

# PATSy & VL-PATSy: Online Case-Based Training for Healthcare Professionals

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## Abstract

This paper describes PATSy (<http://www.patsy.ac.uk>), an online repository of virtual patient cases for training and research for students and practitioners in the clinical sciences. A typical student session with PATSy is illustrated. An extension to PATSy that adds vicarious learning resources (VL-PATSy) is also described. The concept of vicarious learning is outlined and results from a study of learning outcomes from VL-PATSy are presented. PATSy and VL-PATSy will be demonstrated at the symposium.

## Introduction

This paper describes the *Patient Assessment Training System* (PATSy, <http://www.patsy.ac.uk>) and an extension of it called VL-PATSy. PATSy is an established online case-based teaching and learning resource used for training students of medicine, health science and clinical psychology. It is a web-based generic shell designed to accept data from any discipline that has cases. The disciplines represented currently include developmental reading disorders, neuro psychology, neurology/medical rehabilitation and speech and language pathologies. Sixty-one data-rich and extensively described cases of adults and children with disorders are accessible under 4 domain headings - speech and language, dyslexia, medical rehabilitation and neuropsychology. The system is currently used by 21 university departments in the UK and overseas, including the majority of UK Speech and Language science departments. PATSy has been designed to meet the needs of both students in initial clinical education (ICE) as well as by professional clinicians undergoing continuing professional development (CPD). PATSy allows tutors to expose an entire class of students to the same cases. This is an advantage because clinical placement experiences are different for each student, and

do not necessarily expose students to a wide range of cases. PATSy also contains published and rare cases that can bring the journal literature alive for students. Pedagogically, PATSy is designed for use in blended learning contexts *i.e.* in conjunction with more traditional methods of clinical training, professional education and academic teaching. It serves as an electronic archive for case-based research as it contains rich collections of test data and it provides health science students with opportunities to practice diagnostic reasoning on ‘virtual patients’. Students can access real patient data in the form of videos, assessments, and (anonymized) medical histories. They may practice their clinical skills at any time and repeatedly (even on the same patient!). With PATSy, students ‘learn by doing’ (e.g. Anderson, Corbett, Koedinger & Pelletier, 1995).

In the following sections PATSy's features will be illustrated with examples taken from the Speech and Language Therapy (SLT) domain.

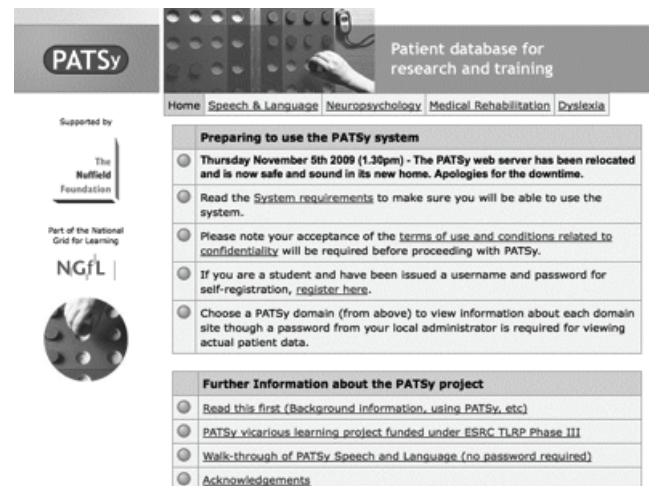


Figure 1: PATSy front page

Clinical reasoning in SLT

Teaching clinical reasoning is very challenging because students find hypothesis generation and systematic hypothesis testing very difficult. The cognitive load of diagnostic reasoning is immense. *Inter alia*, students need:

- knowledge of heuristics for the generation of hypotheses based on theory or observation
- an ability to conceptualize the problem space and represent it appropriately
- the ability to design a testing strategy (e.g. explore one thing at a time)
- to be able to change strategy as a function of reasoning stage (e.g. do ‘broad brush’ tests first)
- an ability to weigh evidence (Hoben, Varley & Cox, 2007).

Experienced SLT therapists diagnose speech & language disorders using a variety of reasoning modes. Novices, however, are encouraged to generate and test hypotheses *i.e.* operate exclusively in the hypothetico-deductive mode. Hypothesis testing takes the form of assessing a patient's language performance using appropriate (psychometric and language) tests and testing sequences. As a student's expertise slowly develops, s/he must be scaffolded during the transition to more heterogeneous, expert modes that include case-based reasoning. The challenge is to support students to help them ‘grow’ their personal case-base so that it becomes large and varied enough to allow them to add case-based reasoning to their reasoning repertoire. PATSy (and VL-PATSy - described below) are designed to support such learning transitions.

A typical student PATSy session

The student logs in (Figure 1) and selects a domain (e.g. Speech and Language) and is directed to the speech and language home page. The student then selects the required type of case. This can be by age group - (“adult, child, either. The student can also set logging to “on” or “off”. A PATSy log records, for each student, system-generated data (time stamped logs of PATSy areas visited, tests accessed, test items ‘administered’ to the patient, etc.). This system-generated data is interleaved with text written by the student in response to prompts such as ‘Conclusions so far?’, and ‘What next?’ Throughout a PATSy training session students are encouraged to state their model-derived hypotheses in advance, to reflect on their conclusions and to explicitly state what they plan to do next based on those conclusions.

Selecting case ‘DBL’, the user is presented with a list of options (Figure 2). The case consists of a medical history, video clip(s) and assessment data. At this point students typically observe video clips of the patient speaking or read the medical history. The student may then be required

to formulate a clinical hypothesis, based on his or her initial observations. A wide range of test data is available for each patient (average 27 tests - Figure 3). Test data consists of text, images, phonetic (IPA) transcriptions of patient utterances, and audio clips of clinician and patient utterances and spoken responses. Tutors can choose to instruct students to optimize their test selections in order to efficiently converge on a diagnosis to spare the ‘patient’ unnecessary testing and to minimize costs.

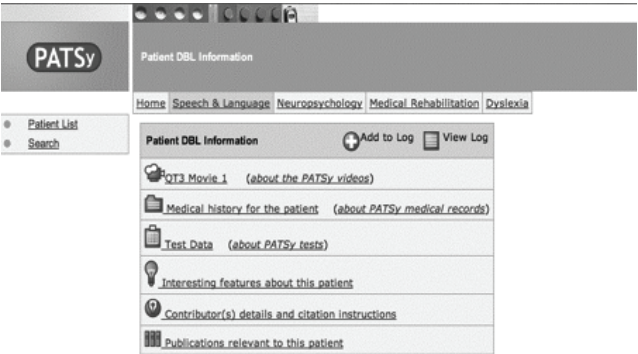


Figure 2: Resources for virtual patient case ‘DBL’ under PATSy's Speech and Language Therapy domain heading.

Test	Max	Total	Correct Score	Proportion correct
ADA L1: Lexical Decision (spoken)	100	143	89	
ADA L1W: Lexical Decision (written)	100	142	89	
ADA L2W: Reading of Words	80	65	81	
ADA P1: Minimal Pairs same voice non-words	40	39	98	
ADA P2: Minimal Pairs different voice non-words	40	29	73	
ADA RW: Nonword Reading	40	20	50	
Howard & Franklin 100 pictures: Naming	100	68	68	
Howard & Franklin 100 pictures: Reading	100	90	90	
Howard & Franklin 100 pictures: Repeating	100	100	1	
Nonword and Word Repetition	80	73	91	
Palpa 49: Synonym Judgement (spoken)	60	47	67	
Palpa 50: Synonym Judgement (written)	60	46	77	
Pyramids and Palm Trees (picture-picture condition)	52	47	90	
Pyramids and Palm Trees (picture-word condition)	52	43	83	
Pyramids and Palm Trees (word-word condition)	52	38	73	
Short-term digit recall (auditory)		3.75		
Short-term digit recall (visual)		3		
Short-term matching span (auditory)		4		
Short-term matching span (visual)		3		
TROG (spoken)	20	11 blocks		
Western Aphasia Battery	100	82.7	.827	

Figure 3: Tests and assessments available to PATSy users for case 'DBL'

The student records the patient's test results on the test's score sheet, as if the student were actually in a clinic. In light of the test data, the student may revise his or her initial clinical hypothesis until the student is satisfied that sufficient information to diagnose the nature of the patient's speech and language problem has been acquired. To illustrate, consider an item from the Test of Reception of Grammar (TROG - Bishop, 1989) shown in Figure 4.

The student can play a sound file of the sentence spoken by a speech therapist to the patient “*The pencil on the shoe is blue*”). The student can then click on a button to reveal the picture that the patient pointed to in response (depicted by an animated arrow). Note that the patient made a correct response to this particular item. In the case of erroneous responses, the student is expected to score them and interpret their clinical significance.

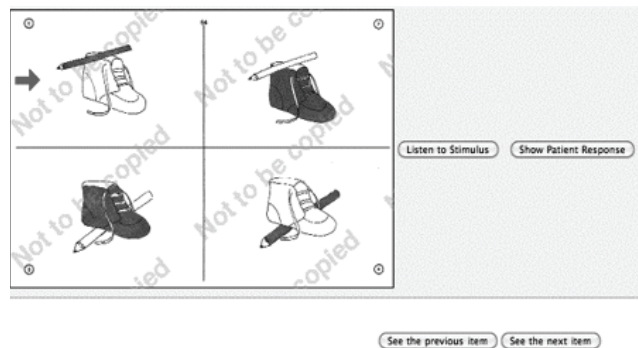


Figure 4 - Item 54 from the Test of Reception of Grammar (TROG, Bishop, 1989) as realized on the PATSy system.

## VL-PATSy

Resources designed to support vicarious learning by students using PATSy's speech and language therapy domain have been added to the original PATSy system. Vicarious learning (VL) is the notion that people can learn through being given access to the learning experiences of others. Our conception of VL draws theoretically from several sources: social cognitive theory (e.g. Bandura, 2001), social constructivism (e.g. Palincsar, 1998), evolutionary psychology (e.g. Byrne & Russon, 1998), case-based learning (e.g. Williams, 1993), and reflective practice (Schon, 1983). Simple traditional examples are instances such as master classes in music, 'crit sessions' in architectural design training, and the process of clinical teachers going through cases with students. In these situations, one student is the focus of tutorial attention, but others present will benefit from observing the interaction. It is a topic of growing interest among educators (e.g. Chi, Siler, Jeong, Yamauchi & Hausmann, 2001).

The vicarious learning support system (VL-PATSy) provides students with access to a database of 179 VL videoclips (Figure 5).<sup>1</sup> Each clip is of two people (student-student or student-tutor) in dialogue about a clinical reasoning topic. The topics were selected following a study of students' clinical reasoning using PATSy (Howarth et al., 2005). Of the 179 VL videoclips, 90 are student-

<sup>1</sup> Further technical details can be found in Cox & Pang (2005)

student dialogues and 89 are student-tutor dialogues. The average duration of the VL clips is 2 minutes and 20 seconds (range 25 seconds to 6 minutes 3 seconds). Each clip is tagged with metadata concerning the topic of discussion, nature of participants, duration, etc. (Hoben, Varley & Cox, 2007).

The conversations are not spontaneous - the interlocutors were video recorded while they engaged in task-directed dialogues (TDDs). TDD is a method borrowed from language teaching where it is used for generating discussion where spontaneous discussion is infrequent and where capturing naturally occurring dialogue is difficult and uncontrollable. Previous work (e.g. Lee et al., 1999) has established that dialogue derived from TDD exercises can be more reusable and educationally effective than that captured 'in the wild'. Examples of the topics discussed in the VL-PATSy clips include:

- Two students discussing hypothesis generation, hypothesis testing and evidence evaluation
- Two students discussing strategies for making sense of a large amount of data
- A tutor and student discussing working towards the most plausible explanation of the facts
- Two students discussing ruling out diagnoses
- Two students discussing the use of broad versus fine-grained tests
- A student and tutor discussing whether a hypothesis is the same as a guess



Figure 5: VL-PATSy interface for browsing VL clips. Example shows two students in dialogue about a clinical reasoning topic.

The VL clips are indexed in a variety of ways in the database. For example, students can browse clips at any time by topic and/or phase of reasoning (hypothesis generation, testing, etc.). Alternatively, VL-PATSy can be set to monitor their activities on PATSy and proactively present VL resources when 'reasoning impasse' rules fire. These are event-condition action (ECA) rules that fire if certain events are detected. For example, an ECA rule might fire if a student using PATSy



administers an unusual or inappropriate sequence of language tests. For example, students frequently attempt to administer tests of language function that are too fine grained at an early phase of their diagnostic testing. ECA rule firing determines which VL-PATSy video clips are presented to the student on a 'just-in-time' basis.

## Evaluation of VL-PATSy

A qualitative evaluation of students' learning with PATSy & VL-PATSy has been conducted. Sixty-eight speech and language therapy student participants used the systems over a period of approximately 10 weeks. Each learner interacted, on average, with nine PATSy virtual cases (range 1 to 21). Usage pattern data from the PATSy and VL-PATSy system logs revealed that each learner viewed, on average, 11.6 VL clips (range 0 – 67) clips when the system offered them. Participants spontaneously browsed, on average, 18.1 VL videoclips (range 0 – 110). A post-intervention student learning experience questionnaire (LEQ) was administered. Results showed that 58% of students agreed with the statement *PATSy help me apply knowledge I've learned elsewhere (e.g. in lectures and tutorials)* and 69% disagreed with the statement *PATSy has not helped me learn to think critically*.

Students were also asked about their vicarious learning experiences:

*Compared to traditional forms of teaching and learning, learning by observing others helped me reflect* (Somewhat less 1.8%, About the same amount 36.4%, Somewhat more 54.6% and Much more 7.3%).

*Clips in which the discussion did not lead to firm conclusions or results are not useful to me to learn from* (Strongly disagree 1.8%, Disagree 41.8%, Neutral 23.6%, Agree 21.8% and Strongly agree 10.9%).

*I would have learned more if I had been a participant in the discussions, rather than just an observer* (Strongly disagree, 1.9%, Disagree 28.3%, Neutral 26.4% and Agree, 43.4%).

*Being an observer of (rather than a participant in) a discussion gives you more time to reflect and think about what's being said* (Disagree 1.8%, Neutral 18.2%, Agree 72.7% and Strongly Agree 7.3%).

The results suggest that students perceive PATSy to be a useful resource - they are broadly consistent with previous (focus group) evaluations.<sup>2</sup> The VL resources were also regarded as useful supplements to PATSy and as a

beneficial mode of learning. However, further (quantitative, cognitive) evaluations of learning outcomes are needed to establish the extent to which students' subjective perceptions are accompanied by clinical reasoning skill acquisition.

## Acknowledgements

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<sup>2</sup> [www.patsy.ac.uk/speech/reports.html](http://www.patsy.ac.uk/speech/reports.html)  
[www.patsy.ac.uk/neuropsychology/report.html](http://www.patsy.ac.uk/neuropsychology/report.html)