Transfer of dental students' skills from the haptic to conventional simulation learning environments

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Background

Simulation in the Curriculum

- Simodont® – haptic dental drilling skills trainer
  - Fully virtual drilling environment
  - Haptic interface providing force feedback
    - Improved value of training
- Effective integration into the curriculum requires
  - Positive a attitude from all parties
  - Acceptance from all stakeholders
    - Students
    - Academic staff
  - Understanding of its strengths and weaknesses

Image: E. Yates 2014

Investigating the transfer of skills learned in the haptic environment

- If proven, how does this help individual students?
- How does it help in training the next generation of clinicians?
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Currently, where are the haptics used in our Course?

DMD – hours per student

- ***Year 1 first semester*** – module manual dexterity (MD)
  - 10+ hours each student (on a 'needs' basis)
- ***Year 1 second semester*** – within Operative Dentistry module (MD) –
  - 3 hours
- ***Year 2 first semester*** – within Operative Dentistry module in advance of moving into clinic
  - Modified cases
  - Complete 4 cases
    - Check sheet
- ***Year 2 second semester*** – within Paediatric Dentistry
  - Two cases
    - Partial vital pulpotomy
    - Preparation of teeth for a stainless steel crown
- **Years 2 and 4 remediation**
  - Cariology and crown preparations

Background:
Graduate training course for dentistry

Doctor of Dental Medicine (DMD)

- Four year graduate course
- Students have previously completed a 3 or 4 year Bachelor degree (or higher degrees)
- No prerequisite units
  - However: assumed knowledge of
    - Tertiary Level Year 1:
      - Physics,
      - Chemistry and
      - Biology
- The introduction of manual dexterity training for academically bright students is a potential challenge

Year 1 first semester

Very early in course – starts within 2 weeks of first semester

- Module manual dexterity (MD)
  - 10+ hours each student (on a 'needs' basis)
  - Introduction to the technology
  - Start drilling
  - Proceed at own pace
  - Tutor supported

Method

- Aims
  - Determine if haptic training can result in success in the conventional simulation learning environment.
  - Investigate a correlation between individual characteristics (age, gender and previous academic experience) and ability to pass in the conventional simulation test environment after training in the in the haptic simulation environment.

- Study Sample
  - UWA first year Doctor of Dental Medicine (DMD) (n=57)
- Methodology
  - After 5 hours of haptic training, a conventional training challenge occurred
  - The shape cut was recorded with an optical scan of the flat surface of the plastic block
  - The shape was then measured using Image J software
  - Analysis
  - Data were analysed using the R environment for statistical computing[1]
  - Percentage of success based on area was computed in SPSS version 22 [2]

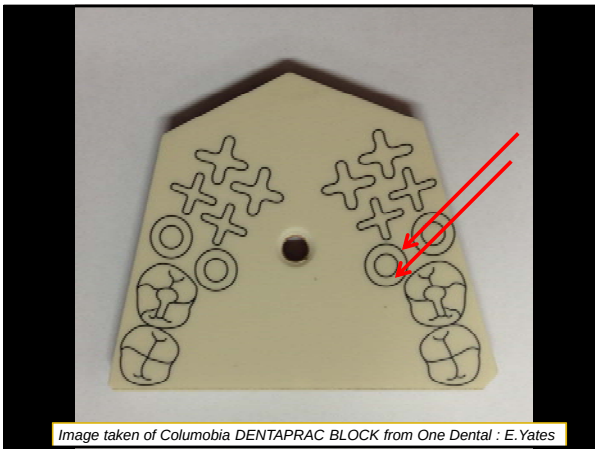

Image taken of Columobia DENTAPRAC BLOCK from One Dental : E.Yates

Aim 1
Determine if haptic training in a task can result in success in the conventional simulation learning environment.

Methodology
The area of the preparation achieved in the plastic block was compared to that of the area range acceptable for the doughnut task in the Simodont Level 3 with error of 0.2mm.

Three categories were determined:
- Less than 30.042 mm2
- Within the range 30.042 mm2 and 41.541 mm2
- Greater than 41.541 mm2

The areas found to be within the range 30.042 mm2 and 41.541 mm2 were denoted as an acceptable pass

Results

66.3% of students were able to cut an acceptable doughnut shape in the DentaPrac Block (as determined by the area) within a time limit of 10 minutes.

Previous imperical experience is that without haptic training students struggle to achieve this standard in 3 hours.

Data relating to Gender (n=41) and previous tertiary degree (n=41)

	Passed				Total	
	No		Yes			
	N	%	N	%	N	%
Gender						
Female	2	**9.09**	20	**90.91**	22	53.66
Male	0	**0**	19	**100**	19	46.34
Type of Previous Degree						
Health/Clinical Science	0	**0**	10	**100**	10	24.39
Non-Science	1	**16.67**	5	**83.33**	6	14.63
Science	1	**4**	24	**96**	25	60.98

AIM 2

- Investigate a correlation between individual characteristics (age, gender and previous degree) and ability to perform in the conventional environment after training delivered in the in the haptic simulation.

Methodology

Demographic data supplied by Faculty of Medicine and Dentistry and Health Sciences Selection Committee

UWA HREC Ethics approved

This project has started the investigation of characteristics that may explain ability to achieve success with manual dexterity tasks.

Indicative:

Training in the haptic world is able to transfer acquired skill to successfully achieve in the conventional simulation environment for 66.3 % of the cohort within 10 minutes

The results calculated for the characteristics of gender, previous degree and age are not significant.

Note: *Improved power is needed to achieve significance*

There were 41 students who passed at least one attempt of the conventional simulation tasks:

Passed	Variable	N	Mean	Std Dev
No	Age	2	21.00	0.00
	HT Lesson Time	2	247.71	73.39
	HT Drill Time	2	116.31	53.14
	Total HT attempts	2	56.50	20.51
Yes	Age	41	25.41	3.83
	HT Lesson Time	41	343.35	161.23
	HT Drill Time	41	126.12	39.85
	Total HT attempts	41	130.63	65.74

- Further research with increased power is needed
- The advantage of further research is to determine characteristics of potential success in a dental training course can:
  - Supporting advice for students in the training process
  - Improve selection processes

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BEME GUIDE

The failure to fail underperforming trainees in health professions education: A BEME systematic review: BEME Guide No. 42

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ABSTRACT

Background: Many clinical educators feel unprepared and/or unwilling to report unsatisfactory trainee performance. This systematic review consolidates knowledge from medical, nursing, and dental literature on the experiences and perceptions of evaluators or assessors with this failure to fail phenomenon.

Methods: We searched the English language literature in CINAHL, EMBASE, and MEDLINE from January 2005 to January 2015. Qualitative and quantitative studies were included. Following our review protocol, registered with BEME, reviewers worked in pairs to identify relevant articles. The investigators participated in thematic analysis of the qualitative data reported in these studies. Through several cycles of analysis, discussion and reflection, the team identified the barriers and enablers to failing a trainee.

Results: From 5330 articles, we included 28 publications in the review. The barriers identified were (1) assessor's professional considerations, (2) assessor's personal considerations, (3) trainee related considerations, (4) unsatisfactory evaluator development and evaluation tools, (5) institutional culture and (6) consideration of available remediation for the trainee. The enablers identified were: (1) duty to patients, to society, and to the profession, (2) institutional support such as backing a failing evaluation, support from colleagues, evaluator development, and strong assessment systems, and (3) opportunities for students after failing.

Discussion/conclusions: The inhibiting and enabling factors to failing an underperforming trainee were common across the professions included in this study, across the 10 years of data, and across the educational continuum. We suggest that these results can inform efforts aimed at addressing the failure to fail problem.

https://www.unige.ch/medecine/udrem/files/1414/8854/0305/

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Practice points

- We identified six barriers to failing underperforming trainees: (1) evaluator's professional considerations, (2) evaluator's personal considerations, (3) trainee related considerations, (4) unsatisfactory evaluator development and evaluation tools, (5) institutional culture and (6) consideration of available remediation for the trainee.
- We identified three enablers supporting assessors' willingness to fail a failing trainee: (1) duty to patients, to society, and to the profession, (2) institutional support such as backing a failing evaluation, support from colleagues, evaluator development, and strong assessment systems, and (3) opportunities for students after failing.

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Consider the issue of "Failing to Fail"

The difficult issue of assessing underperforming dental students

- Are we able to grade students in a manner which assesses their proficiency of their clinical skills?
- At what level should the student be able to have extra experience/training?

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Failing to fail: clinicians' experience of assessing underperforming dental students

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- http://onlinelibrary.wiley.com.ezproxy.csu.edu.au/doi/10.1111/eje.12036/epdf

Aim: To develop an understanding of clinicians' approaches to assessing underperforming dental students.

Methodology: Seventeen clinical staff were interviewed (eleven females, six males). Interviews were recorded and transcribed verbatim. A grounded theory methodology was used, with simultaneous data collection and analysis. The main analytical technique was constant comparison.

Findings: Participants' shared basic problem was *Assessing undergraduate students*, expressed as how they evaluated and used the assessment system or perceived others to do so. The core category, which explains what clinical staff do to manage their difficulties with assessment, was identified as *Failing to Fail* and has three subcategories: *Evaluating the Assessment System, Shielding the Student* and *Protecting Myself.*

Conclusion: This study has substantiated the complexity of failing to fail and confirmed that some causes are shared across healthcare professions, although insufficient staff discussion, the avoidance of confrontation and the impact of negative student attitude are not reported elsewhere or are minor findings. It is recommended that clinical staff receive additional training in assessment and that they are made more aware of their learning needs, their attitudes and beliefs. Increased discussion between staff about assessment and about students known to be in difficulty is essential.

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Just a thought to consider…….

- Until now, the focus has been on helping the student to succeed
- Soon, there could be an opportunity to help the academic staff member and institution to carry out their most challenging duty…….

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