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Original article

Development of a script concordance test in hand rehabilitation: Methodological process and preliminary validation results

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ABSTRACT

Introduction: This article describes the development and use of a script concordance test (SCT) to assess and certify the expertise of members of the French professional association specialising in hand and upper limb rehabilitation, orthotics and prosthetics: SFRM-GEMMSOR, which brings together physiotherapy and occupational therapy experts in hand rehabilitation. Their expertise is assessed on a combination of training, clinical experience and contextual analysis. The SCT was designed to document this expertise and guarantee recognised certification.

Methods: The PAF2S® company was asked to design the SCT, with a team of three health education experts. Ten writers and sixteen expert panellists produced 67 clinical vignettes and 227 items, aiming to reflect the diversity of hand rehabilitation cases. After optimisation, 59 vignettes and 200 items were chosen.

Sixty-one items were selected to create an SCT which was then tested on 24 rehabilitation specialists at the 60th conference of the French Society for Surgery of the Hand (SFCM). Following analysis of the results, poorly discriminating items were adjusted, and the internal consistency of the test was assessed with a Cronbach's alpha level of 0.88, indicating strong reliability.

Results: The experts achieved a mean correct response rate of 77.1% (standard deviation: 5.2%), vs. 66.1% achieved by participating rehabilitation specialists (standard deviation: 5.7%). A threshold of 56.3% allowed 23 out of 24 participants to pass the test.

Discussion: The study highlights the value of the SCT for assessing expertise in hand rehabilitation, while revealing biases and limitations related to the composition of the expert panel and the simulated clinical reasoning process. The SCT offers more than simple certification, with possible applications in continuing professional development, classifying standards of expertise within SFRM-GEMMSOR and identifying practitioners' professional development needs.

Conclusion: The SCT is a valuable instrument for documenting and structuring clinical expertise in hand rehabilitation, opening up new prospects for improving clinical reasoning and recognition of professional skills within SFRM-GEMMSOR.

Introduction

SFRM-GEMMSOR

The French Society for Hand Rehabilitation (SFRM), also known as the Hand and Upper Limb Orthotics and Rehabilitation Study Group (SFRM-GEMMSOR), is a professional association of physiotherapists and occupational therapists specialising in hand and upper limb rehabilitation, orthotics and prosthetics. SFRM-GEMMSOR was

founded on 7 July 1984 and is governed by the French 1901 law on non-profit organisations. Its main objective is to promote the development of hand rehabilitation by coordinating and publishing research conducted by physiotherapists and occupational therapists, and to provide discussion and networking opportunities for all therapists in the field. The association focuses on hand and upper limb rehabilitation, orthotics and prosthetics. It brings together 240 rehabilitation specialists, with physiotherapists accounting for 92% of members and occupational therapists, 8%. It works closely with the French Society for Surgery of the Hand (SFCM) as a certifying body for emergency hand clinics affiliated with the European Federation of Hand Trauma Centres (FESUM). SFRM-GEMMSOR is also a member of

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the European Federation of Societies for Hand Therapy (EFSHT) and the International Federation of Societies for Hand Therapy (IFSHT), with a clear commitment to the international community. SFRM-GEMMSOR plays a key role in developing and promoting practices in hand and upper limb rehabilitation, orthotics and prosthetics in France, by highlighting the importance of continuing professional development, scientific research and partnerships between professions. With the introduction of direct access clinical certification in hand rehabilitation, discussed herein, SFRM-GEMMSOR has moved a step closer to improving evidence-based professional practices and benefit for patients.

Assessment of expertise

Health expertise denotes the ability of a professional or group to activate understanding, interpersonal skills and knowledge to make informed decisions in complex situations. It is integral to ensuring quality care, adapting to patients' needs and continuously improving practices. According to the French National Health Authority (HAS), health expertise is the ability to "analyse complex situations, propose appropriate solutions and guarantee quality care" [1]. It relies on initial training, continuing professional development, clinical experience and adherence to good practice guidelines. The HAS stresses the importance of assessing professional skills, particularly through standard instruments such as audits and peer assessments, to certify expertise. More specifically, the physiotherapy training reference defines core competency 6 "expertise in physiotherapy" as "designing and implementing a physiotherapy expert consulting service" through the ability to assess, diagnose and treat patients, supported by rigorous clinical reasoning and evidence [2]. For occupational therapists, this specifically corresponds to core competency 5 "creating and implementing an occupational therapy and public health educational and consulting strategy". Expertise is described as a combination of specialised knowledge, practical experience and contextual judgement. It goes beyond simply accumulating experience, and includes:

- Complex problem-solving skills in diverse contexts.
- In-depth understanding of fundamental concepts in one's domain.
- Social recognition of one's role as an authority on a given subject.

Experience alone is not sufficient to gain expertise. Guided, structured learning is required, often assessed by peers or institutions, illustrating the social nature of expertise. Expertise is not a fixed construct, and experts must adapt constantly to new knowledge and changing environments. Adaptability involves regular self-assessment and updating skills [3–6]. A holistic view of health expertise is vital to face current challenges in the quality and safety of care. It is also an essential basis for assessing professional practices and training healthcare professionals. Expertise is assessed on quantitative and qualitative methods. This aims to identify, and measure acquired skills through behaviours and attitudes demonstrating advanced competence in a given domain. Methods include self-assessment with a portfolio [7] and review of professional practices to gather information on how expertise is perceived by practitioners. Indicators supported by clinical data (e.g. functional improvement or pain reduction) may also be used. Peer assessments based on clinical audits or situational judgement tests with expert panels offer interesting new prospects. Expert panels are used along these lines in script concordance tests (SCT) to assess clinical reasoning ability in contexts of uncertainty [8].

The SCT

The SCT is a (summative and formative) assessment method designed to compare decision-making by clinicians and expert

panellists in contexts of uncertainty. It is firmly rooted in script theory, a theoretical model for organising knowledge [8]. According to the script theory, clinical expertise stems from the ability to activate pre-existing cognitive structures (scripts) stored in the long-term memory. Scripts allow clinical cues to be rapidly associated with diagnostic or therapeutic hypotheses [9]. They are constantly activated in clinical situations and feed into the clinical reasoning process. They consequently play a key role in generating hypotheses, clearly identified in the dual process theory [10,11]. The SCT is made up of clinical vignettes comprising:

- An initial clinical scenario (e.g. a patient's symptoms).
- A clinical hypothesis (diagnostic or therapeutic).
- Additional information (e.g. test results or new data).
- A question asking participants to assess the effect of additional information on the initial clinical hypothesis.
- Responses indicated by participants using a Likert scale, stating whether the information strengthens, weakens or has no effect on the hypothesis [8].

The participants' responses are then compared with those of the expert panellists. The quality of clinical reasoning is then measured by the degree of concordance with the panellists [12]. Although the SCT is considered a reliable, valid instrument, it is susceptible to various biases and limitations discussed below. It is worth noting that the SCT appears suitable for physiotherapy applications [13,14]. In conclusion, the SCT is a valuable instrument for assessing clinical reasoning ability in contexts of uncertainty. However, its design and use must be carefully considered to ensure it is both relevant and effective.

It is in this context that we chose to use the SCT to assess the expertise of SFRM-GEMMSOR members. The study therefore aimed to design and use an SCT to certify their expertise.

Method

The PAF2S® company was asked to design the SCT and put together a team of three experts in applied health education sciences and/or experienced in SCT design. The team guided SFRM-GEMMSOR members, clinical hand rehabilitation experts, through every step of the design process. The clinical experts were divided into two different groups: ten writers and sixteen expert panellists. SFRM-GEMMSOR selected the experts on the following criteria: prior continuing professional development in hand rehabilitation, at least five years of experience in hand rehabilitation and active SFRM-GEMMSOR membership. This collaborative approach guaranteed a scientifically rigorous design process, in line with guidance from Lubarsky et al. [12].

Drafting the vignettes

One of the first tasks involved prioritising disorders encountered in hand rehabilitation, along with steps of the clinical reasoning process [15]. The aim was to reflect the complexity and diversity of cases in the field to produce an SCT with authentic clinical situations corresponding to the lived experience of rehabilitation experts. The experts assigned to the writing task were invited to allocate 100 points to different disorders (Table 1) and 100 points to different steps of the clinical reasoning process (Table 2). The items related to these two characteristics, representative of clinical experts' activities in hand rehabilitation, were then drawn up proportionally to the defined priorities. The vignettes were drawn up under the supervision of the design team on 15–16 May 2024. Two separate groups of five hand rehabilitation experts produced the vignettes, and each group reviewed the other's work. The vignettes were then validated by the design team to ensure they met the established quality criteria

Table 1
Disorders prioritised by experts.

Disorders	Number of points	Target proportion of vignettes
Paediatric congenital malformations	15	1.88%
Brachial plexus	16	2.00%
Burns	28	3.50%
Amputations and prosthetic devices	36	4.50%
Infections	44	5.50%
Peripheral nerve injuries	46	5.75%
Allodynia excluding complex regional pain syndrome	48	6.00%
Rheumatic diseases (Dupuytren's contracture, rhizarthrosis, etc)	56	7.00%
Entrapment neuropathy	60	7.50%
Complex regional pain syndrome	66	8.25%
Non-surgical tendon disorders (tendinopathy, finger pulleys, etc)	73	9.16%
Hand injuries, excluding tendon disorders	74	9.25%
Wrists and ligaments of the fingers	76	9.50%
Orthotic devices	76	9.50%
Surgical tendon disorders	86	10.76%
Total	800	100%

described in the literature [12,16]. In total, 67 clinical vignettes were produced, comprising 227 items, with at least 3 items per vignette. A number was allocated to each vignette, and each item was coded according to the relevant disorder and step of the clinical reasoning process. A clinical vignette with all these details is shown in Table 3.

Optimisation following panellist responses

The 16 expert panellists received training on how to use the SCT. Training took place during an interactive session in which the experts explored script concordance in physiotherapy based on the work of Richard and Panchout [14]. This phase aimed to shed light on the different biases potentially able to influence the assessment, such as anchoring and mere-exposure effects [12]. The experts' responses and comments were collected via a digital platform (Woodlap©) adapted to the SCT and complying with the General Data Protection Regulation, in line with ethical standards and data privacy requirements. Twenty-one items were excluded from the SCT after manual optimisation, and 59 vignettes with 200 items were validated at the end of this step.

Optimisation after testing by volunteer rehabilitation specialists

A 61-item SCT was produced, using the vignettes designed by the writers, and tested on 24 volunteer hand rehabilitation specialists attending the 60th conference of the SFCM, on 20 December 2024 during a special workshop featured in the Paris conference

Table 3
Example of a clinical vignette and independent items for complex regional pain syndrome.

Clinical vignette	Item number	Hypotheses	Step of the clinical reasoning process	Additional clinical information
Mr X, age 75 years, a pensioner with an active lifestyle, attends an appointment on D + 30 after neurolysis of the median nerve in the dominant upper limb. He rates his pain, mainly occurring in the evening and at night, as 8 out of 10 on a visual analogue scale. The wrist is observed to be warm, swollen and stiff.	1	You decide to apply the motor imagery protocol.	Intervention	Patient shows signs of dyspraxia.
	2	A complex regional pain syndrome exists.	Investigation	Wrist shows signs of degenerative osteoarthritis.
	3	You decide to fit a brace.	Intervention	No change in pain after a week.
	4	You conclude that this is an aetiology of pain due to degenerative osteoarthritis of the wrist.	Inclusion and exclusion	Pain is constant.

Table 2
Steps of the clinical reasoning process prioritised by experts.

Step of the clinical reasoning process	Number of points	Target proportion of vignettes
Ability to make a guide diagnosis	86	14.33%
Ability to provide a prognosis for rehabilitation	87	14.50%
Ability to make a diagnosis of inclusion or exclusion for a patient with a hand complaint	138	23.00%
Ability to investigate with appropriate clinical tests	144	24.00%
Ability to intervene using appropriate rehabilitation techniques	145	24.17%
Total	600	100%

programme. The 24 participants were briefed beforehand and accompanied during the SCT. An in-depth analysis was conducted to identify poorly discriminating vignettes and items. Adjustments were made based on recommendations for excluding or adapting items shown to be poorly discriminating. Cronbach's alpha coefficient was also used to measure the internal consistency of the test. At the end of this step and after optimising the test, 23 items were removed as they were thought to lack discriminating power.

Results

After optimising the SCT, the following data were calculated based on the experts' responses:

- Mean correct response rate of 77.1% with a standard deviation of 5.2%.
- Median: 76.6%.
- Minimum: 69.4%.
- Maximum: 86.1%.

A Cronbach's alpha level of 0.88 was achieved, indicating the satisfactory internal consistency of the SCT. The SCT pass mark was set at 56.3% in keeping with guidance for subtracting four standard deviations from the mean obtained by the experts to define the target threshold [12].

The 24 participants achieved the following results:

- Mean correct response rate of 66.1% with a standard deviation of 5.7%.
- Median: 66.8%.
- Minimum: 46.7%.
- Maximum: 76.2%.

Only one of the 24 participants failed the SCT under these conditions.

Discussion

Specific practices and specialisation: the SCT in question

As is the case in all healthcare professions, expertise in physiotherapy and occupational therapy is based on a subtle interaction between specific practices, i.e. experience gained in specific clinical contexts, and specialisation, which implies advanced training in a target field. This dynamic is particularly apparent in contexts of uncertainty where clinicians need to activate specific knowledge while demonstrating their ability to apply their skills to atypical cases. The SCT appears to be a valuable instrument for assessing this expertise. It measures hand therapists' ability to activate their clinical scripts, i.e. cognitive structures able to rapidly associate clinical data with appropriate decisions [8,12,17].

However, use of the SCT reveals tensions between specific practices and specialisation. Clinicians who consider themselves specialists develop scripts which, although highly refined, can potentially be limited to their field. In contrast, general clinicians may provide less precise responses in specialised contexts, despite access to broader scripts [9]. This duality creates a challenge in SCT design which must include sufficiently specific scenarios to assess specific skills while applying general principles to guarantee clinical relevance. Lastly, studies on the SCT show that, far from being a fixed construct, expertise develops continuously with exposure and feedback, underlining the need for assessment systems able to adapt to these dynamics [18,19].

Choice of pass mark

The SCT pass mark is a decisive factor which influences the selectivity and educational relevance of the test. Several options were analysed on the observed performance. A threshold based on the mean minus four standard deviations, as recommended by Lubarsky et al. [12], is the reference standard for assessments. When applied to the study, this threshold allows 23 out of the 24 participants to pass the test. It balances selectivity and equity by aligning with expert practices.

Other thresholds, such as a concordant response rate of 40%, have the advantage of more achievable pass rates. This could, however, negatively affect SCT certification value, particularly if the aim is to guarantee a high standard of expertise in hand rehabilitation.

The threshold should therefore be guided by the specific objectives of the SCT. If the aim is to certify a high standard of clinical expertise, a threshold of 69%, the minimum expert score, may be chosen and would guarantee high selectivity. However, if the main objective is educational in nature, for instance, to identify professional development needs or promote learning, the threshold used in this study may be preferable. A compromise between strict requirements and inclusivity could highlight the benefit of SFRM-GEMMSOR using this instrument, for future participants.

Lastly, different standards of expertise could be envisaged for SFRM-GEMMSOR members based on SCT scores. In this context, it would no longer be a matter of a participant passing the test, but rather being awarded a standard instead, based on score category. Any professional could then join SFRM-GEMMSOR and be awarded a standard of expertise based on their SCT result.

The SCT, more than an assessment tool

The potential scope of the SCT, initially designed as a certification instrument for expert members of this professional association specialising in hand rehabilitation, has been shown to extend far beyond its original role as an assessment tool. Firmly rooted in script theory, it helps structure experts' knowledge

around cognitive maps adapted to real-world clinical situations. During training, the instrument promotes adaptive learning by exposing students to clinical cases that require them to activate their knowledge, justify their choices and adjust their reasoning based on comments received from experts during the test design phase [20]. Furthermore, the SCT stimulates reflective learning through formative assessment, which allows students to identify avenues for improvement and adjust their reasoning through constructive feedback, promoting a critical and progressive approach [12]. The instrument is also a means of collaborative learning since discussing the differences in responses encourages dialogue, thereby fostering understanding and cohesion within the group [16]. Lastly, the SCT can be readily integrated into a curriculum, to track the development of skills throughout training, while keeping students motivated through relevant and engaging clinical cases [21]. Extending its use beyond certification opens up new prospects for improving clinical reasoning and collaborative learning in the healthcare professional community, particularly in hand rehabilitation [22]. From this perspective, the preliminary work in this study on prioritising the steps of the clinical reasoning process and prevalent disorders can help clarify priority educational objectives, essential for improving hand rehabilitation practices. It also made it possible to code the SCTs according to the step of the clinical reasoning process and the main categories of disorders encountered. This approach enables the identification of areas for improvement in continuing professional development, based on a more detailed analysis of the results. This contributes to a partial educational needs assessment of the test participants.

Study biases and limitations

Although effective for assessing clinical reasoning in contexts of uncertainty, the SCT has a number of biases and limitations which must be taken into account to guarantee validity. The expert panel is a decisive factor in this respect. Homogeneity may bias the reference system, while a lack of consensus among experts reduces scoring reliability. Between 10 and 15 expert panellists are generally recommended, to guarantee sufficient robustness [8,12,19]. We attempted to limit this bias in the study by appointing 16 expert panellists. Participants also have noteworthy cognitive biases, such as the anchoring effect, which influences responses to align with the initial information, and the mere-exposure effect, which is advantageous for participants encountering scenarios resembling their personal experience, together with prior knowledge of the instrument [23]. The writers, expert panellists and participants received training and guidance on the use of the SCT to limit the latter bias.

Methodological biases include vignettes with ambiguous wording, which may generate incorrect responses and variations in participants' subjective interpretation of Likert scales [12]. Cultural biases also come into play, with variations in standard practices in different countries, institutions and disciplines, sometimes limiting the general applicability of results [17,24].

The SCT also has a number of conceptual and practical limitations in addition to these biases. Questions may also be raised concerning ecological validity, since clinical reasoning is assessed in simulated contexts which do not always consider real-world obligations such as time constraints or interactions between professions [25]. Furthermore, educational feedback is often limited as the SCT does not provide participants with detailed feedback in member certification contexts, as observed in this study [12]. Lastly, implementation requires extensive resources, which can limit use when resources are scarce [24].

The adjustments suggested in our study aimed to take into consideration known biases and limitations of the SCT.

Conclusion

This study demonstrated the use of the SCT as an innovative instrument to assess and certify the expertise of hand rehabilitation specialists within a professional association. SCT design is supported by a rigorous methodology, involving the selection and training of writers and experts, the creation of relevant clinical vignettes and the optimisation of items. The resulting instrument thus reflects the complexities and uncertainties inherent in clinical practice, while taking into account the disorders observed, prioritised by the experts, and the importance of certain steps of the clinical reasoning process in demonstrating expertise in hand rehabilitation. This approach also highlights challenges related to biases, ecological limitations of the SCT and composition of the expert panel. However, partnering with a company to design the SCT, making adjustments to diversify the panels and ensuring that writers followed a quality process helped overcome these obstacles and optimise the instrument.

For SFRM-GEMMSOR, certification of its members' professional expertise, awarding a standard of expertise based on the score obtained, identifying professional development needs from an educational perspective and constructing concordance training based on results potentially fall within the scope of the SCT.

Beyond its initial role as a certification instrument, the SCT has proven to be a powerful tool in adaptive, reflective and collaborative learning, as a means of improving healthcare professionals' skills. By expanding its scope, namely, to include continuing professional development, the SCT has established itself as a relevant instrument for assessing and developing expertise in hand rehabilitation.

CRedit authorship contribution statement

Conceptualization: Etienne Panchout (EP), Methodology: Etienne Panchout (EP), Investigation: Etienne Panchout (EP), Salomé Richard (SR), Mickaël Duveau Hoarau (MDH), Data curation: Etienne Panchout (EP),

Formal analysis: Salomé Richard (SR), Writing – original draft: Etienne Panchout (EP), Writing – review & editing: Frédéric Apaix (FA), Marie-Charlotte Branchet (MCB), Supervision: Etienne Panchout (EP), Mickaël Duveau Hoarau (MDH), Project administration: Frédéric Apaix (FA), Marie-Charlotte Branchet (MCB)

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Declaration of competing interest

Etienne Panchout is the managing director of SAS PAF2S mentioned in the document. Frédéric Apaix is president of SFRM-GEMMSOR.

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