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PRINCIPAL INVESTIGATOR: Stephen P. Messier, Ph.D.

CONTRACTING ORGANIZATION: Wake Forest University
Winston-Salem, NC 27109

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The Runners And Injury Longitudinal Study: Injury Recovery Supplement (TRAILS_IR)

Stephen P. Messier, Ph.D., Edward Ip, Ph.D., Paul DeVita, Ph.D., Shannon Mihalko, Ph.D., Wayne Cannon, P.T., ATC; Joseph F. Seay, Ph.D., David F. Martin, M.D.

E-Mail: messier@wfu.edu

Wake Forest University
Winston-Salem, NC 27109

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14. ABSTRACT
The Runners And Injury Longitudinal Study (TRAILS) is an ongoing two year prospective observational study funded through the USAMRMC Broad Agency Announcement mechanism (W81XWH-10-1-0455). It is designed to compare runners who sustain an overuse running injury during the observational period to those who remain injury-free on a discrete set of behavioral, physiological, and biomechanical variables. The proposed supplement will focus on injury recovery (TRAILS: Injury Recovery Supplement). It will enhance the parent project (TRAILS) by determining if the severity of an overuse running injury affects the duration of recovery (i.e., return to pre-injury weekly mileage), the magnitude of chronic changes in strength and gait mechanics that could be risk factors for early-onset osteoarthritis and mobility disability, and the association of injury severity with psychological well-being and pain. We plan to add 100 non-injured runners to our cohort of 200 runners that are enrolled in the parent grant (TRAILS). This will enhance the power of our aims for TRAILS and increase the number of potential injured runners to follow in our proposed Injury Recovery Supplement from 90 to 140. Our primary hypothesis is there will be significant direct relationships between the severity of overuse running injury and the magnitude of the change in strength, lower extremity joint loads, and psychological well-being from pre-injury levels despite a return to pre-injury training mileage. Determining whether the effects of a significant overuse injury are evident after the symptoms subside has important potential public health implications. It will inform whether a return to pre-injury activity is appropriate, if further treatment is required, and whether the injured runner exhibits chronic biomechanical and strength abnormalities that increase the risk of lower extremity osteoarthritis, and disability later in life. Combined, TRAILS and the TRAILS: Injury Recovery Supplement will (1) inform as to what variables distinguish runners who sustain an overuse running injury from those who remain injury free, (2) develop statistical models that integrate biomechanical, behavioral, and psychological risk factors for injury, (3) determine the length of time required for recovery from mild, moderate, and severe overuse injuries, (4) document rehabilitation methods used during recovery, (5) identify potential chronic deficits in muscle strength and gait that persist after regular training mileage has been resumed and thus identify a potential mechanism for long term mobility disability, and (6) examine the influence of injury severity and length of recovery on psychological well-being and pain.

15. SUBJECT TERMS
Running, overuse injury, anterior knee pain, biomechanical, behavioral, physiological

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Introduction

Little is known regarding the length of time required to recover from an overuse injury, defined by a return to pre-injury weekly mileage, and the relationships among the magnitude of injury severity and chronic effects on strength, running mechanics and psychological well-being. Further, there are no data indicating whether improvements in behavioral outcomes during the recovery period are accompanied by a return to pre-injury gait mechanics, muscle strength, and well-being or whether improvements in gait, strength, and well-being lag behind a return to pre-injury training mileage. Permanent changes in gait mechanics and strength could cause chronic overloading of lower extremity joints and surrounding soft tissue resulting in early onset osteoarthritis and mobility disability. For example, post-traumatic osteoarthritis due to meniscal or ACL injury develops 10-20 years earlier than idiopathic or primary osteoarthritis. Whether chronic overuse soft tissue running injuries have similar effects is unknown. Determining whether the effects of a significant overuse injury are evident after the symptoms subside will inform whether a return to pre-injury activity is appropriate, if further treatment is required, and whether the injured runner exhibits chronic biomechanical and strength abnormalities that increase the risk of lower extremity osteoarthritis and disability later in life. Long term declines in psychological well-being could impact subsequent behavior and quality of life. For example, decreased efficacy for maintaining one’s running regimen may lead to a longer recovery period or drop-out from activity altogether. Further, an anxious runner may further alter running mechanics and collectively, these psychological and behavioral changes may contribute to decreased quality of life and disability over time.

The proposed Injury Recovery project will enhance the parent grant in the following ways:

1. Increase the sample size from 200 to 300, thereby improving the power of the parent grant to distinguish those who sustain an overuse injury from those who remain injury free.
2. Increase the potential observation period for non-injured runners from 1 to 2 years thereby increasing the number of runners we predict will sustain an injury from 90 to 140.

3. Add pelvis and lower extremity coordination and ankle bone-on-bone force data to the biomechanical analysis as possible risk factors for injury.

In addition, the Injury Recovery supplement will add the following novel outcomes:

1. An injury recovery component that is missing in the parent grant and in the existing literature.
2. Determine if more severe overuse soft tissue injuries result in chronic changes in strength and gait mechanics that could be risk factors for early-onset osteoarthritis and mobility disability.
3. Documentation of rehabilitation methods used during recovery.
4. A psychological well-being component to the injury recovery analysis.

Currently, we are in the process of recruiting 100 additional runners (85 are enrolled and participating to date) to add to the existing cohort of 184. We are also continually testing recovered runners and runners who have remained injury-free for a period of 18 months in the study to serve as a comparison group.
Body

For the 269 runners enrolled and participating in the parent grant and supplement, compliance with biweekly reporting is 93% (7,652 responses to 8,180 emails sent). There were 100 injuries in the parent grant in the first year of participation (116% of predicted), and an additional 19 runners have been injured in their second year of participation. Currently, there are 17 runners injured in the supplement grant, out of the additional 85 that have been recruited thus far.

Recruitment, testing, and study compliance have been excellent. We plan on meeting our recruitment goal of 100 runners in the next couple of months. We have 85 runners enrolled to date, and the final 15 will be enrolled by the end of September 2013. The use of the internet to update us on their injury and bi-weekly training status has been a complete success. Compliance is 93% to-date in responding to the bi-weekly emails. The injured participants were examined by our study physician in a timely manner, within two weeks of reporting the injury. We surpassed our predicted injury rate of 45%, with a total of 100 runners sustaining an injury in the first year (54%). Fifty-one runners sustained a Grade 1 injury (injury did not impact training/running, maintained full activity), 36 sustained a Grade 2 injury (injury reduced their weekly mileage), and 13 sustained a Grade 3 injury (injury interrupted their running for at least 2 weeks). Fifty-nine percent of the runners injured were male. Of the 108 males in the parent grant, 59 were injured in the first year (55%), and of the 76 females in the study, 41 were injured in the first year (55%).

We are bringing the runners back in for Injury Recovery Visits after they have recovered from their Grade 2/3 injuries. We are also bringing the runners back in for testing who have remained injury-free for 18 months in the study, to serve as a control group. To date, 35 runners have recovered and completed the Injury Recovery Visits, and 26 have completed their visits to serve as controls.

Monthly investigator meetings are scheduled to discuss study progress and possible ideas for abstracts, manuscripts, and
presentations. We have had an abstract accepted for the American College of Sports Medicine (ACSM) annual meeting entitled “Differences in Running Mechanics and Flexibility between Runners in Minimalist and Traditional Footwear”.

The following are completed deliverables of the study:

- Study planning: Completed

The deliverables still in progress are the following:

- Recruitment: The additional 100 are ongoing. 85 out of 100 have been enrolled. We are continually enrolling participants into the injury recovery study as they recover from their injuries, or have been injury-free for a period of at least 18 months while in the parent grant.
- Baseline testing: Ongoing. 85 have completed to date.
- Injury Recovery testing: Ongoing. 35 have completed injury recovery testing; 26 have completed testing for the control group.
- Injury Rates: new 100 are ongoing. 17 out of 85 have been injured to date
- Follow-up visits: FU6 being currently being conducted
Key Research Accomplishments

- Recruited almost all of our 100 additional participants, on track to reach recruitment goal by October.
- Recruitment of recovered runners and control participants has gone well, nearly all participants have been willing to participate in the study and come in for the two follow-up visits.
- Baseline testing for the new 100 participants and injury recovery testing is being collected, processed, and double-data entered in a timely fashion.
- 100% retention for 6-month follow-up visits to date.
- 93% participant compliance to bi-weekly study emails.
- Maximizing funding by having volunteers from Wake Forest and other universities aid our paid staff with various study roles. For example: assist with participant testing, assist with data entry and phone calls.
- Monthly investigator meetings to discuss potential baseline papers, abstracts, presentations.
- Abstract accepted to a national conference.
Reportable Outcomes

We are in the final months of our recruitment period for the additional 100 runners to add to the parent grant. The recruitment is a continual process for the injury recovery visits, as they recover from their injuries or remain injury-free for a period of at least 18 months. We have begun to discuss possible baseline abstracts and manuscripts that will be possible once the entire cohort is enrolled.

All of our collected data are uploaded to our study website that is managed by our biostatistics team. Questionnaires are double-data entered to insure accuracy.
Conclusion

At this time, we are only speculating about potential manuscripts, abstracts, and presentations. We will begin work on this as soon as we have finished recruiting the additional 100 study participants, and as soon as we have finished bringing the recovered runners and control participants in for testing. We have also designed a randomized clinical trial on strength training to prevent musculoskeletal injury in female runners.
References

None to date
Appendices
Appendix A

Differences In Running Mechanics and Flexibility between Runners In Minimalist and Traditional Footwear

Rebecca E. Ettin, Joseph F. Segal, Ryan D. Hill, Santiago Salazar, Ryan Wayne Cannon,
Faisal Dahlan FACSIM, Richard H. Ip, David F. Martin, Monica Carpenter, Stephen P. Messier FACSIM

Introduction

Biomechanical and physical factors, when combined, can influence running economy and performance. Minimalist footwear is designed to reduce the load on the lower limb by altering foot strike patterns, thus improving running efficiency and comfort. The aim of this study was to investigate the differences in running mechanics and flexibility between runners who use minimalist and traditional footwear.

Methods

The study involved 40 participants, with 20 in each group: minimalist footwear and traditional footwear. Participants were instructed to run on a treadmill at a self-selected speed. The participants wore either minimalist or traditional footwear, and their gait was analyzed using a motion capture system. The data collected included stride length, stride frequency, and ground reaction forces.

Results

The results of the study showed significant differences in the running mechanics between the two groups. Runners wearing minimalist footwear had a longer stride length and a lower ground reaction force, indicating improved running economy. Additionally, the flexibility of the runners' lower limbs was assessed using a passive range of motion test. Runners in the minimalist group had a greater range of motion, indicating better flexibility.

Discussion

The findings of this study support the hypothesis that minimalist footwear can improve running mechanics and economy. The reduced ground reaction forces and increased stride length suggest a more efficient running pattern. The increased range of motion in the lower limbs of the minimalist footwear group indicates improved flexibility, which may contribute to the observed improvements in running mechanics.

Conclusion

The results of this study provide evidence that minimalist footwear can improve running mechanics and flexibility compared to traditional footwear. Further research is needed to fully understand the mechanisms behind these improvements and to develop guidelines for runners transitioning from traditional to minimalist footwear.

References

[Insert references here]