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**Verhagen, E., Voogt, N., Bruinsma, A., & Finch, C.** (2013). A knowledge transfer scheme to bridge the gap between science and practice: An integration of existing research frameworks into a tool for practice. *British Journal of Sports Medicine*.

Which has been published in final form at:

<http://doi.org/10.1136/bjsports-2013-092241>

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**A knowledge transfer scheme to bridge the gap between science and practice; an integration of existing research frameworks into a tool for practice**

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**Word count** 2,925

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## **ABSTRACT**

Evidence of effectiveness does not equal successful implementation. To progress the field, practical tools are needed to bridge the gap between research and practice and to truly unite effectiveness and implementation evidence. This paper describes the Knowledge Transfer Scheme (KTS) integrating existing implementation research frameworks into a tool which has been developed specifically to bridge the gap between knowledge derived from research on the one side, and evidence-based useable information and tools for practice on the other.

## **BACKGROUND**

Over the past two decades, knowledge about the prevention and treatment of various sports and physical activity related injuries within different sports has grown exponentially [1]. Based on the currently available evidence, it is reasonable to state that we are able to significantly reduce the risk of injury for most participants across many sports and physical activities. However, wide-scale implementation of cost-effective intervention measures and treatment protocols under real life conditions proves to be an on-going challenge[2, 3].

It is well recognised that in order to truly impact the health of active individuals, more (implementation) research effort should be placed on translating efficacious preventive methods into practice[4-6]. A number of papers have been published in the past years describing research frameworks leading to successful implementation[5-8]. However, these frameworks are primarily aimed at guiding research efforts towards implementation. Paradoxically this may lead to the pitfall, as these implementation frameworks also provide research outcomes that still need to be implemented into practice.

Knowledge about effective implementation does not necessarily mean implementation is successful. Only efforts that can practically implement evidence to the sporting field will have more substantial impact across all participants. Therefore, what is required to accompany the available implementation research frameworks, are practical tools that are able to bridge the gap between research and practice[9]. For this purpose, this paper describes the Knowledge Transfer Scheme (KTS) which integrates existing research frameworks into a tool for practice. The KTS has been developed specifically to result in practical and sustainable evidence based products by bridging the

gap between knowledge derived from research on the one hand and evidence-based useable information and tools for practice on the other (Figure 1).

## **FIGURE 1**

### **BOTTOM-UP AND TOP-DOWN**

Current approaches towards the prevention of sports and physical activity related injuries in general use a top-down approach following the widely adopted sequence of prevention[10]. This approach states an injury problem is described in terms of incidence and severity, after which etiological insights lead to preventive approaches. Hereafter, efficacious or effective preventive measures are translated to the field. The latter follows the implementation steps of the TRIPP approach[5] which can be regarded, in one sense, as an addendum to the original sequence of prevention. The TRIPP approach [6] aims at a better understanding of the implementation context for injury prevention, and stresses the importance of understanding both behavioural inputs and outputs in relation to sports injury prevention.

Although the sequence of prevention is required to develop an evidence base of efficacious and effective preventive measures it inherently restricts the potential impact an intervention has in a practical setting[9]. The issue here is that measures are developed and evaluated from the researchers' perspective only, thus generating knowledge that needs to be translated to practice. This is a rather top-down approach in which researchers aim to feed practice based upon their scientific focus and output. Sometimes this is necessary as science may produce novel measures or provide more effective measures for practitioners to adopt. However, given the available evidence-

base, there is also an opportunity to take more of a bottom-up approach through which practitioners pose practical issues which are then linked to a solution based upon available evidence[9,11].

The KTS consist of a series of five steps that includes both approaches. Bottom-up knowledge transfer starts with a question or problem stated by practice (step 1), after which, in step 2, evidence is sought to potentially answer the question or to solve the posed problem. Using a top-down approach, KTS can start in step 2 with evidence, assuming that the underlying problem has already been described. Naturally, such evidence stems from research that aims to solve a problem (research question). Yet, it may be necessary to revert back to step 1 and further elaborate on the problem, context and population and integrate subsequent evidence in step 2 to target the full scope of the problem. A step-by-step explanation of the five KTS steps is provided in Table 1. The remainder of this manuscript describes the content, need, and rationale of each subsequent step.

**Table 1** Detailed explanation of the five Knowledge Transfer Scheme (KTS) steps

<p><b>Step 1 Problem Statement</b></p>	<p>Describe the problem as encountered in practice in terms of:</p> <ul style="list-style-type: none"> <li>• problem magnitude</li> <li>• problem severity</li> <li>• societal burden</li> <li>• problem context</li> </ul>
<p><b>Step 2 Evidence synthesis and description</b></p>	<p>For all available evidence describe:</p> <ul style="list-style-type: none"> <li>• the gain for the individual</li> <li>• the gain for society</li> <li>• the context of the evidence</li> <li>• contemporary views and practices of practice and practitioners</li> </ul>
<p><b>Establish a Knowledge Transfer Group (KTG) consisting of representativeness of key stakeholders, practitioners and researchers with expertise on the injury or evidence at hand.</b></p>	

<b>Step 3 Knowledge transfer group (KTG)</b>	Within the KTG discuss: <ul style="list-style-type: none"> <li>• the problem statement (KTS step 1)</li> <li>• the evidence description (KTS step 2)</li> <li>• completeness of group</li> </ul> <i>In the event that the group identifies that some key stakeholders or experts are missing, they can be added to the KTG</i>
<b>Step 4 Product development</b>	For the KTS product to be developed describe the: <ul style="list-style-type: none"> <li>• product goal</li> <li>• target group(s)</li> <li>• product context</li> </ul>
<b>Step 5 Evaluation</b>	Evaluate the KTS product within the RE-AIM Framework[12]: <ul style="list-style-type: none"> <li>• Reach</li> <li>• Effectiveness</li> <li>• Adoption</li> <li>• Implementation</li> <li>• Maintenance</li> </ul>

## STEP 1 - PROBLEM STATEMENT

The first step of the KTS is to describe the ‘problem’ encountered in practice in terms of its magnitude, severity, societal importance and societal burden. This provides a necessary first step that not only explicates the problem, but also provides an argument as to why the problem must be solved.

This initial problem definition consists of two components (1) a scientific, epidemiological, behavioural, and social description of an at-risk group or community and its problems; and (2) an

effort to "get to know," or begin to understand, the character of the community, its members, and its strengths, weaknesses and challenges. This first component is equivalent to the starting points of the sequence of prevention[11] and TRIPP framework[6] and is necessary for providing a clear problem statement that draws on the available evidence. When existing evidence is presented as the starting point of the KTS, this first step is assumed to have been used to generate that evidence.

The second component provides more than a description of a health problem as commonly applied in sports medicine research; i.e. health issue X is very common in population Y. It is a description of the health problem's impact on quality of life, its specific behavioural and environmental causes, and (where applicable) determinants of those behaviour and environmental causes.

This approach draws loosely upon the needs assessment encapsulated in the Intervention Mapping (IM) protocol[13]. The IM is a tool widely adopted in health promotion practice that captures the process of the development of a health promotion program in a series of six consecutive steps. It maps the path from recognition of a need or problem to the identification of a behavioural solution, and provides the tools to do so in a multidisciplinary manner. The difference, however, between the KTS and IM is that IM describes a basis for *developing* a new intervention that fits the problem for a specific population, whereas KTS describes a basis to *seek existing effective* interventions that fits the problem in a population.

## **STEP 2 - EVIDENCE SYNTHESIS AND DESCRIPTION**

The second step synthesises and describes evidence to solve the problem that has been postulated in step 1. Ideally this is done through a systematic review in which the problem statement of the previous step serves as the PICO question (patient problem or population (P), intervention (I), comparison (C) and outcome(s) (O)) for the search. Importantly, a plethora of reviews are readily

available and not every stated problem requires a novel effort to seek and summarise evidence. It is worthwhile to scan previous reviews to establish an overview of available evidence.

It is necessary to gain insight into whether the available information provides sufficient evidence to inform to reduction in the burden of the problem put forward by practice. As such, it is important to describe the potential health gain that can be achieved through implementation of the established evidence. This must be done at both the level of the individual (e.g. a reduction of injury risk, a reduction of residual complaints after injury, improved performance, swifter return to play) and the level of society (e.g. a reduced (economic) burden of injury, increased sports participation, and reduced demand of medical system)[14]. This is especially important for multiple available programs or interventions, where subsequent choices may need to be made further along the KTS as to which specific interventions or components to implement. Moreover, evidence is likely to come from studies conducted in different contexts, sports, or populations. This will affect the estimated impact that programs or interventions might have when used to solve the problem stated in the first step. It is also necessary to gain additional information about evidence through consultation with clinical or practical experts or the authors of studies that provide evidence.

In addition to the potential health gain, it is also of importance to describe the context in which prior evidence has been obtained and, subsequently, which stakeholders are required to put that evidence into practice. As stated before, evidence can relate to various sports and intervention settings, or may be delivered through different stakeholders[15]. A straightforward description of the various contexts in which the available evidence was established should be compared to the context in which the current problem resides. This will indicate hooks for implementation, but will also suggest which intervention or program components will not fit the problem context. Based upon this information, the end-users and other stakeholders required to successfully implement evidence are distinguished and invited to partake in the KTG[16].

### **STEP 3 - KNOWLEDGE TRANSFER GROUP**

The first two steps of the KTS have been theoretical and descriptive in nature. From the third step onwards, the KTS translates this information into practice actions through the establishment of a knowledge transfer group (KTG). This KTG should consist of representative key practitioner stakeholders (as established in step 2), and researchers with expertise on the injury or evidence at hand. To avoid bias, an independent chair, who is not involved in idea and content generation, should be appointed to guide the on-going discussions.

Ideally, a KTG will consist of at least two participants, two researchers from different disciplines (e.g. fundamental and epidemiological backgrounds), two (sports) physicians or other clinicians, and a representative of each stakeholder group. Although novel for the translation and implementation of sports medicine evidence to the field [10, 16], this engagement of the end-users is standard practice in Community Development Health Promotion Practice [17-19].

The KTG should not be too big if it is to fully support on-going open discussion, but it also needs to provide for a voice for all major stakeholders. This is a fine balance, and they need to be chosen so as to have the strongest voices of evidence users (athletes), implementers (stakeholders) and evidence providers (researchers). There will be some instances in which an intervention or program only indirectly targets athletes (e.g. rule changes, treatment protocols, or on-site first aid guidelines). Nonetheless, it is the athlete's health status that is targeted by the intervention in the end, and as such athletes need a strong voice in a KTG.

The KTG is somewhat similar to the focus groups employed in other frameworks like IM[12]. The IM focus groups are generally only used by researchers to gather qualitative information from a specific population. Based upon this gathered information researchers develop the product or intervention. In contrast, the KTG is responsible for the on-going discussion process and the subsequent development of products to implement evidence (step 4). This is a critical difference, as KTS directs product development informed by practice.

The KTG should meet physically, and the number of sessions will vary depending upon the discussions within the group and the on-going 'product' development process (Step 4). The goals and intended processes of the KTG must be communicated during the first session at which any outstanding questions should be answered.

The first task of the KTG is to discuss the problem statement and evidence description of steps 1 and 2. The aim should be to assess the completeness and clarity of both descriptions, as well as to reach consensus across all members. The group should assess how the problem is perceived in practice, through engagement of its end-user and stakeholders members. If required, the group might choose to gather more information from its peers or other experts. Also, the available evidence needs to be in terms of possible hesitations, willingness, ignorance or lack of knowledge within the broader implementation context and practitioners.

Based upon its reflection of steps 1 and 2, the KTG might consider that some stakeholders are missing or redundant from its group. As such, membership of the KTG is not set in stone, but may alter in size and composition during this process. Through this approach, all stakeholders have the opportunity to provide expertise that is critical for develop products that are relevant and applicable to real-world problems in the KTS step 4 [9,16].

#### **STEP 4 - PRODUCT DEVELOPMENT**

The ultimate goal of the KTS is to translate evidence that solves a practice-generated problem into a useable and sustainable product to be implemented in practice. If this product is designed solely by a top-down approach, rather than also considering bottom-up views as outlined in the KTS, then it is no surprise that athletes fail to uptake the evidence. The product needs to properly designed from the outset with the end user in mind. It is the task of the KTG to develop such a product from selected evidence. As combination of practice-generated problems and the available evidence is

unique and demands a different approach or product; the process for generating this is not a single simple approach.

In relation to the KTS, a 'product' is defined as the wrapper or package in which the available evidence is presented to the end-users. A KTS product does not, therefore, necessarily have to be a tangible (commercial) product like (e.g. a new helmet with an appealing form). The end product can be anything that is based upon effectiveness evidence and which is directly useable in practice. Examples include sports or setting specific exercise programs, rule changes in regards to mouthguard use during field hockey practices, policy changes in regards to Automated External Defibrillator availability at amateur soccer clubs, or guidelines for medical staff for first aid provision. It is the responsibility of the KTG to reach consensus on the best product based upon their stated problem and the available evidence. As every product will be different, to the KTG will need to describe a number of factors to describe the essence of the product for evaluation in KTS step 5. These factors are (1) what is the goal of the product? (2) for whom is the product intended? and (3) in which context is the product situated?

## **STEP 5 - EVALUATION**

The evaluation of a KTS product revolves around its uptake in a real-life situation. A KTS product is expected to be developed from, or comprised of, evidence-based components and so its effectiveness does not need to be re-established. However, the translatability and feasibility of the developed products do need to be established within their intended context. Although multiple approaches for implementation evaluation exist, we recommend the RE-AIM framework for this purpose [12,15]. The RE-AIM framework designed by Glasgow et al.[12] was originally developed to evaluate the public health impact of health promotion interventions. This framework describes five interacting dimensions that identify the translatability and feasibility of a program.

A framework such as RE-AIM is useful for evaluating KTS products as it evaluates them specifically within their implementation context. In the KTS context, the RE AIM Framework can be applied to products directed at individual athletes, but also to products targeting intermediaries (e.g. coach or (sports) physician) or higher-order products delivered by sports governing bodies[15].

## **CONCLUSIONS**

Evidence of effectiveness does not equal successful implementation. Therefore, in order to truly impact the health of active individual, more (implementation) effort should be placed on translating 'proven' preventive methods to practice[2-4, 9]. In recent years, research frameworks leading to successful implementation in sports injury prevention have been described[5-8]. Importantly, these frameworks are supportive of research on implementation but do not provide a practical guideline on how to effectively translate research evidence to practice. In addition, the research frameworks tend to only draw upon available evidence about efficacious interventions, with little or no consideration of whether or not they necessarily fit the athlete's practical context. In doing so, they use a top-down approach of trying to translate objective research outcomes to the end-user expectations; an attempt that has proven feasible in lifestyle interventions [3]. To overcome these mentioned drawbacks, the KTS described in this paper has been developed specifically to bridge the gap between knowledge derived from research on the one side and evidence based useable information and tools for practice on the other. The KTS integrates existing implementation research frameworks into a tool for practice, by which practical issues are linked to available evidence and practical and sustainable products are developed and evaluated in their intended context. In short, it combines both top-down and bottom-up approaches to ensure greater implementation success.

## **ACKNOWLEDGEMENTS**

The authors would like to Marja Westhoff of The Netherlands Organisation for Health Research and Development (ZonMw) for her feedback on the ideas presented in this manuscript.

## **COMPETING INTEREST**

The authors declare no competing interests.

## **FUNDING**

This study was financially supported by The Netherlands Organisation for Health Research and Development (ZonMw). Caroline Finch was supported by a National Health and Medical Research Council (of Australia) Principal Research Fellowship (ID:565900)

## **CONTRIBUTOR STATEMENT**

EV, AB and NV contributed equally to the conception of the manuscript. CF contributed to the writing of the manuscript and provided critical or other input during various paper drafts.

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## **WHAT ARE THE NEW FINDINGS**

- The Knowledge Transfer Scheme integrates existing implementation research frameworks into a tool for practice, by which practical issues are linked to available evidence.

- Knowledge translation is an iterative bottom up / top down process based upon a conversation between researchers, practitioners and the target community.
- Multidisciplinary Knowledge Transfer Groups play a key role in the translation of evidence into practice actions

## **FIGURE LEGENDS**

**Figure 1** The 5 step Knowledge Transfer Scheme