

A new way to assess medical competencies: the Script Concordance Test (SCT) on line

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Solving medical ill-defined problems is a specific skill of experienced physicians. It is thus very interesting to assess such a competence. Assessing competencies is generally made with exercises (such as rich-context multiple-choice questions) where good answers originated from the consensus reached by a panel of experts, when in fact the reasoning process for solving ill-defined problems varies from one physician to another. Since 2000, B. Charlin and collaborators have defined a new kind of evaluation, set to measure the ability to resolve ill-defined problems. This evaluation method, called Script Concordance Tests (SCT), is set up on the script theory: we (or in our case physicians) use scripts (i.e. knowledge structures specifically adapted to the task we commonly perform) to quickly process information in order to confirm or eliminate hypotheses or options. We have developed a tool accessible from our EvaluToile web site (www.evalutoile.u-bordeaux2.fr) which allows teachers to set up the SCT questions, to manage their groups of experts, to invite experts to do the SCT (the tool then calculate the marks that will be given to students). And with this same site, students can do the SCT, and compare their results to those of the panel of experts they chose.

Keywords script concordance test; formative assessment; clinical reasoning evaluation; ill-defined problems; medical training; continuing medical education

1. Introduction

1.1 Evaluating the “solving ill-defined problems” competence

Solving ill-defined problems is a skill gained with experience. Such a competence has to be assessed so teachers can know how much of this competence their learners have gained. Assessing competencies is generally made with exercises, one of the most classical such exercise is multiple-choice question. In all of these exercises the good answers originate from the consensus reached by a panel of experts. But this principle of a consensus is the exact opposite of how the reasoning process happens: in fact the way experts solve ill-defined problems varies from one to another.

1.2 A new evaluation method: the script concordance test (SCT)

Since 2000, B. Charlin and collaborators have defined a new kind of evaluation, set to measure the ability to resolve ill-defined problems [1]. Their work has been done in the field of medical studies, and more particularly in the field of evaluation of physicians. This evaluation method, called Script Concordance Tests (SCT), is set up on the script theory: we (or in our case physicians) use scripts (i.e. knowledge structures specifically adapted to the task we commonly perform) to quickly process information in order to confirm or eliminate hypotheses or options. SCT have been tested by medical teachers in France, in Canada and in the USA. More than ten articles prove the interest of SCT for both medical studies and continuing medical education.

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2. Script Concordance Test

2.1 Building SCT

Building SCT is done in two main steps. In the first one, the medical teacher set up what is called a vignette.

A vignette contains data (mainly text, but radiographies or scanner images can also be used) presenting a challenging clinical case. The vignette is challenging because not all the data needed are provided or because several attitudes are acceptable. The teacher then selects one option or hypothesis relevant to the case, and he provides one new piece of information about the case.

The task for the student will be to evaluate the effect of this new information on the hypothesis using of a five-point Likert scale going from -2 (the hypothesis is not valid anymore) to +2 (the hypothesis is the good one). In fact, because it is a really hard and time consuming work to create vignettes, teachers can provide more than one hypothesis-information couple by vignette, but they have to ensure there is no link and no progression at all in these couples (SCT are not clinical cases type examinations).

In the second step, experts do the SCT, and their answers are recorded. These answers are then used to calculate the mark given to the students for each question. A very interesting point in the calculation of the score in SCT is that we can have more than one reference panel (say general practitioners, experts of the domain, students doing their internship), thus more than one scoring.

2.2 Using SCT

To evaluate students, we ask them to answer the SCT with the Likert type scale. When they have finished the test, we can give them more than one result, because they answers can be compared to experts of the domain, to older students, or to family physicians.

3. EvaluToile: a web site offering a SCT tool

Impressed by this new evaluation method and particularly to what it can bring to medical continuing education and to formative evaluation (self-evaluation is one of the best way to motivate learners using CBT or involved in eLearning) we decided to develop a tool to manage SCT.

This tool is accessible from our EvaluToile web site (www.evalutoile.u-bordeaux2.fr). With this site, the students can do the SCT, against the panel of experts they choose.

3.1 How teachers manage their SCT

But most importantly EvaluToile allows medical teachers:

- to set up the questions used in SCT,
- to manage their panels of experts, and ask the experts to do the SCT (the site automatically send the selected experts an email with a short explanation and a web link to reach the SCT),
- to see the results of examinations.

Titre	Tronc supra-aortiques
Vignette	Un homme de 67 ans, fumeur (2 paquets par jour depuis l'âge de 20 ans) présente une artériopathie des membres inférieurs avec une claudication d'effort de la jambe gauche à 300m. l'examen clinique montre, outre une abolition des pouls distaux à gauche, un souffle cervical gauche. Les pressions systoliques de cheville sont à 110 mm à droite et 80 mm Hg à gauche pour une TA à 110/70 mm Hg. L'échographie-doppler montre une aorte athéromateuse, une
Illustrations	
Public	Etudiants DCEM
Discipline	Médecine Vasculaire
Situation	Athéromatose
Format	Mixte

Fig. 1 : Creating a vignette.

Teachers fill-in Title and Vignette (clinical context) text boxes and set some properties as target audience (i.e. students, senior specialists) and speciality. Optionally, they can add figures to illustrate the case or to provide some more information as radiographies or scanner images.

Vignette
 Un homme de 67 ans, fumeur (2 paquets par jour depuis l'âge de 20 ans) présente une artériopathie des membres inférieurs avec une claudication d'effort de la jambe gauche à 300m. L'examen clinique montre, outre une abolition des pouls distaux à gauche, un souffle cervical gauche. Les pressions systoliques de cheville sont à 110 mm à droite et 80 mm Hg à gauche pour une TA à 110/70 mm Hg. L'échographie-doppler montre une aorte atheromateuse, une occlusion proximale de l'artère fémorale superficielle gauche, mais aussi une sténose de la carotide interne gauche au bulbe. L'ECG au repos est normal.

Domaine
 Pathologie des tronc supra-aortique

Hypothèse **Données**

Si ... Et ...

le pourcentage de sténose carotide interne G est de 60% en diamètre et le patient est coronarien vous instituez un traitement anti-agrégant plaquettaire et essayez d'obtenir l'arrêt du tabac

Illustrations Illustrations

Consigne
 Cette attitude vous apparaît ...

Nombre de niveaux de l'échelle ● 3 ● 5 ● 7

très inappropriée

inappropriée

neutre

appropriée

très appropriée

Fig. 2: Adding a new item.

Teachers can then add as many hypothesis-information couple (called item) as they like and set the possible answers as a 3-, 5- or 7-point Lickert scale. Here again, one or more figures can be uploaded to illustrate the hypothesis part or the new information one.

When all items have been created, the SCT author can submit it to some of the experts he gathered emails in his notebook part of the site. A management console, presented in Figure 3a, allow him to invite experts by simply checking the box in front of their name and see, later, if they have done the SCT. Figure 3b shows experts chosen by the author to be part of the reference panel and the mark they would have been given comparing their answers with other selected experts' ones.

Sélectionnez le groupe de référence: Spécialiste

Demandes Simulation Clés de correction Validation

Expert	Demande	Réponse	Vue	Validée	
<input checked="" type="checkbox"/> B. L.	24/02/2005 à 11:32	24/03/2005 à 11:32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Supprimer demande Enlever réponses
<input checked="" type="checkbox"/> C. P.	24/02/2005 à 11:32	24/03/2005 à 11:32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Supprimer demande Enlever réponses
<input checked="" type="checkbox"/> C. C.	24/02/2005 à 11:32	24/03/2005 à 11:32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Supprimer demande Enlever réponses
<input checked="" type="checkbox"/> C. J.	24/02/2005 à 11:32	24/03/2005 à 11:32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Supprimer demande Enlever réponses
<input checked="" type="checkbox"/> L. P.	24/02/2005 à 11:32	24/03/2005 à 11:32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Supprimer demande Enlever réponses
<input checked="" type="checkbox"/> P. B.	24/02/2005 à 11:32	24/03/2005 à 11:32	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Supprimer demande Enlever réponses

Vous pouvez personnaliser le message envoyé à vos confrères.
 #url# sera remplacé par l'url propre à chaque expert.

Fig. 3a: Invitations management console.

Sélectionnez le groupe de référence: Spécialiste

Demandes Simulation Clés de correction Validation

Expert	Score	Réussite
<input checked="" type="checkbox"/> B. L.	83 % (5/5)	100 %
<input checked="" type="checkbox"/> C. P.	63 % (4/5)	80 %
<input checked="" type="checkbox"/> C. C.	73 % (4/5)	80 %
<input checked="" type="checkbox"/> C. J.	83 % (5/5)	100 %
<input checked="" type="checkbox"/> L. P.	43 % (3/5)	60 %
<input checked="" type="checkbox"/> P. B.	73 % (4/5)	80 %

Avec les experts sélectionnés, vous obtenez :

- Moyenne = 69 %
- Ecart-Type = 13,76

Fig. 3b: Composing the reference panel.

When, at least, one reference panel is composed and validated by the author, the SCT can be incorporated into a SCT set. This set can be always available to students or only available during a predefined time period and can be time limited.

3.2 How students do a SCT

Students can look for a SCT set, by providing search criteria as target audience or speciality. After choosing one in the results list, the candidate indicates which expert panel will be his reference during the examination. The SCT set can then be run. SCTs from the set are randomly displayed to the student, and items within each SCT are also randomly provided, one by one. The site provides a new item when

the student has answered one. The examination can be set up to show or not the mark each point of the Lickert scale yields, computed with the answers given by the experts of the reference panel (the one selected by the student).

Figure 4a shows how an item is displayed. By placing the mouse cursor over each colored square (representing the Lickert scale points), a title is displayed just above telling what the choice corresponds to. Figure 4b shows the result after choosing the fourth point. You can see my answer yields 100 points. This shows this is the answer the more experts chose.



Fig. 4a: Display of an item, waiting for answer.



Fig. 4b: Answer to an item and its mark.

After the last answer, the student can see how many points he gained for each SCT of the examination and a global mark. A graphical representation is also displayed showing a kind of “concordance zone” between student’s and experts’ answers. If more than one reference panel are available for this examination, the student can select any of them. Marks and gained points are re-computed accordingly to the new panel experts’ answers.

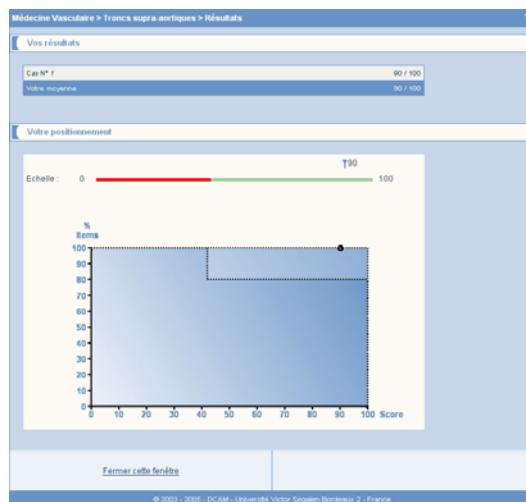


Fig. 5: Display of the results.

4. Conclusion: Evolutions of our SCT tool

This tool can be used in both medical studies and in continuing medical education. It is now used:

- as the self-evaluation of online courses of the Victor Segalen Bordeaux 2 University,
- as the assessment of the French neurosurgery residents by Campus Numérique de Neurochirurgie (neurosurgery digital campus, <http://www.unilim.fr/campus-neurochirurgie/>),
- by the medical continuing education committee of Université Médicale Virtuelle Francophone (UMVF, French speaking virtual medical university),
- by the College of the Teachers of Vascular Medicine as a continuing medical education tool.

4.1 Evolution of our SCT tools

The first main evolution has been made one and a half year ago [3]. At that time, teachers have to have their experts do the SCT by hand, then calculate the score and put it in our tool. In our version 2, this is now automatically done and computed through the tool.

We have two other evolutions, which are less important. The first one is including some statistical calculation that could help the validation of the scores. B. Charlin and his collaborators are using the α coefficient of Cronbach [2]. The second one will be a way to allow teachers to exchange SCT, with or without scores.

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