead researcher,  Exchange emails with all supervisors on progress | End November |

|  |  |  |
| --- | --- | --- |
| Milestone 7: Research Submission to University. | | |
| Action (What will be done?) | **Key Performance Indicator** (How will you determine if milestone has been achieved?) | **Deadline** |
| Submit Final Research to the University of Bath | Submit Final Research to the University of Bath  Supply PRF with confirmation of submission | Mid December 2015 |
| Distribute final submission to supervisors. | Email final submissions to supervisors. | End Dec |
| Receive confirmation of results. | University to alert lead researcher of final results – Lead researcher can commence Dissemination. | Feb 2016 |

**8. Project budget:**

1. **– This is the ideal amount of funding being requested to enable the previously discussed project to be completed –**

|  |  |
| --- | --- |
| Items requested *(Personnel, equipment, travel related to data collection, consumables)*  *Refer to Guideline No 8, page 3* | **Amount requested**  **(Do not include GST)** |
|  |  |
| **Baseline© Push/Pull Dynamometer, Model 12-0343 500lb/225kg Digital** | **$1095**  **(via ‘ape medical’, Australia)** |
| **Lactate Pro Analyser 2** | **$764.10**  **(via ‘Cycle Classic Imports’, Australia)** |
| **Blood Lactate test strips (75)** | **$232.20** |
| **Blood Lactate Pro Analyser 2 USB Cable + Software** | **$90** |
| **1 x Catapult GPS Unit** | **$3800**  **(via ‘Catapult Sports’, Australia)** |
| **Research Helper Fees + Lead Researcher Time:**  **($20 p.hour x 5 hours p.day (2 days of trials (A and B)) x 4 personnel =** (helpers with these skills identified will need to take time off normal work positions) | **$800** |
|  |  |
| **IDEAL** | **Total: $6781.30** |

**(Budget Outline in Appendix 1)**

### (B) – If value (A) is not acceptable, the below equipment can be requested (pre-owned) and includes no payment for lead researcher or helpers during the project data collection days:

|  |  |
| --- | --- |
| Items requested *(Personnel, equipment, travel related to data collection, consumables)*  *Refer to Guideline No 8, page 3* | **Amount requested**  **(Do not include GST)** |
|  |  |
| **Baseline© Push/Pull Dynamometer, Model 12-0343 500lb/225kg Digital** | **$1095**  **(via ape medical, Australia)** |
| **Lactate Pro Analyser (version 1 – pre owned) (no longer making strips for version 1 from September 2016).** | **$424.50**  **(via Cycle Classic Imports, Australia)** |
| **Blood Lactate test strips (75)** | **$232.20** |
| **1 x Catapult S5 GPS Unit** | **$3800**  **(via Catapult, Australia)** |
|  |  |
|  | **Total: $5551.70** |

**(Budget Outline in Appendix 1)**

### (C) – If value (B) is not acceptable, I am happy to self-fund/request for assistance at various departments for the lactate analyser, and complete the project with no payment for lead researcher or helpers during the project data collection days. The below is simply then a request for the dynamometer and a GPS unit.

|  |  |
| --- | --- |
| Items requested *(Personnel, equipment, travel related to data collection, consumables)*  *Refer to Guideline No 8, page 3* | **Amount requested**  **(Do not include GST)** |
|  |  |
| **Baseline© Push/Pull Dynamometer, Model 12-0343 500lb/225kg Digital** | **$1095**  **(via ape medical, Australia)** |
| **Lactate Pro Analyser (version 1 – pre owned) (no longer making strips for version 1 from September 2016).** | **$424.50**  **(via Cycle Classic Imports, Australia)** |
| **Blood Lactate test strips (75)** | **$232.20** |
| **1 x Catapult S5 GPS Unit** | **$3800**  **(via Catapult, Australia)** |
|  |  |
|  | **Total: $5551.70** |

**(Budget Outline in Appendix 1)**

### 9. Research Record

# 9.1 Chief Investigator (Applicant):

# Mr. Liam James Robinson

Academic Achievement in Undergraduate/Postgraduate Studies *(Please attach a copy of most relevant transcript of results) – (Both in Appendix)*

* Included Undergraduate Transcript (BSc (Hons) Physiotherapy) (2008) (York, UK).
* Included up to Postgraduate Dip Sports Physiotherapy (2014) (Bath, UK).

Awards and Prizes *(list most relevant awards and prizes if any)*

|  |
| --- |
| Nil to Note. |

Previous Research Grants *(list ALL previous grants received and $ value if any)*

|  |
| --- |
| Nil Previous – First Applied For. |

Publications *(list 5 most relevant publications if any)*

|  |
| --- |
| Nil |

Conference Presentations and Posters *(list most relevant conference presentations and posters if any)*

|  |
| --- |
| Nil |

# 9.2 Associate Investigator 1 (Lead Supervising Investigator)

Dr.Craig Twist

Publications *(list 5 most relevant publications if any)*

|  |
| --- |
| 1. Ashton, R., & Twist, C. (2015). The number of directional changes alters the physiological, perceptual and neuromuscular responses of netball players during intermittent shuttle running. Journal of Strength and Conditioning Research. In Press. 2. Beaven, R., Highton, J., Thorpe, C., Knott, E. & Twist, C. (2014). The movement and physiological demands of international and regional men's touch rugby matches. Journal of Strength and Conditioning Research, 28, 3274-3279. 3. Twist, C., Highton, J., Waldron, M., Edwards, E., Austin, D., & Gabbett. (2014). Movement demands of elite rugby league players during Australian National Rugby League and European Super League matches. International Journal of Sports Physiology and Performance, 9, 925-930. 4. Twist, C., & Highton, M. (2013). Monitoring fatigue and recovery in rugby league players. International Journal of Sports Physiology and Performance, 8, 467-474. 5. Waldron, M., Highton, J., & Twist, C. (2013). The reliability of a rugby league movement simulation protocol (RLMSP-i) designed to replicate the performance of interchanged players. International Journal of Sports Physiology and Performance, 8, 483-489. |

Conference Presentations *(list 3 most relevant conference presentations if any)*

|  |
| --- |
| 1. Twist, C., Mullen, T., Waldron, M. & Highton, J. (2014). The influence of physical contact on the external and internal demands during simulated rugby league match play. 19th Annual Congress of the European College of Sport Science, Amsterdam, 1st -5th July. 2. Highton, J., Icke, R., MacNay, S., Waldron, M., & Twist, C. (2013). Fatigue and pacing strategies during a simulated rugby league match. 18th Annual Congress of the European College of Sport Science, Barcelona, 26th-29th June. 3. Highton, J., Waldron, M., Daniels, M., & Twist, C. (2012). Preliminary evidence of transient fatigue and pacing during interchanges in rugby league. 17th Annual Congress of the European College of Sport Science, Bruges, 4th-8th July. |

Previous Research Student Supervision Experience *(in no more than 200 words, describe your experience and outcomes of previous research student supervision)*

|  |
| --- |
| *I have supersede all of the following students to completion:*  Dave Sykes (PhD, University of Chester) - An analysis of the movement demands of rugby league and subsequent impact on player recovery. ***Co-supervisor***.  Christine Foster (MPhil, University of Chester) - The physiological demands of rugby league specific small-sided games. ***Principle supervisor***  Jamie Highton (PhD, University of Chester) - The effect of carbohydrate and protein ingestion on exercise-induced muscle damage and the recovery of dynamic muscle function and performance following intermittent high intensity exercise. ***Co-supervisor.***  Mark Waldron (PhD, University of Chester) - Profiling ‘real world’ performance characteristics of youth team rugby league players: Implications for talent identification and development. ***Co-supervisor.***  Robbie Connell (PhD, University of Chester) - A biomechanical analysis of upper-extremity plyometrics applied to the dynamics of sporting movements. ***Co-supervisor.***  Dean Burt (PhD, University of Chester) - The effects of exercise-induced muscle damage on endurance performance. ***Principle supervisor***  Samantha Moss (PhD, University of Chester) - The physical, physiological and performance characteristics of British youth handball players. ***Principle supervisor***    I have also supervised >20 MSc/MRes theses since 2007 |

Statement Addressing Plan and Commitment to Support and Develop Chief Investigator *(in no more than 200 words, describe you plan to develop research skills in the chief investigator and support them in conduct of the proposed research)*

|  |
| --- |
| My support for Liam will include feedback in relation to research design, test procedures and comments on draft chapters. These will be provided in written and oral formats via e-mail and Skype, respectively. My intention is to provide critical feedback and steering of the project to ensure the intended data are collected appropriately and within the required timeframe. Moreover, I will provide support and guidance for Liam with respect to the challenges that he faces with the collection of data in an applied setting. |

# 

# 9.3 Associate Investigator 2:

Dr. Keith Stokes

Publications *(list 5 most relevant publications if any)*

|  |
| --- |
| 1. Roberts, S. P., Trewartha, G., England, M., Shaddick, G. and Stokes, K. A. (2013). Epidemiology of time-loss injuries in English community-level rugby union. *BMJ Open*, 3 (11), e003998. 2. Roberts, S. P., Stokes, K. A., Trewartha, G., Hogben, P., Doyle, J. and Thompson, D. (2011). Effect of combined carbohydrate-protein ingestion on markers of recovery after simulated rugby union match-play. *Journal of Sports Sciences*, 29 (12), pp. 1253-1262. 3. Roberts, S., Stokes, K. A., Weston, L. and Trewartha, G. (2010). The Bath University rugby shuttle test (BURST) : A pilot study. *International Journal of Sports Physiology and Performance*, 5 (1), pp. 64-74. 4. Roberts, S. P., Trewartha, G., Higgitt, R. J., El-Abd, J. and Stokes, K. A. (2008). The physical demands of elite English rugby union. *Journal of Sports Sciences*, 26 (8), pp. 825-833. 5. Burton, D. A., Stokes, K. A. and Hall, G. M. (2004). Physiological effects of exercise. Continuing Education in Anaesthesia, *Critical Care & Pain*, 4, pp. 185-188. |

Conference Presentations: *(list 3 most relevant conference presentations if any)*

|  |
| --- |
| 1. Trewartha, G., Preatoni, E., Stokes, K. and England, M. H. (2011). Biomechanics of machine scrummaging : Biomechanics of the rugby scrum - Phase 1 report. Other. University of Bath. 2. Trewartha, G., Preatoni, E., Cazzola, D., Stokes, K. and England, M. H. (2013). Biomechanics of live scrummaging : Biomechanics of the rugby scrum - Phase 2 final report. Other. University of Bath. 3. Cazzola, D., Trewartha, G., Stokes, K., England, M., Wallbaum, A. and Preatoni, E. (2013). Measuring biomechanical stresses in machine and live scrummaging using CompactRIO and LabVIEW. National Instruments Case Study. |

# 9.4 Associate Investigator 3: (Australian Based).

Prof. Aaron Couuts

Publications *(list 5 most relevant publications if any)*

|  |
| --- |
| 1. Rampinini, E., Alberti, G., Fiorenza, M., Riggio, M., Sassi, R., Borges, T.O. & Coutts, A.J. 2015, 'Accuracy of GPS devices for measuring high-intensity running in field-based team sports.', Int J Sports Med, vol. 36, no. 1, pp. 49-53. 2. Kempton, T., Sirotic, A.C. & Coutts, A.J. 2015, 'An integrated analysis of match-related fatigue in professional rugby league.', J Sports Sci, vol. 33, no. 1, pp. 39-47. 3. Wallace, L.K., Slattery, K.M. & Coutts, A.J. 2014, 'A comparison of methods for quantifying training load: relationships between modelled and actual training responses.', Eur J Appl Physiol, vol. 114, no. 1, pp. 11-20. 4. Arruda, A.F., Carling, C., Zanetti, V., Aoki, M.S., Coutts, A.J. & Moreira, A. 2014, 'Effects of a Very Congested Match Schedule on Body Load Impacts, Accelerations, and Running Measures in Youth Soccer Players.', Int J Sports Physiol Perform. 5. McLean, B.D., Coutts, A.J., Kelly, V., McGuigan, M.R. & Cormack, S.J. 2010, 'Neuromuscular, endocrine, and perceptual fatigue responses during different length between-match microcycles in professional rugby league players.', Int J Sports Physiol Perform, vol. 5, no. 3, pp. 367-383. |

Conference Presentations *(list 3 most relevant conference presentations if any)*

|  |
| --- |
| 1. Coutts, A.J., Sirotic, A.C. & Knowles, H. 2006, 'Changes in match-specific sprinting performance in relation to training loads in elite rugby league players', Book of Abstracts - 11th Annual Congress of the European College of Sport Science, European College of Sport Science, Lausanne, Switzerland, pp. 102-103. 2. Coutts, A.J., Reaburn, P., Piva, T. & Murphy, A.J. 2005, 'Changes in muscular strength, power, endurance and biochemistry during deliberate overreaching and tapering in Rugby League players', Promoting Innovation, Measuring Success - Program & Abstracts of the 2005 Australian Conference of Science and Medicine in Sport, Sports Medicine Australia, Dickson, Australia, pp. 64-64. 3. Slattery, K.M., Wallace, L.K. & Coutts, A.J. 2005, 'Practical test for monitoring fatigue and recovery in triathletes', Promoting Innovation, Measuring Success - Program & Abstracts of the 2005 Australian Conference of Science and Medicine in Sport, Sports Medicine Australia, Dickson, Australia, pp. 171-171. |

**10. Project Workload**

*(Please demonstrate the capacity of the investigators to undertake the proposed research project in conjunction with other professional commitments).*

# 10.1 Chief Investigator (Applicant) Liam James Robinson

|  |  |
| --- | --- |
| *Average project hours per week for duration of project:*  8-10 *hours/week* | *Average project hours per week as percentage of investigator’s related EFT role:*  15% of [0.7] EFT role (Private Practice)  15% of [0.3] EFT role (Rugby Club) |

# 10.2 Associate Investigator 1 (Lead Supervising Investigator): Dr. Craig Twist

|  |  |
| --- | --- |
| *Average project hours per week for duration of project:* | *Average project hours per week as percentage of investigator’s related EFT role:* |
| *2 – 4 hours/week* | 10-15% of [1.0] EFT role |

# 10.3 Associate Investigator 2: Dr. Keith Stokes

|  |  |
| --- | --- |
| *Average project hours per week for duration of project* | *Average project hours per week as percentage of investigator’s related EFT role:* |
| *1 hours/week* | <5% of [1.0] EFT role |

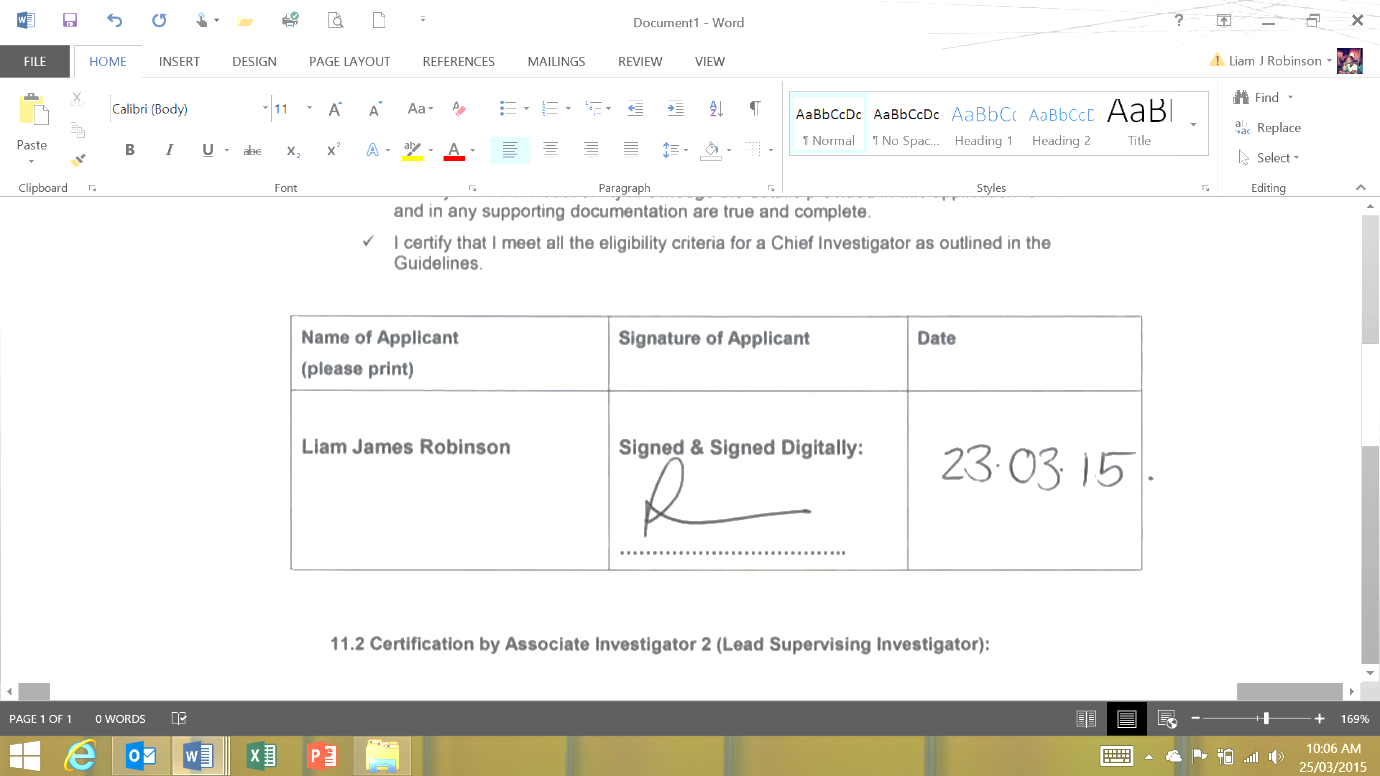
# 10.4 Associate Investigator 3: Prof. Aaron Couuts

|  |  |
| --- | --- |
| *Average project hours per week for duration of project* | *Average project hours per week as percentage of investigator’s related EFT role* |
| *1-2 hours/week as req.* | 5% of [0.6] EFT role  5% of [0.4] EFT role |

**11. Certifications**

**11.1 Certification by *Chief Investigator* (Applicant):**

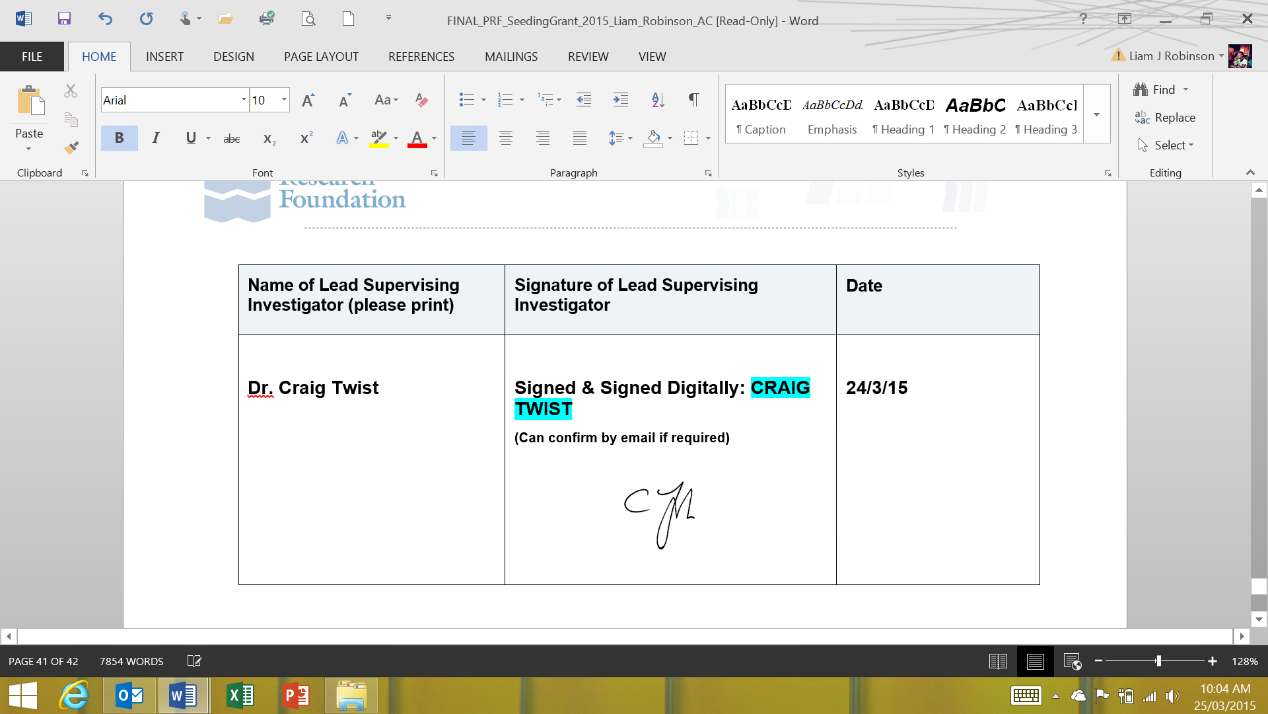
**Mr. Liam James Robinson**

* I certify that to the best of my knowledge the details provided in this application form and in any supporting documentation are true and complete.
* I certify that I meet all the eligibility criteria for a Chief Investigator as outlined in the Guidelines.

**11.2 Certification by *Associate Investigator 2* (Lead Supervising Investigator):**

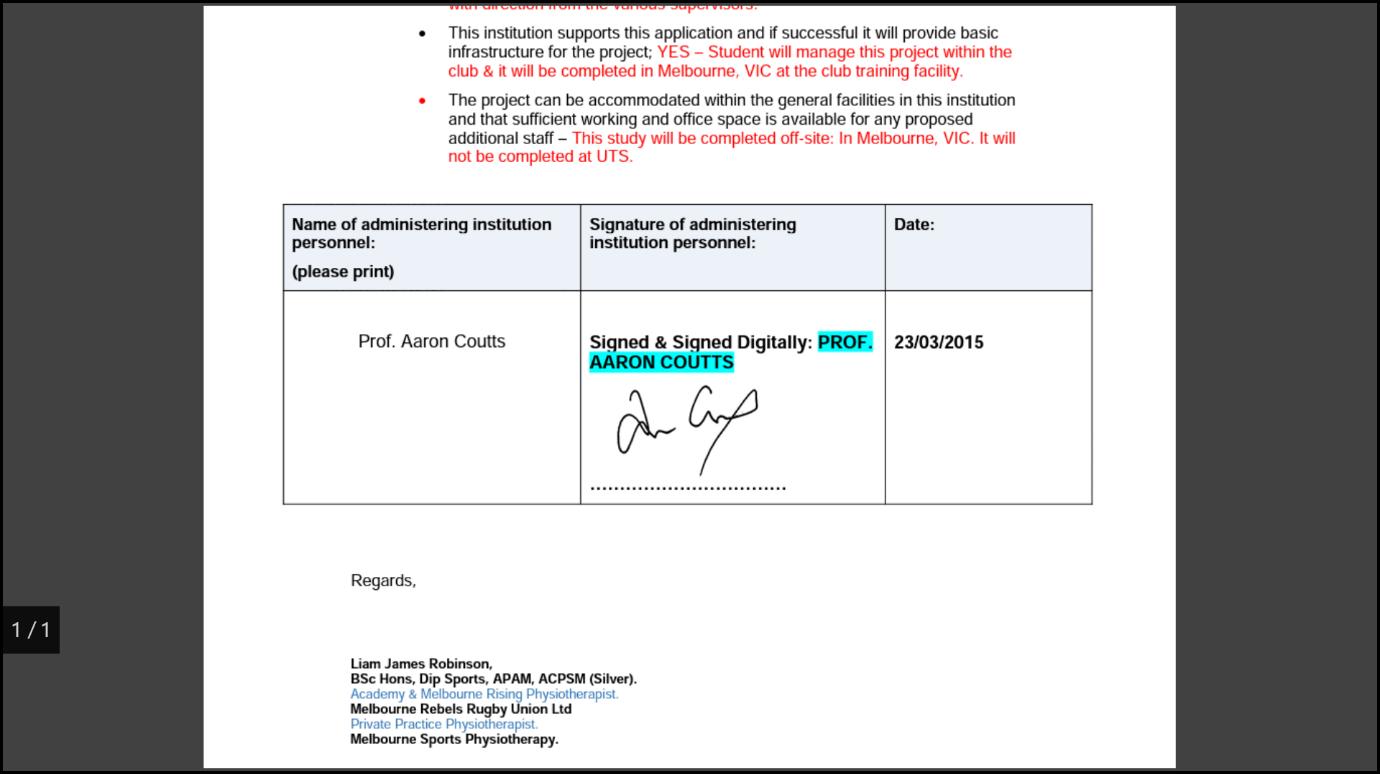
**Dr. Craig Twist**

* I certify that to the best of my knowledge the details provided in this application form and in any supporting documentation are true and complete.
* I certify that I will commit to the proposed support and development measures outlined in section 9.2 of this application.

****

**11.3 Certification by the *administering institution personnel*:**

Prof. Aaron Coutts

* I certify that: **YES**
* I am prepared to have the project carried out in my institution under the circumstances set out by the applicant(s) - This study will be completed off-site: In Melbourne, VIC, by the Individual and supported here in Australia by me, Aaron Coutts as a project supervisor.
* To the best of my knowledge all details on this application form are true and complete; YES
* The amount of time which the investigator/s will be devoting to the project is appropriate to existing workloads; YES – This Student will manage the project with direction from the various supervisors. Prof Aaron Couuts will also be in Melbourne at times and will meet with the student during the time of the project.
* This institution supports this application and if successful it will provide basic infrastructure for the project; YES – Student will manage this project within the club (Melbourne) and supervisors will oversee it (externally). Will be completed in Melbourne, VIC at the club training facility. UTS HRECs is being applied for in further support.
* The project can be accommodated within the general facilities in this institution and that sufficient working and office space is available for any proposed additional staff – This study will be completed off-site: In Melbourne, VIC. It will not be completed at UTS but supported by UTS. This can be completed off-site.

Regards,

**Liam James Robinson,**

**BSc Hons, Dip Sports, APAM, ACPSM (Silver).**

Academy & Melbourne Rising Physiotherapist.

**Melbourne Rebels Rugby Union Ltd**

Private Practice Physiotherapist.

**Melbourne Sports Physiotherapy.**

M: 0413 034 270

E: [liam.james.robinson@gmail.com](mailto:liam.james.robinson@gmail.com)

W: [www.melbournesportsphysiotherapy.com.au](http://www.melbournesportsphysiotherapy.com.au)