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A Consensus Definition of Running-Related Injury in Recreational Runners: A Modified Delphi Approach

STUDY DESIGN: Delphi study.

OBJECTIVE: To reach a consensus definition of running-related injury in recreational runners through a modified Delphi approach.

BACKGROUND: Many studies have suggested the need for a standardized definition of running-related injury to provide uniformity to injury surveillance in running.

METHODS: We invited 112 researchers from running-related injury studies identified in a previous systematic review to classify words and terms frequently used in definitions of running-related injury in an online form during 3 rounds of study. In the last round, participants were asked to approve or disapprove the consensus definition. We considered an agreement level of at least 75% to be a consensus.

RESULTS: Thirty-eight participants agreed to participate in the study. The response rates were 94.7% (n = 36) for the first round, 83.3% (n = 30) for the second round, and 86.7% (n = 26) for the third round. A consensus definition of running-related injury was reached, with 80% of participants approving the following: "Running-related (training or competition) musculoskeletal pain in the lower limbs that causes a restriction on or stoppage of running (distance, speed, duration, or training) for at least 7 days or 3 consecutive scheduled training sessions, or that requires the runner to consult a physician or other health professional."

CONCLUSION: The proposed standardized definition of running-related injury could assist in standardizing the definitions used in sport science research and facilitate between-study comparisons. Future studies testing the validity of the proposed consensus definition, as well as its accurate translation to other languages, are also needed. *J Orthop Sports Phys Ther 2015;45(5):375-380. Epub 26 Mar 2015. doi:10.2519/jospt.2015.5741*

KEY WORDS: *jogging, judgement, lower extremity, terminology*

The lack of standard concepts in research is perhaps the most significant difficulty in the comparison of results between studies.[26] In the running-injury field, many researchers have noted the problem of how to define a running-related injury.[11,25,29] Some investigators have suggested the need for a standardized definition of running-related injury.[16,19,23,29] Because a consensus has not yet been reached, researchers have used different definitions in their studies.[11,17,31]

Currently, the rates of prevalence and incidence of running injuries vary between 19% and 92%,[24,29] depending on the injury definition adopted. Some of the disparities in injury rates are certainly linked to the differing definitions used in each study.[4,10-13,15-17,27,29] For instance, Bovens et al[3] used a broad definition of running-related injury ("Any physical complaint developed in relation with running activities and causing restriction in running distance, speed, duration or frequency") and found an injury incidence of 84.9%. On the other hand, Blair et al[2] adopted a narrower definition of running-related injury ("An injury that causes the runners to stop running for at least seven days") and found a lower injury incidence of 24%. The higher rate of injury found in the first study may be due to the lack of a specific period of interruption or time off from running in the definition used, in contrast to the definition employed in the second study, which clearly specifies the period of interruption.

Thus, the lack of a standard definition of running-related injury hinders comparisons between studies.[30] Sports such as cricket,[20] tennis,[22] rugby,[6] and soccer[5] have a consensus on the definition of injury, and, recently, a consensus for injury in track-and-field athletes was published.[28] A consensus on the definition of injury related to these sports has provided uniformity to injury-surveillance studies. A consensus definition of running-related

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injury specifically for recreational runners may contribute to reducing the wide variations observed in reported injury rates. Such standardization may also contribute to the efficacy of injury-prevention programs in the future.[7,11]

The Delphi methodology has been shown to be effective in reaching a consensus definition and can be defined as "a method for structuring a group communication problem."[32] The Delphi method consists of a group facilitation technique that achieves consensus by a panel of experts through several rounds of structured anonymous questionnaires or focus-group interviews.[8,18] The aim of this study was to reach a consensus definition of running-related injury for recreational runners through a modified Delphi approach.

METHODS

Participants

From a previous systematic review[33] on the definitions used to refer to a running-related injury, all researchers who used a definition of running-related injury previously were identified as potential participants. From the reference lists of previous reviews and studies, researchers who did not define a running-related injury but conducted other studies related to running (eg, biomechanical or intervention studies) were also identified as potential participants. All potential participants were invited to participate in this consensus. The enrollment process of the study was performed in 3 steps: (1) an e-mail invitation was sent to all potential participants, (2) 2 reminders at 15-day intervals were sent to potential participants who did not reply to the first contact, and (3) participants who did not reply to all 3 invitations were no longer contacted and were not included in the study. All participants were contacted by e-mail over the course of the study. This study was approved by the Research Ethics Committee of Universidade Cidade de São Paulo, Brazil (protocol number 0087.0.186.000-11).

Analysis of Participant Profiles

An additional search of the included participants' profiles in the Thomson Reuters Web of Science database was conducted to collect the following information: number of articles published, number of articles published with the key word "running" in the title or abstract, number of citations, and h-index (number of papers published, as well as the impact of these papers).

Data Collection

The invitation by e-mail contained a brief description of the study, an online link to further details of the study, and a consent form for the participants. Participants who accepted the invitation were directed to the first round of the study.

First Round In the first round, the participants were asked to classify words and terms frequently used in definitions of running-related injury through an online form. These terms were created by the research team of this consensus by analyzing more than 48 different definitions to refer to a running-related injury in the scientific literature. The terms were divided into 3 main categories and their subcategories based on previous studies[1,5,6]: (1) presence of physical complaint (symptom, bodily system involved, body region), (2) interruption of training or competition (primary activities involved, extent of injury, extent of limitation, interruption, period of the injury), and (3) need for medical assistance (medical assistance/medication). Before classifying the words and terms, participants were also asked to approve the categories and subcategories proposed.

The participants rated each term on a 4-point scale (0-3), on which 0 represented "not suitable to describe a running-related injury" and 3 represented "extremely suitable to describe a running-related injury," adapted from a previous study with a similar design.[26] Terms that reached a consensus level of at least 75% were included in the next rounds.[8] The consensus level was calculated by dividing the sum of the participant's scores by the total score possible (ie, 100% of agreement) and then converting the values to percentages. Participants could also comment on the terms and suggest new terms to be included in the next rounds. Each opinion or suggested term was automatically included in the next round. Participants were asked to answer the online form in 15 days. E-mail reminders were sent on the 16th day and 31st day after the first request to participants who failed to respond. After 45 days, participants who did not answer were excluded from the study. To ensure the vi-

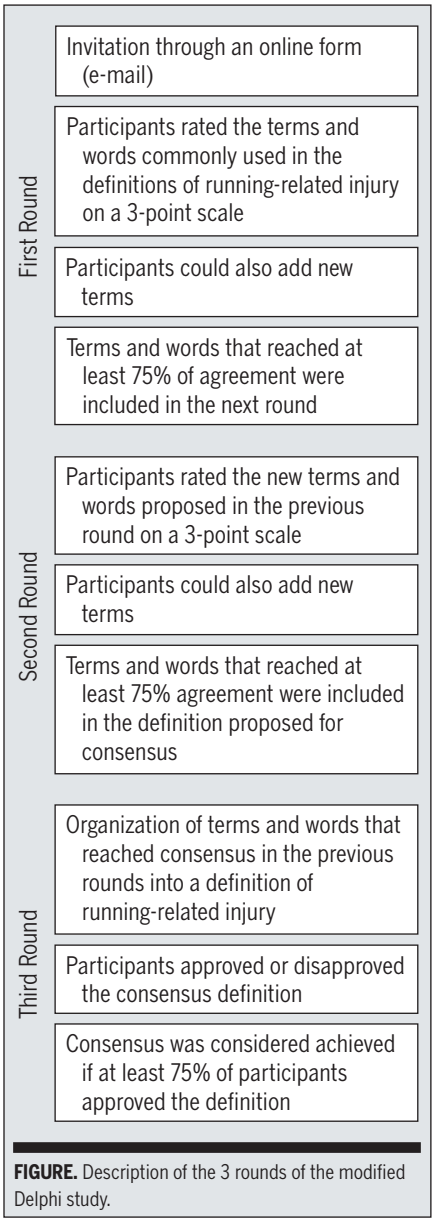

FIGURE. Description of the 3 rounds of the modified Delphi study.

TABLE 1 Research Profile of the Participants (n = 38)

Publication Data	Median (IQR)	Range
Articles published	27.5 (51.5)	1-739
Articles published on running injury	4.0 (14.0)	4-32
Citations related to running	82.5 (332.7)	0-749
h-index	8.0 (13.2)	1-56

Abbreviation: IQR, interquartile range.

ability of the study, each round had to be concluded in a maximum of 2 months.

Second Round In the second round, participants were asked to classify the new terms suggested and terms that reached a 75% consensus level in the first round. We adopted the same criteria used in the previous round for consensus level and exclusion.

Third Round In the final round, a consensus definition was proposed based on the terms that reached a 75% consensus level in the 2 previous rounds. Participants were requested to approve the consensus definition using the 4-point scale described earlier. A minimum consensus level of 75% was required to accept the consensus definition. Participants could also comment on the consensus definition but were not allowed to include new terms. If the definition had not been approved by 75% of the participants, another round would have been opened to reach consensus. The **FIGURE** depicts the 3 rounds of this study.

RESULTS

We identified 112 eligible participants and invited all of them to participate in this study. A total of 53 (47%) participants replied to the e-mail invitation, of whom 38 (34%) agreed to participate in the consensus. Thus, we enrolled 38 (72%) of the participants who replied to our invitation. The participants were from 9 different countries: Australia, Brazil, Canada, China, Denmark, Japan, the Netherlands, New Zealand, and the United States. **TABLE 1** shows the research profile of the participants who agreed to participate in this study. All invitees had defined a running injury or had previously published research on running injury. The invited researchers had varied levels of experience, from junior (1 publication only) to senior (more than 500 articles published).

The response rates for the 3 rounds of the study were 94.7% (n = 36) for the first round, 83.3% (n = 30) for the second round, and 86.7% (n = 26) for the third round. Thus, the dropout rate of the study was 31%.

In the first round, the participants approved all subcategories suggested by the authors, with a consensus level of more than 75%. The subcategory "symptom" obtained a 97% consensus level, followed by the subcategories "body region" and "primary activities involved" (94%), "extent of injury" and "extent of limitation" (92%), "interruption" and "medical attention" (89%), "period of the injury" (80%), and "bodily system involved" (78%).

The terms and words related to these subcategories were rated based on their importance to the definition. The terms with a consensus level of more than 75% and the new terms suggested were included in the next round. **TABLE 2** shows the terms with a consensus level greater than 75% in the first round, divided into subcategories.

The second round included the new terms suggested by the participants and the terms that reached consensus in the first round. **TABLE 3** shows the terms assessed in the second round and their level of consensus.

In the final round, the participants had to approve or disapprove the definition composed of the terms from the previous rounds. The definition was approved by 80.7% of the participants in this study. Therefore, for this panel of experts, a running-related injury in recreational runners is defined as "running-related (training or competition) musculoskeletal pain in the lower limbs that causes a restriction on or stoppage of running (distance, speed, duration, or training) for at least 7 days or 3 consecutive scheduled training sessions, or that requires the runner to consult a physician or other health professional." For retrospective studies, the question on injury must cover the last 6 months.

DISCUSSION

Thirty-eight experts from 9 different countries agreed to participate in this modified Delphi study. An analysis of their profiles shows that they are mostly experienced researchers with a high level of expertise on the topic of running injury. The median number of articles published for each of the participants was about 27 (interquartile range, 51.5), of which a median of 4 articles (interquartile range, 14.0) were specifically on running injury. The participants included were influential researchers and had the appropriate background to contribute to the development of this consensus.

The structure of the consensus definition of running-related injury in the present report, similar to consensus definitions of injury for other sports, considered 3 main domains (the presence of physical complaint, the need to interrupt training or competition, and the need for medical assistance).[5,6,20,21] Additionally, the consensus definition reached in this study is in accordance with a recent consensus definition for health-related incidents in athletic populations.[28] Although we adopted a stricter methodology and recreational runners are not considered an athletic population, both consensus definitions

would complement the sports-injury field.

Five participants did not agree with the consensus definition, of whom 3 did not agree with the period of injury considered for retrospective studies. However, most of the participants agreed that retrospective studies are needed to establish a period for collecting retrospective data. This consensus determined that 6 months is the appropriate period for retrospective data on injuries. Most of the participants agreed that retrospective data older than 6 months could lead to recall bias. Runners are usually asked not only to report if they have experienced an injury in the past, but also about the details of the injury (ie, intensity, location, and diagnosis). Therefore, 6 months seemed to be a suitable period to avoid recall bias in retrospective studies.[9,14]

Two researchers did not agree with the inclusion of the need for medical assistance in the definition, stating that the rates of injury could be overestimated, depending on the cultural aspects of the country or the health system. Runners may seek medical attention for reasons considered irrelevant in some cultures or for minor reasons, such as muscle pain after exercise, whereas, in other cultures, they may seek medical help only for the most serious conditions, which may lead to underestimated injury rates. In an attempt to solve this issue, the need for medical consultation was included in the consensus definition as an alternative to the time lost due to injury (7 days or 3 consecutive scheduled training sessions), and not as a necessary condition for a running injury.

It is important to note that the consensus definition established in this study may not be the correct or best definition of running-related injury and is, rather, a definition that a group of experts considered appropriate for running-related injuries. One limitation of this study is that the definition of "runner" was not considered in the consensus. Additionally, although we decided to develop a consensus for recreational runners, to our knowledge there is no clear definition or consensus for this type of runner in the literature. Also, this consensus can be applied to other types of runners, such as elite runners, as there is no consensus of injury definition or type of runner yet. Moreover, this consensus does not eliminate all variations in study results. Runners may have different pain or injury thresholds (eg, one runner may have a low pain threshold for a time-loss injury, and another runner with a high pain threshold may not report the same time-loss injury). Health professionals may also have different perspectives about the acceptable levels of pain or injury (eg, different recovery times could be considered for each professional), and runners and physicians may use painkillers to manage injuries (eg, painkillers may change the runner's pain threshold).

One of the strengths of this definition advanced for running-related injury in recreational runners is the use of a methodology specially developed for achieving a consensus, in which most of the researchers in the field of running inju-

TABLE 2 Terms With a Consensus Level Greater Than 75% in the First Round

Terms Used to Describe a Running-Related Injury	Level of Consensus, %
Symptom	
Pain	79.1
Bodily system involved	
Musculoskeletal	92.9
Body region	
Lower limbs	76.5
Primary activities involved	
Running related	86.3
During training	76.5
During running	79.4
Extent of injury	
Loss	75.8
Stoppage/interruption	77.8
Restriction	75.8
Extent of limitation	
Running	83.8
Distance	82.8
Duration	75.8
Speed	79.8
Training	75.8
Interruption	
7 d	79.2
3 consecutive scheduled training sessions	76.0
Period of the injury	
Last 6 mo	82.8
Medical assistance/medication	
Medical consultation	79.2
Visit a health professional	83.3

TABLE 3 Terms Assessed in the Second Round

Terms Used to Describe a Running-Related Injury	Level of Consensus, %
Symptom	
Pain	79.1
Stiffness*	41.4
Bodily system involved	
Musculoskeletal	92.9
Body region	
Lower limbs	76.5
Upper limbs*	32.2
Back*	39.1
Trunk*	49.4
Primary activities involved	
Running related	86.3
During training	76.5
During running	79.4
Extent of injury	
Loss	75.8
Stoppage/interruption	77.8
Restriction	75.8
Extent of limitation	
Running	83.8
Distance	82.8
Duration	75.8
Speed	79.8
Training	75.8
Intensity*	70.1
Interruption	
7 d	79.2
3 consecutive scheduled training sessions	76.0
1 competition*	36.8
Period of the injury	
Last 6 mo	82.8
Last year*	48.3
Medical assistance/medication	
Medical consultation	79.2
Visit a health professional	83.3
Require surgery*	42.5

**New terms proposed in the first round.*

ries were invited to participate. Moreover, the definition of running-related injury in this study was approved by 80.7% of the participants, which is considered to be a very good consensus level for Delphi studies.[8] This study represents a step forward in the field of running injuries. The use of this consensus definition in future studies should be encouraged by researchers; nevertheless, it must be tested in the population of runners in future studies, because we do not know how effective it would be in practice. Moreover, to determine how this consensus definition may influence injury rates, it would be interesting to go back and redefine running injury in existing running studies that provide sufficient classification and injury rates of their samples.

CONCLUSION

The proposed standardized definition of running-related injury could assist in standardizing the definitions used in sport science research and facilitate between-study comparisons. Future studies testing the validity of this consensus definition, as well as its accurate translation to other languages, are also needed. The consensus reached in this Delphi study may bring uniformity to injury-surveillance studies on running injuries and should reduce the wide variations observed in incidence and severity of these injuries in the future. ◉

KEY POINTS

FINDINGS: This study provides a consensus definition of running-related injury reached by a group of experts.

IMPLICATIONS: The use of this consensus definition should be encouraged in future research to bring uniformity to injury-surveillance studies on running.

CAUTION: The existence of this consensus definition does not necessarily mean that we have found the correct or best definition of running-related injuries.

ONLINE APPENDIX

The terms included in the first round of the study are available online at www.jospt.org.

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APPENDIX

TABLE All Terms Included in the First Round of the Study

Terms Used to Describe a Running-Related Injury	Level of Consensus, %
Symptom	
Injury	61.9
Complaint	61.0
Ailment	25.7
Pain	79.1
Problem	33.3
Disorder	22.9
Illness	14.3
Aggravation	23.8
Symptom	54.3
Event	18.1
Incident	19.1
Disability	32.4
Damage	25.7
Bodily system involved	
Musculoskeletal	92.9
Physical	69.1
Metabolic	21.4
Neurologic	33.3
Psychological	27.4
Bodily	27.4
Body region	
Lower limbs	76.5
Lower back	63.7
Anatomic part	62.8
Primary activities involved	
Running related	86.3
During training	76.5
During running	79.4
After start of running	62.8
During walking	33.3
During jogging	53.9
During competition	61.8
Finish line	28.4
After exercise	52.0

Table continues on page B2.

APPENDIX

TABLE All Terms Included in the First Round of the Study (continued)

Terms Used to Describe a Running-Related Injury	Level of Consensus, %
Extent of injury	
Loss	75.8
Stoppage/interruption	77.8
Restriction	75.8
Modify	63.6
Slow	45.5
Affect	50.5
Interfere	53.5
Alter	53.5
Interrupt	64.7
Limit	66.7
Remove	13.1
Impair	35.4
Prevent	49.5
Reduce	64.7
Cease	48.5
Hamper	39.4
Extent of limitation	
Running	83.8
Distance	82.8
Duration	75.8
Speed	79.8
Training	75.8
Frequency	71.7
Performance	60.6
Competition	66.7
Exercise	42.4
Work or school activities	34.3
Running program	60.6
Weekly distance	67.7
Jogging	48.5
Function	38.4
Running mileage	68.7
Pace	57.6

Table continues on page B3.

TABLE All Terms Included in the First Round of the Study (continued)

Terms Used to Describe a Running-Related Injury	Level of Consensus, %
Interruption	
7 d	79.2
3 consecutive scheduled training sessions	76.0
1 d	49.0
1 d or more	46.9
2 d	54.2
2 wk	60.4
Period of the injury	
Last 6 mo	82.8
Last 5 y	23.0
Medical assistance/medication	
Medical consultation	79.2
Visit a health professional	83.3
Seek medical help	72.9
Use of medication	52.1
Medical assistance is requested	50.0
Medical aid station	44.8
Seek medical assistance	65.6
See a health professional	67.7