

## The structure of reflective practice in medicine

SILVIA MAMEDE<sup>1</sup> & HENK G SCHMIDT<sup>2</sup>

**BACKGROUND** The capability to reflect consciously upon one's professional practice is generally considered important for the development of expertise and, hence, for education. However, to our knowledge no empirical research has been conducted to date into the nature of reflective practice in medicine.

**PURPOSE** To study the structure of reflective practice in medicine.

**METHODS** A questionnaire based on the literature was developed and administered to a group of primary care doctors. The data were subjected to confirmatory factor analysis using structural equations modelling.

**RESULTS** A 5-factor model of reflective practice emerged. It consisted of the following factors: deliberate induction; deliberate deduction; testing and synthesising; openness for reflection, and meta-reasoning. The model fitted the data sufficiently.

**CONCLUSION** A multidimensional structure of reflective practice in medicine was brought to light by the study. Its components in terms of reasoning processes, behaviours and attitudes were identified and measured among doctors. Once conceptualised and measured, reflective practice can be studied to gain a better understanding of its relation to expertise development in medicine. In addition, training students to apply reflective practices may become a goal in medical education.

**KEYWORDS** education, medical, continuing/\*methods; family practice/\*education/methods; clinical competence/standards; \*mental processes.

<sup>1</sup>Innovare Institute, Fortaleza, Ceará, Brazil

<sup>2</sup>Institute of Psychology, Faculty of Social Sciences, Erasmus University, Rotterdam, The Netherlands

*Correspondence:* Henk G Schmidt, Institute of Psychology, Faculty of Social Sciences, Erasmus University, PO Box 1738, 3000 DR Rotterdam, The Netherlands. Tel: 00 31 10 408 9648; Fax: 00 31 10 408 9009; E-mail: schmidt@fsw.eur.nl

*Medical Education* 2004; **38**: 1302–1308

doi:10.1111/j.1365-2929.2004.01917.x

### INTRODUCTION

The purpose of this article is to report on a study into the reflective practices of doctors. It is generally assumed that reflective practice, that is, the preparedness of doctors to think critically and to engage themselves in reflection upon their professional activities, would contribute to the improvement of their performance.<sup>1–3</sup> The changing context of health care delivery and the growth of the medical knowledge base are placing high demands on the doctor's expertise. Indeed, clinical practice has become increasingly characterised by change, ambiguity and complexity.<sup>3,4</sup> A renewed professionalism in medicine has been emphasised and one of its key requirements is that doctors develop the ability to critically reflect upon their own decisions.<sup>4–7</sup> Gaining an understanding of what reflective practice entails may therefore be a useful endeavour.

In modern times, the notion of reflection as a contributor to the improvement of practice has its roots in the work of John Dewey.<sup>8,9</sup> For Dewey<sup>10</sup> reflective thought (as he calls it) is provoked by an event in one's life that arouses a state of doubt, perplexity or uncertainty, and leads the individual to search for possible explanations or solutions. This happens through what he conceptualises as a 5-stage process of reflective thought, which comprises:

- 1 a state of doubt, perplexity or uncertainty due to an emerging difficulty in understanding an event or solving a problem;
- 2 definition of the difficulty by thoroughly understanding the nature of the problem;
- 3 occurrence of a suggested explanation or possible solution for the problem, through inductive reasoning;

## Overview

### What is already known on this subject

The literature on expert performance suggests the concept of reflective practice as a primary mechanism in expertise acquisition.

Critically reflecting upon one's professional practices is generally considered important for the development of expertise in medicine.

### What this study adds

Reflective practice in medicine turns out to have a 5-factor structure: deliberate induction; deliberate deduction; testing; openness to reflection, and meta-reasoning.

Its components were shown to fit the empirical data.

### Suggestions for further research

The relationship between reflective practice and medical expertise development should be investigated.

Can educational interventions promote reflective practice among doctors?

- 4 rational elaboration of ideas produced through abstract, deductive thought focusing on their implications, and
- 5 testing resulting hypotheses by overt or imaginative action.

Other authors have built upon Dewey's ideas to explore the concept of critical thinking and have highlighted its attitudinal dimensions.<sup>11,12</sup> In its broad conception, 'critical thinking' is defined in the literature as a set of multidimensional skills consistent with Dewey's construct of 'reflective thinking'. In this sense, the terms 'reflective' and 'critical' may be interchangeable.<sup>13</sup>

More recently, Schön<sup>14</sup> proposed the idea of 'reflective practice'. According to Schön, professionals' practice is largely based upon tacit knowledge ('knowing-in-action'), the use of which increases as practice becomes stable. Professionals tend to be

selectively inattentive to phenomena that do not fit the categories of their knowing-in-action and miss opportunities to think about what they are doing. Schön's 'reflective practitioner' would notice when a phenomenon at hand, such as an unexpected outcome of treatment, eluded his or her ordinary categories of knowing-in-action. A process of 'reflection-in-action' would, then, start by defining the problem within the dynamics of the situation and identifying the decisions to be made, the ends to be achieved and the means to be chosen. In a subsequent stage, the professional may critically review his or her initial understanding of the problem and develop more complex representations that lead him or her to generate solutions. Their validity is tested in a next step, through analysing scenarios and consequences, or the pros and cons of each alternative, whose adoption would enrich the professional's knowledge structure and practice. In addition, Schön proposed the construct of 'reflection-on-action', as a reconstructive mental review that occurs later on, after the event, and provides opportunities to learn from the earlier decision making process.

The concept of reflective practice fits in well with recent psychological theories that attempt to explain the development of professional expertise. Studies in various professional fields have reinforced the idea that the development of expertise occurs through a process of cognitive restructuring of the knowledge upon which the expert acts.<sup>15</sup> In the medical domain, for instance, it is assumed that, through practice, biomedical knowledge is replaced by, or becomes 'encapsulated' into, clinical knowledge.<sup>16,17</sup> Ericsson and Charness<sup>15</sup> assume that expertise entertains a linear relationship with amount of experience. However, experience alone has been demonstrated to be not enough. Studies on expert performance have brought about the concept of 'deliberate practice' as the primary mechanism by which to acquire expertise. Deliberate practice is an effortful activity conducted with the goal of improving performance. In this sense, it differentiates from the activities the individual carries out as part of routine work or for play. It has been shown, for instance, that expert pianists listen to their own performance of a piece very critically while practising, and do not simply repeat the piece but concentrate on extensively rehearsing those parts that need improvement.<sup>18</sup> A general practitioner who studies the diagnosis of an internist to whom he or she has referred a patient with the view of doing a better job when encountering a similar patient is also engaged in deliberate practice. Central to the concept of deliberate practice is:

- critical reflection upon one's practices,
- focusing on weaknesses in one's performance;
- in particular when encountering difficult or unexpected problems, and
- with the goal of improving performance.

Conceptualised this way, the similarities with the idea of reflective practice are striking. Therefore, we will use the term 'reflective' interchangeably with 'deliberate' in relation to professional practice.

Empirical studies on the nature of reflective practice are rare. In medicine, as far as we know, they are virtually absent. Indeed, interest in the theme of reflection has grown only in recent years. The literature to date confines itself to reports of attempts to implement reflective practices<sup>19,20</sup> or proposals of educational approaches for its development.<sup>21,22</sup> The only exception is perhaps the teacher<sup>23,24</sup> and nursing<sup>25</sup> expertise literature, in which the theme of reflection has been further explored. We do not yet know, however, which behaviours constitute reflective practice in the health professions. To our knowledge empirical evidence in this respect is entirely missing.

In this contribution, results will be reported of a first attempt to empirically study the structure of reflective practice in doctors. To that end, a questionnaire was developed, inspired by the work of both Dewey and Schön, consisting of items referring to 1 of 5 dimensions of reflective practice in medicine that we wish to distinguish. In agreement with the literature, we assume that reflective thought is unlikely to occur in familiar, or routine, situations. In those situations the expert doctor's reasoning is thought to be characterised by the application of automatic, tacit knowledge that requires no conscious attention.<sup>26</sup> In addition, we assume that reflective practice is an effortful, deliberate attempt to learn from experience, akin to the idea of deliberate practice put forward by Ericsson and Charness.<sup>15</sup> The dimensions proposed here are:

#### **Deliberate induction**

In response to an unfamiliar problem, the reflective doctor will take time to generate possible alternative explanations for it. As stated, the concept of deliberation is used here to indicate that this type of induction requires an effortful and conscious attempt rather than an automatic one.

#### **Deliberate deduction**

When a number of hypotheses is generated, the doctor may engage in 'deliberate deduction'.

Deliberate deduction is the logical deduction of consequences of these hypotheses in terms of possible signs and symptoms the present patient must have if any of these hypotheses were true.

#### **Testing these hypotheses against the problem at hand**

Testing predictions against the problem leads to hypotheses verification.

The first 3 components of what we see as reflective practice in medicine describe the thinking activities of reflective practitioners in this field. Based on Dewey's view of the skills required for reflective thinking<sup>10</sup> and its affective dimensions, more recently emphasised by others,<sup>11,12</sup> we believe that 2 other aspects of reflective practice need to be included: an attitude of openness towards reflection and meta-reasoning.

#### **An attitude of openness towards reflection**

The doctor must be willing to engage in this kind of constructive activity when confronted with a difficult or unfamiliar problem, and not to just discard it. In addition, the doctor must tolerate the uncertainty or ambiguity that usually characterise the period of reflection.

#### **Meta-reasoning**

'Meta-reasoning' refers to the ability to think about one's own thinking processes and to critically review one's own assumptions or beliefs regarding a problem.

The 5 components in our model do not correspond to a technically based strategy to be used, step-by-step, by doctors. In fact, they represent different dimensions that may overlap and occur in the action-present as well as after the event.

---

## **METHOD**

The questionnaire was administered to a group of primary care doctors and the results were submitted to confirmatory factor analysis using structural equation modelling.

#### **Participants**

The participants consisted of 202 doctors in clinical practice in primary health care in major cities in the

Brazilian state of Ceará (84 females and 118 males). At the time of the study around 1100 doctors worked in public family health services in the state. The study population's mean age was 43.01 years (SD = 10.85 years). The doctors had on average almost 17 years of practice (SD = 10.45). The average number of patients seen each week was 147.82 (SD = 95.22). A small number of respondents saw an unusual number of patients, and were hence responsible for the large standard deviation. A research assistant visited the participants in their offices. The questionnaire was self-administered and returned to the assistant.

### Instrument

The questionnaire consisted of 87 questions, 65 of which referred to aspects of reflective thinking. The other questions enquired about sex, age and education. In addition, questions were asked about the nature of the participant's practice, in terms of the number of patients seen, number of difficult problems encountered, current and previous positions, and amount of practice. The items were either 5-point Likert items of the agree–disagree type or the never–always type, or questions to which participants could respond with an estimate. The number of items addressing each dimension varied from 12 to 20. Deliberate induction was measured by items such as: 'Exploring signs and symptoms not compatible with the conjectures I made about a patient's problem can be a worthwhile device for reaching a diagnosis'. Deliberate deduction was measured by items such as: 'How many times in the last 4 weeks have you designed a systematic plan for exploring all the hypotheses taken into consideration for a patient's problem?' Testing hypotheses consisted of items such as: 'I adjusted treatment in the light of knowledge about feasibility of possible measures acquired while dealing with previous similar patients'. Openness to reflection was measured by items such as: 'Uncertainty with regard to a patient's problem is a good starting point for managing a case'. Meta-reasoning was measured by items such as: '... how many times during the last 4 weeks I realised that my own expectations with regard to problem control were likely to be unrealistic.'

### Statistical analysis

The data were analysed using the structural equation modelling program AMOS,<sup>27</sup> enabling us to test whether the hypothesised 5 latent factors explain the structure of the empirical data collected through

the questionnaire. The program provides a number of relevant statistics, among them a chi-square statistic that can be used to test whether the empirical data sufficiently fit the *a priori* theoretical model. In addition, other statistics have been developed for the evaluation of a particular model, such as the comparative fit index (CFI), used to measure the improvement in amount of fit relative to a model, assuming independence among variables. The CFI should be larger than 0.90 if a model is to fit the data sufficiently. The root mean square error of approximation (RMSEA) is another relevant statistic of fit. It represents the root square of the chi-square divided by the number of degrees of freedom and takes into account the relative complexity of the model tested. It should be no larger than 0.10. Chi-square divided by the number of degrees of freedom (df), finally, should be no larger than 4.

---

## RESULTS

The 5-factor latent structure was tested against the data assuming that the 5 factors were independent of each other. In addition, several alternatives were tested. In the first, all factors were allowed to correlate, that is, they were considered dependent on each other. The second alternative assumed that underneath the 5 factors resides a second-order latent factor that causes the others. Here the assumption is that although the 5 factors can be distinguished, they are all part of a 'deeper', unitary reflective practice process. The third alternative assumed a 1-factor solution. All items were supposed to load on the same underlying factor. Besides these theoretically expected alternatives, other models were also tested to verify whether they could better explain the empirical data. Table 1 summarises the findings.

The results displayed in Table 1 suggest that Model 2 (all factors correlated), Model 3 (5 first-order factors, 1 second-order factor), and Model 5 (some factors correlated) explain the empirical data equally well. The other alternatives must be rejected based on these data. In addition we tested some models involving more factors, but all of these failed. Although empirically the 3 acceptable models cannot be distinguished, it is clear that Models 2 and 5 are slight variations on the same theme, of which Model 5 is more in line with the actual data (Table 2). In addition, Model 5 is to be preferred over Model 3 because it has a simpler structure, as expressed by the larger degrees of

Table 1 Summary statistics of 5 tests of the reflective practice model

Model	Chi-square	d.f.	P	Chi-square/ d.f.	CFI	RMSEA
1 5 factors: all factors independent	1157.77	432	0.01	2.68	0.71	0.09
2 5 factors: all factors correlated	634.14	422	0.01	1.50	0.92	0.05
3 1 second-order, 5 first-order factors	656.89	427	0.01	1.54	0.91	0.06
4 1 factor	2044.3	434	0.01	4.71	0.36	0.14
5 5 factors: correlations between meta-reasoning and induction, and openness and deduction	642.07	430	0.01	1.49	0.92	0.05

Table 2 Factor correlation matrix

	Deliberate induction	Deliberate deduction	Testing and synthesising	Openness for reflection
Deliberate induction				
Deliberate deduction	0.190			
Testing and synthesising	0.020	0.042		
Openness to reflection	- 0.061	0.264*	- 0.003	
Meta-reasoning	0.839*	0.175	0.041	- 0.072

\*  $P < 0.05$ .

Table 3 Descriptive statistics for the 5 factors

Factors	No. of items	Range	Minimum	Maximum	Means	Standard deviation	Alpha reliability
Meta-reasoning	7	13.29	1.00	14.29	2.66	0.96	0.68
Deliberate induction	8	14.29	0.96	15.25	2.47	1.08	0.83
Deliberate deduction	6	18.80	- 4.96	13.83	2.28	2.76	0.81
Testing and synthesising	6	2.83	2.00	4.83	3.61	0.55	0.79
Openness to reflection	6	8.85	0.82	9.67	3.48	1.77	0.86

freedom. The latter is a methodological rather than an empirical preference.

A summary of descriptive statistics for the 5 dimensions is presented in Table 3.

The data displayed in Table 3 suggest that the 5 scales have sufficient measurement reliability, perhaps with the exception of the meta-reasoning scale. However, one should take into account the fact that conventional measures of reliability

tend to be sensitive to the number of items involved.

## DISCUSSION

In this study, the assumption was made that doctors who regularly reflect upon their professional activities and try to learn from their practice may ultimately serve their patients better than those who do not. There is some indirect evidence from the deliberate

practice literature<sup>15</sup> that this assumption may be true. The question then is: what exactly constitutes reflective practice? Based on a review of the relevant literature, we postulated that reflective practice consists of 5 sets of behaviours in response to difficult problems encountered in professional practice. To test the plausibility of the proposed dimensions, a self-report instrument was developed and administered to a group of primary health care doctors. The resulting data were analysed using confirmatory factor analysis. The data fitted the hypothesised 5-factor solution quite well.

What do these findings imply? First, it turns out to be possible to measure, among doctors, differences in approach to difficult medical problems. Some doctors are more inclined than others to deal with these problems in a reflective fashion. These differences can be quite large. Some of our sample never engaged in such deliberate practice, whereas others would do this more or less routinely when faced with such problems.

A second implication of the results is that reflective practice in medicine does not seem to be a unitary phenomenon but has a multidimensional structure. The evidence for a 5-factor structure (rather than a structure comprising of fewer factors) is fairly strong because alternatives could be rejected. A model in which correlations were assumed between deliberate induction and meta-reasoning on the one hand, and deliberate deduction and openness for reflection on the other, showed the best fit and is theoretically defensible. It is reasonable to expect that meta-reasoning influences the depth with which individuals conduct inductive thinking to explore possible explanations for the problem. Openness towards reflection could also be seen as enhancing or restricting the extent to which a doctor investigates his or her initial hypotheses for a problem.

The present study provided elements of a structure of reflective practice in medicine, defining its constituents and identifying behaviours, attitudes and reasoning strategies that reveal them. It is a first step to further investigating possible relations between doctors' reflective practices and the degree of expertise they develop and are able to maintain throughout their professional lives. The latter may also contribute to designing strategies for organising professional experience in such a way that it promotes expertise development. Indeed, structuring reflective practice so that the analytic components of medical reasoning can be reinforced is recognised as a major need and, on the other hand, as a difficult

challenge.<sup>2</sup> This issue is related to another possible implication of our findings, which concerns whether reflective practice can be taught. Several authors suggest that, to the extent that critical thinking comprises a set of skills, it could be developed in others, not in the abstract, but within a certain domain.<sup>13</sup> Better understanding of the thinking process is considered crucial for making it teachable. In this sense, understanding the structure of reflective practice in medicine may contribute to the implementation of well designed educational programmes. It is still to be explored if and how such programmes could promote reflective practice among students and doctors. In addition, it remains to be seen whether the changes potentially produced by educational interventions would last and whether they would have a longterm effect on practice. Future research will tell.

---

## CONTRIBUTORS

Both authors designed the study. Silvia Mamede undertook the literature review and supervised the data collection. The authors jointly analysed the data, interpreted the findings and wrote the paper.

---

## ACKNOWLEDGEMENTS

The authors would like to acknowledge Dr Alvaro Leite, Dr João Macedo, Dr Júlio Penaforte and Dr Vic Dubois for their collaboration in the questionnaire design.

---

## FUNDING

The preparation of this article was supported by a grant to the first author by the Department for International Development (DfID), UK.

---

## ETHICAL APPROVAL

The study was carried out in Brazil. The consent of participating doctors was sought and acquired.

---

## REFERENCES

- 1 Epstein RM. Mindful practice. *JAMA* 1999;**282**:833–9.
- 2 Guest CB, Regehr G, Tiberius RG. The lifelong challenge of expertise. *Med Educ* 2001;**35**:78–81.
- 3 Maudsley G, Strivens J. Promoting professional knowledge, experiential learning and critical thinking for medical students. *Med Educ* 2000;**34**:535–44.

- 4 General Medical Council. *Tomorrow's Doctors: Recommendations on Undergraduate Medical Education*. London: GMC 1993.
- 5 Arnold L. Assessing professional behaviour: yesterday, today and tomorrow. *Acad Med* 2002;**77**:502–14.
- 6 American Board of Internal Medicine. *Project Professionalism*. Philadelphia: American Board of Internal Medicine 1995.
- 7 Swick HM. Toward a normative definition of medical professionalism. *Acad Med* 2000;**75**:612–6.
- 8 Boud D, Keogh R, Walker D. *Reflection: Turning Experience into Learning*. London: Kogan Page 2000.
- 9 Kolb DA. *Experiential Learning: Experience as a Source of Learning and Development*. Englewood Cliffs, New Jersey: Prentice Hall 1984.
- 10 Dewey J. *How We Think*. Boston: Heath 1933.
- 11 Brookfield SD. *Developing Critical Thinkers*. San Francisco: Jossey-Bass 1987.
- 12 Boyd EM, Fales AW. Reflective learning: key to learning from experience. *J Humanistic Psychol* 1983;**23**:99–117.
- 13 Garrison DR. Critical thinking and adult education: a conceptual model for developing critical thinking in adult learners. *Int J Lifelong Educ* 1991;**10**:287–303.
- 14 Schön DA. *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books 1983.
- 15 Ericsson KA, Charness N. Expert performance: its structure and acquisition. *Am Psychol* 1994;**49**:725–46.
- 16 Patel VL, Evans DA, Groen GJ. Reconciling basic science and clinical reasoning. *Teach Learn Med* 1989;**1**:116–21.
- 17 Schmidt HG, Norman GR, Boshuizen HPA. A cognitive perspective on medical expertise: theory and implications. *Acad Med* 1990;**65**:611–21.
- 18 Ericsson KA, Krampe RT, Tesch-Romer C. The role of deliberate practice in the acquisition of expert performance. *Psychol Rev* 1993;**100**:363–406.
- 19 Arseneau R. Exit rounds: a reflective exercise. *Acad Med* 1995;**70**:684–7.
- 20 Snadden D, Thomas ML, Griffin EM, Hudson H. Portfolio-based learning and general practice vocational training. *Med Educ* 1996;**30**:148–52.
- 21 Heidenreich C, Lye P, Simpson D, Lourich BA. The search for effective and efficient ambulatory teaching methods through the literature. *Pediatrics* 2000;**105**:231–7.
- 22 Scott Smith C, Irby DM. The roles of experience and reflection in ambulatory care education. *Acad Med* 1997;**72**:32–5.
- 23 Francis D. Critical incident analysis: a strategy for developing reflective practice. *Teachers Teaching: Theory Pract* 1997;**3**:169–88.
- 24 Hatton N, Smith D. Reflection in teacher education: towards definition and implementation. *Teaching & Teacher Educ* 1995;**11**:33–49.
- 25 Maynard CA. Relationship of critical thinking ability to professional nursing competence. *J Nurs Educ* 1996;**35**:12–8.
- 26 Schmidt HG, Boshuizen HPA. On acquiring expertise in medicine. *Educational Psychol Rev* 1993;**5**:1–17.
- 27 Arbuckle JL, Wothke W. *AMOS Users' Guide, Version 4.0*. Chicago: Small Waters Corporation 1999.

*Received 3 March 2003; editorial comments to authors 3 April 2003; accepted for publication 17 November 2003*