

Sarah Clarke (*nee Breen*) PhD. BSc. CSCS. (Hons)

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1.0 CURRENT EMPLOYMENT

August 2016 - present	Assistant Professor , Biomechanics, School of Health & Human Performance, Northern Michigan University (NMU), Marquette, MI.
Sept 2013 - 2016	Senior Lecturer , Biomechanics, School of Sport, Carnegie Faculty, Leeds Beckett University (LBU), Headingley Campus, Leeds, United Kingdom
Aug 2012-May 2013	Assistant Professor , Biomechanics, Department of Health, Physical Education and Recreation, Northern Michigan University (NMU), Marquette, MI.
Jan 2012-Aug 2012	Lecturer , Biomechanics and Performance Analysis, Department of Physical Education and Sport and Exercise Sciences, University of Limerick (UL)
Sept 2008-Jan 2012	Lab Tutor/ Instructor , Sport and Exercise Sciences, Department of Physical Education and Sport and Exercise Sciences, University of Limerick (UL)

2.0 EDUCATION

PgC	2015	<u>Academic Practice</u> Leeds Beckett University. Accredited Fellow of the Higher Education Academy .
PhD	2012	<u>Sport Injury Biomechanics</u> University of Limerick. Thesis Title: <i>Lower limb kinematics, kinetics and coordination during a land and cut task; the role of gender and previous ACL injury</i> . Supervisors: Dr Drew Harrison & Dr Ian Kenny
BSc.	2008	<u>Sport and Exercise Sciences</u> (1 st Class Honours). University of Limerick.

3.0 TEACHING EXPERIENCE & RESPONSIBILITIES

3.1 August/2016- Present: Assistant Professor in Sport & Exercise Science, NMU

- Coordination and delivery of theoretical and practical content in courses on the Sport Science, Exercise Science and Athletic Training programmes:

Undergraduate Classes/Modules/Courses delivered include:

- o ES417 - Biomechanics (Undergraduate), Face-to-Face and Online.

Undergraduate & Postgraduate Classes/Modules/Courses delivered include:

- o ES422 - Sports Biomechanics
- o ES476 - Exercise & Fitness for Special Populations
- o ES475 - Theory of Strength & Conditioning
- o ES495A - Performance Analysis for Sport

Postgraduate only Classes/Modules/Courses delivered include:

- o ES571F - Lab Procedures - Force Measurement, Electromyography & Video Analysis
- o ES501 - Communication in Exercise Science
- o ES540 - Advanced Mechanical Kinesiology (Graduate Problem Based Learning Course)

- Research Supervision:

Experiences involve directing and reading MSc Research Thesis projects and undergraduate directed study projects. Please see section 5.1 for further details.

3.2 August/2013- Present: Senior Lecturer in Sport & Exercise Biomechanics, LBU

- Teaching responsibilities span across a range of degree programs including Sport & Exercise Science (SPEX), Physical Education (PE), Sport Physical Activity and Health (SPAH) and Sport & Exercise Therapy (SET) Programme.

Undergraduate Classes/Modules/Courses delivered include:

- o Scientific Foundations of Human Movement (Undergraduate),
- o Biomechanical Analysis of Human Performance (Undergraduate)
- o Fundamentals of Biomechanics & Anatomy (Undergraduate SPEX + SET)
- o Science of Physical Activity & Health for Adults (Undergraduate SPAH)
- o Science of Physical Activity & Health for Children & Young People (Undergraduate SPAH)
- o Obesity Management (Undergraduate SPEX, SET + SPAH)
- o Professional Development (Undergraduate SPEX + SPAH)
- o Performance in Extreme Environments (Undergraduate SPEX + PE)

Postgraduate Classes/Modules/Courses delivered include:

- o Biomechanics of Human Performance (Postgraduate)
- o Research & Professional Practice (Postgraduate)

- Research Supervision:

Experiences involve supervising undergraduate and Master's Dissertation / Research Thesis projects demonstrating a strong ability to oversee and facilitate in both undergraduate and postgraduate capacities. Please see section 5.1 for further details.

3.2 August/2012- May/2013: Assistant Professor in Sport & Exercise Biomechanics, NMU

- Coordination and delivery of theoretical and practical content in courses on the Sport Science, Exercise Science and Physical Education programmes:

Undergraduate Classes/Modules/Courses delivered include:

- o PE212 - Anatomical Assessment of Human Motion (Undergraduate)
- o ES417 - Biomechanics (Undergraduate)

Undergraduate & Postgraduate Classes/Modules/Courses delivered include:

- o ES571F - Lab Procedures - Force Measurement (Undergraduate and Graduate)
- o ES495A - Performance Analysis for Team Sports (Undergraduate and Graduate)
- o ES422 - Sports Biomechanics (Undergraduate and Graduate)

Postgraduate only Classes/Modules/Courses delivered include:

- o ES540 - Advanced Mechanical Kinesiology (Graduate)

3.3 January/2012 - August/2012: Lecturer Biomechanics and Performance Analysis, UL

- Planning, coordination and delivery of both theoretical and practical content on the "Team Sports Video & Performance Analysis" course on the Sport and Performance Graduate program:

- Also deliver practical and theoretical content in other courses on the Sport and Performance Graduate program:
 - Strength Sports
 - Speed Sports
 - Endurance Sports
 - Professional Competences, Problem Based learning
- Supervision of undergraduate and postgraduate thesis research projects - supporting my supervisory development.

3.4 September/2008 - January/2012: Lab Tutor / Instructor Sport and Exercise Sciences, UL

- Teaching Responsibilities on the Sport and Exercise Sciences and Physical Education undergraduate programmes:
 - Introduction to Physiology
 - Coaching Science 1 (Track & Field)
 - Exercise to Music (Aerobics)
 - Motor Development Psychology
 - Sports Injury
 - Qualitative Biomechanics
 - Quantitative Biomechanical Analysis
 - Nutrition and Exercise Metabolism
 - Novel Methods in Biomechanics

4.0 UNIVERSITY SERVICE/ADMINISTRATION

2017-present	Committee on Elections and Committees	Review applications and elect faculty onto cross campus committees	
2016-present	Starfish Functional/ Implementation Team	Faculty advisor for the implementation of a new advising software across campus	NMU
2016-present	Institutional Review Board	Review ethical aspects of research applications	NMU
2016	Periodic Review	Review of current curriculum for refocus in 2017	LBU
2013-2016	PhD Interim Assessment	Assess PhD students in a preliminary viva to ensure work is at a doctoral level.	LBU
2013-2016	Program Marketing	Presentations / demonstrations at undergraduate and postgraduate open days (marketing events to promote our programs)	LBU
2013-2016	Advising	n=40 undergraduate students per year	LBU
2014-2016	Program Leadership	Coordinate aspects of the undergraduate Sport Physical Activity and Health Programme	LBU
2015	New Course Development	Member of course design committee for Masters in Physical Activity & Health	LBU
2013-2015	Biomechanics Discipline Coordinator	Lead group meetings and coordinate discussion and group activities in areas such as thesis allocation /marking, curriculum review /development and research activities.	LBU
2014	Field Trip Leadership	Provide local leadership on week long residential trip with Freshman Students	LBU
2014	Conference Organizer	Designed to Move Conference 2015 , Leeds UK	LBU
2013-2014	Masters Thesis Committee	External Reviewer on two masters research students: Waterford Institute of Technology, Ireland	
2014-present	Masters Thesis Committee	Cale Anderson	NMU
2012-2013	Faculty Advisor	Student Association for Sport Sciences	NMU
2012-2013	Program Marketing	Presentations / demonstrations at Wildcat Weekend and facilitation of campus visits	
2011	New Course Development	Member of course design committee for Masters in Sports Performance	UL
2008-2012	Research Ethics Committee	Postgraduate Representative	UL

5.0 RESEARCH INTERESTS:

Biomechanical concepts in Anterior Cruciate Ligament Injury specifically risk factors, compensations post-surgery and the role of movement and coordination variability; biomechanics of running form/technique in various footwear and also during ultra-endurance races; changes in balance and coordination with altitude.

5.1 RESEARCH STUDENT SUPERVISION

I have supervised undergraduate and postgraduate dissertations across three universities and I also currently have one PhD student. Further details on these research students are detailed below.

	Research Supervision	Thesis Examination	Publications
LBU	n=18 undergraduate n=2 postgraduate n=1 doctoral	n=18 undergraduate n=2 MSc n=2 PhD (<i>interimassessment</i>)	Mc Cann et al., (2015)
NMU	n = 2 undergraduate	n=3 MSc (<i>thesiscommittee</i>) n=4 MSc (<i>thesis director</i>)	Anderson et al. (2014)
UL	n=2 undergraduate n=2 masters	n=2 BSc n=2 MSc	

5.2 SELECTED JOURNAL ARTICLES [Full list of publications available [here](#)]:

- 2018 Clarke S.B., Deighton K, Newman C, Nicholson G, Gallagher L, Boos CJ, et al. (2018) Changes in balance and joint position sense during a 12-day high altitude trek: The British Services Dhaulagiri medical research expedition. PLoS ONE 13(1): e0190919.
<https://doi.org/10.1371/journal.pone.0190919>
- 2017 Matu, J., O'Hara, J., Hill, N., Clarke, S.B., Boos, C., Newman, C., Holdsworth, D., Ispoglou, T., Duckworth, L., Woods, D., Mellor, A., & Deighton, K. (2017) Changes in appetite, energy intake, body composition and circulating ghrelin constituents during an incremental trekking ascent to high altitude. *European Journal of Applied Physiology*, 117(9), 1917-1928. [\[available here\]](#)
- 2017 Mellor, A., Bakker-Dyos, J., Howard, M., Boos, C., Cooke, M., Vincent, E., Scott, P., O'Hara, J., Clarke, S.B., Barlow, M., Matu, J., Deighton, K., Newman, C., Cruttenden, R., Holdsworth, D., & Woods, D. (2017) British Services Dhaulagiri Medical Research Expedition; A unique military/civilian research collaboration. *Journal of the Royal Army Medical Corps*. (in press) [\[available here\]](#)
- 2017 Boos, C., Vincent, E., Mellor, A., Woods, D., Newman, C., Cruttenden, R., Barlow, M., Cooke, M., Deighton, K., Scott, P., Clarke, S.B., O'Hara, J., (2017) 'The effect of High Altitude on Central blood pressure and arterial stiffness.' *Journal of Human Hypertension*. (in press). [\[available here\]](#)
- 2017 Clarke, S.B., Deighton, K., Newman, C., Boos, C., Woods, D., Mellor, A., Nicholson, G., & O'Hara, J. (2017) Changes in balance and joint position sense during a 12-day high altitude trek: the British Services Dhaulagiri Medical Research Expedition. PlosOne [under review]
- 2016 Clarke, S. B., Stephenson M. L., Jensen R. L. and Drum S. N. 'CHANGES IN RUNNING GAIT PARAMETERS DURING A 161 KM TRAIL RACE' *Journal of Sport & Health Science* [in preparation for submission].
- 2016 Francis, P., and Ledingham, J., and Clarke, S. B., and Collins, D. J., and Jakeman, P., (2016) A COMPARISON OF STRIDE LENGTH AND LOWER EXTREMITY KINEMATICS DURING BAREFOOT AND SHOD RUNNING IN WELL TRAINED DISTANCE RUNNERS. *Journal of Sports Science and Medicine*. 15, 417-423 ISSN 1303-2968 (Published Ahead of Print) [\[available here\]](#)
- 2015 Clarke, S. B., Kenny, I. C., & Harrison, A. J. (2015). Dynamic knee joint mechanics after anterior cruciate ligament reconstruction. *Medicine and science in sports and exercise*, 47(1), 120-127. [\[available here\]](#)
- 2011 Kloyiam, S., Breen S., Jakeman, P., Conway, J., Hutzler, Y., 'Soccer-specific endurance and running economy in soccer players with cerebral palsy' *Adapted Physical Activity Quarterly*, October 2011; 28(4): 354-67. [\[availablehere\]](#)
- 2011 Breen, S., Kenny, I. C., & Harrison, A. J. (2011) Joint kinematics of landing in ACL rehabilitated volunteers, *Portuguese Journal of Sport Sciences*, 11 (Suppl. 2), 635-638. [\[available here\]](#)

5.3 SELECTED CONFERENCE PUBLICATIONS [Full list of publications available [here](#)]:

* - poster presentation, ** - oral presentation (student name underlined)

- 2017 Clarke, S.B., ** Deighton, K., Newman, C., Boos, C., Woods, D., Mellor, A., Nicholson, G., & O'Hara, J. (2017) Changes In Balance And Joint Position Sense During A 12-day High Altitude Trek. *International Society of Biomechanics Conference Proceedings*, 34(1), (pp. In press)

- 2017 Walker, J.,** Clarke, S. B., and Jensen, R. L., (2017) The Comparison Of Knee Joint Kinematics Between Two Types Of Stop Jump. International Society of Biomechanics Conference Proceedings, 34(1), (pp. In press)
- 2017 Jensen, R. L.*, Szuba, D. P., Meidinger, R., Clark, M., and Clarke, S. B., (2017) Effects Of The Speedmaker Device On Muscle Activity And Vertical Jump Performance. International Society of Biomechanics Conference Proceedings, 34(1), (pp. In press)
- 2015 Clarke, S. B.*, Kenny, I. C., Harrison, A. J., 'THE ROLE OF PREVIOUS ANTERIOR CRUCIATE LIGAMENT INJURY ON THE VARIABILITY OF JOINT KINEMATICS AND COORDINATION DURING A MATCH SPECIFIC LAND-CUT TASK' Arthritis Research UK Centre for Sport, Exercise and Osteoarthritis Conference: Physical Activity and Osteoarthritis, Loughborough, UK, December 2015. [\[available here\]](#)
- 2015 Clarke, S. B.** , Kenny, I. C., Harrison, A. J., 'The role of gender on the variability of joint kinematics and kinetics in uninjured athletes during a match specific land-cut task' Congress of the International Society of Biomechanics, Glasgow, UK, July 2015. [\[available here\]](#)
- 2015 McCann, C.** , Clarke, S. B., 'THE ACUTE EFFECTS OF THE PREVENT INJURY ENHANCE PERFORMANCE PROGRAMME (PEP) ON ACL INJURY RISK FACTORS' XXXI International Symposium on Biomechanics in Sports, Poitiers, France, June 2015. [\[available here\]](#)
- 2015 Cousineau, S. A.*, Clarke, S. B., Guseman, E. H., Drum, S. N., 'FACTORS ASSOCIATED WITH NCAA DIVISION I CROSS -COUNTRY TEAM RANKINGS' 2015 RMACSM Meeting, Denver, USA, March 2015 [\[available here p.8\]](#)
- 2014 Anderson, C.** , Breen, S. and Jensen, R. L., 'COMPARISON OF KINEMATICS AND ACCURACY OF OVERHAND AMERICAN FOOTBALL THROWING' LXIII International Symposium on Biomechanics in Sports, Tennessee, Usa, July 2014. [\[available here\]](#)
- 2014 Breen, S.** , Stephenson, M. L., Jensen, R. L. and Drum, S. N. 'CHANGES IN RUNNING GAIT PARAMETERS DURING A 161 KM TRAIL RACE' LXIII International Symposium on Biomechanics in Sports, Tennessee, Usa, July 2014. [\[available here\]](#)
- 2013 Kenny, I. K.*, Madden, D., Downey, J., Murray, P., Campbell, J., and Breen, S., (2013) BIOMECHANICAL MODELLING OF LEG MOVEMENT FOLLOWING KNEE SURGERY. In: University Hospital Limerick Research Symposium 2013, October 18, 2013, University of Limerick, Ireland. [\[available here\]](#)
- 2012 Breen, S.** , Kenny, I. C., Harrison, A. J., 'THE ROLE OF PREVIOUS ANTERIOR CRUCIATE LIGAMENT INJURY ON THE VARIABILITY OF JOINT KINEMATICS AND COORDINATION DURING A MATCH SPECIFIC LAND-CUT TASK' XXX International Symposium on Biomechanics in Sports, Melbourne, Australia, July 2012. (NIA Finalist, 2nd place) [\[available here\]](#)
- 2009 Breen, S.** , and Hanlon, M., 'A COMPARISON OF VARIABILITY IN GROUND REACTION FORCE AND KNEE ANGLE PATTERNS BETWEEN MALE AND FEMALE ATHLETES' XXVII International Symposium on Biomechanics in Sports. Limerick, Ireland, August 2009. [\[available here\]](#)

2008 Anderson R.**, Breen S. and Tucker C., 'MOVEMENT VARIABILITY: A COMPARISON BETWEEN NOVICE, EXPERIENCED AND ELITE PERFORMERS' XXVI International Symposium on Biomechanics in Sports. Seoul, Korea, July 2008. [\[available here\]](#)

5.4 PUBLICATIONS IN PROGRESS

- O Sullivan, I. J. Johnson, M. I., Hind, K. Clarke, S. B. Francis, P. F., 'Are changes in running economy associated with changes in performance in runners? A systematic review.' *Sports Medicine* [under review]
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- Clarke, S. B., Kenny, I. C., Harrison, A. J., 'THE ROLE OF GENDER ON THE VARIABILITY OF JOINT KINEMATICS, KINETICS AND COORDINATION DURING A MATCH SPECIFIC LAND-CUT TASK' *Journal of Applied Biomechanics* [In preparation for re-submission]
- Clarke, S. B., Kenny, I. C., Harrison, A. J., 'THE ROLE OF PREVIOUS ANTERIOR CRUCIATE LIGAMENT INJURY ON THE VARIABILITY OF JOINT KINEMATICS, KINETICS AND COORDINATION DURING A MATCH SPECIFIC LAND-CUT TASK' *American Journal of Sports Medicine*.
- Palmer, D., Clarke, S. B., 'THE EFFECT OF AN INJURY PREVENTION TRAINING ON ANTERIOR CRUCIATE LIGAMENT INJURY RISK FACTORS IN MALE UNIVERSITY LACROSSE PLAYERS' *Journal of Strength & Conditioning Research*.
- Clarke, S. B., Tucker, C. B., Judson, L. J., Gregg, E. L., and Bissas A. 'LOWER LIMB ASYMMETRY IS LINKED WITH A FALL RISK IN OLDER ADULTS' *Journal of Physical Activity and Aging*].

5.5 NOTEWORTHY COLLABORATIONS AND ONGOING PROJECTS:

2015-2016	British Ministry of Defence, UK	Biomechanical changes in walking gait and balance during a mountain expedition at altitude <ul style="list-style-type: none"> ● Ethical approval granted ● Internal Funding Granted ● External Funding Pending ● Data collected April-May 2016 <ul style="list-style-type: none"> ○ Sarah traveled to Nepal with the trekking team to collect the data in the field
2015-2016	Dr Erich Petushek, Michigan State University, USA Dr Chris Richter, Sport Surgery Clinic, Ireland Reeves Weedon, PGA Pro, Harstbourne Country Club	Biomechanical comparison of various golf swing techniques: Potential implications for lower back injury risk <ul style="list-style-type: none"> ● Ethical approval granted ● Data collected (June 2015) ● Publications Expected August 2016
2015-2016	Prof. John Buckley, University Centre Shrewsbury, UK	Rate of muscle fatigue in office workers in different standing postures <ul style="list-style-type: none"> ● Ethical approval granted ● Data collection underway

5.6 RESEARCH FUNDING

EXTERNAL RESEARCH GRANTS [awarded ~\$82,000]

2017	\$25,430	The Research Council of Norway Development of a test to measure knowledge on strength training exercises, with involvement from the world's foremost experts	CO-APPLICANT
2017	\$20,000	NMU Prime Award	LEAD APPLICANT
2017	\$7,510	Super Health Foundation Both Awarded to investigate "Talking the Talk on Walking the walk: A novel training intervention and practitioner education program to improve walking performance and patient care in persons with Multiple Sclerosis	LEAD APPLICANT
2017	\$2,000 [awarded]	ISBS Student Internship Grant Awarded to investigate "Biomechanical adaptations to an implemented ramp angle in recreational alpine skiers" in collaboration with the University of Salzburg	CO-APPLICANT
2017	\$1,000 [awarded]	ISBS Student Mini-Research Grant Awarded to Stephanie Moore to investigate "Biomechanical adaptations to an implemented ramp angle in recreational alpine skiers" in collaboration with the University of Salzburg	Student Supervisor
2015	\$6,000 [un-successful]	Peter Hackett-Paul Auerbach Young Investigator Grant -- Wilderness Medical Society For project entitled "Biomechanical changes in walking gait and balance during a mountain expedition at altitude"	LEAD APPLICANT
2015	\$4,253,300 [pending]	Horizon 2020 Proposal "Frailty and Falls: early detection and intervention using Stochastic Resonance"	CO-APPLICANT Component \$390,189
2014	\$346,670 [un-successful]	Health Research Board Ireland "Medial Leg Functional Biomechanics Following Traditional and Kinematically Aligned Total Knee Replacement"	CO-APPLICANT
2008	\$82,000 [awarded]	Irish Research Council for Science Engineering and Technology, for the completion my PhD research	LEAD APPLICANT

INTERNAL RESEARCH GRANTS [awarded ~\$12,840]

2017	\$51,040 [awarded]	Capital Equipment Replacement Program, NMU. For upgrade of motion analysis and EMG systems.	CO-APPLICANT
2015	\$4990 [awarded]	Carneige Research Fund, LBU. For project entitled "Biomechanical changes in walking gait and balance during a mountain expedition at altitude"	LEAD APPLICANT
2015	\$1425 [awarded]	Carneige Research Fund, Leeds Beckett University. For project entitled "Assessment of injury risk in gymnastics landings. A multidisciplinary approach to athlete performance and coaching process."	CO-APPLICANT
2014	\$1425 [awarded]	Carneige Research Fund, Leeds Beckett University. For project entitled "Assessment of strength and functional movement	LEAD APPLICANT

tasks in older adults” .

2013 \$5,000
[awarded]

Professional Development Grant - College of Professional Studies, NMU. For project entitled “Changes in running gait parameters during a 116 km trail race”

CO-APPLICANT

AWARDS [awarded ~\$1090]

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|------|-------|--|
| 2012 | \$545 | International Society of Biomechanics in Sport New investigator award |
| 2014 | \$545 | Best Poster presentation in 'Lifestyle & Health' category at the University of Limerick Hospitals Research Symposium October |

5.7 REVIEWING EXPERIENCES [tracked on [publons profile](#)]:

- Journal of Sports Biomechanics 2013 -Present.
- Medicine & Science in Sports & Exercise 2013 -Present.
- American Journal of Sports Medicine 2014 -Present.
- Journal of Applied Biomechanics 2015-Present
- Journal of Strength & Conditioning Research 2015 -Present
- Journal of Sport Sciences 2015- Present
- Journal of Sport & Health Science 2015 - Present
- Orthopaedic Journal of Sports Medicine 2016 -Present
- Member of Scientific Committee - 33rd and 34th International Conference in Biomechanics in Sport (2015-2016)

6.0 PROFESSIONAL MEMBERSHIP / CERTIFICATION/AFFILIATIONS

- International Society of Biomechanics in Sport - [Vice President of Publications](#)
- National Strength & Conditioning Association - Certified Strength & Conditioning Specialist
- International Society Performance Analysis in Sport - Level 3 Scientific Accredited Performance Analysis

7.0 SKILLS & ATTRIBUTES

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|----------------------------------|---|
| ● Scientific writing and editing | ● Motion Analysis - 2D & 3D & High Speed |
| ● Team player & Collaborator | ● EMG & Force Plates |
| ● Work on own initiative | ● Isokinetic Dynamometry |
| ● Motivation (Self and Others) | ● Biomechanical Modelling |
| ● IT Literate | ● LabVIEW & Matlab |
| ● Flexibility | ● Pastoral Care and Mentor-ship |
| ● Positivity | ● Traditional and Innovative Teaching Methods |

8.0 MEDIA COVERAGE

APRIL 2016	BBC Look North	https://youtu.be/ZqZPsA3IN6o
MARCH 2015	Yorkshire Evening Post	STUDY SHOWS KNEE ISSUES CARRY BIG LONG TERM RISK
APRIL 2015	British Journal of Hospital Medicine, Vol.76(4) p.189	MOVEMENT DIFFERENCES ASSESSED IN ATHLETES POST-KNEE LIGAMENT RECONSTRUCTION SURGERY

9.0 HOBBIES / INTERESTS

When at home in Ireland I played the [Gaelic Games](#) both ladies football and camogie. I have also been involved in coaching these games at an underage level. I continue to enjoy being active and have completed various marathons, half marathons and adventure races. I tend to adapt to my environment and enjoyed trail running and cross country skiing whilst living in Marquette Michigan, when I lived in Yorkshire I enjoyed getting outdoors and running or walking on the [moors](#) with my two dogs. I also enjoy volunteering in the community and have given up my time to a number of animal rescue charities and local community organizations for older people.