SHORT COMMUNICATION

THE EFFECTS OF A VIRTUAL REALITY SIMULATOR ON FORMATIVE AND SUMMATIVE ASSESSMENT METHODS FOR DENTAL CLINICAL SKILLS: ABSTRACT OF A POSTER PRESENTATION OF PRELIMINARY RESULTS

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Introduction

Dental students' psychomotor skills are being assessed implicitly by formative feedbacks during clinical laboratory sessions and through knowledge-based questions and practical performance measurements given in forms of summative assessments such as a Clinical Skills Examinations (CSE) and Objective Structured Clinical Examinations (OSCE).

Methods

A poster is presented as part of this PhD research investigating the association between psychomotor skills and curricular-based assessments (CSE and OSCE) (Figure 1 and 2). Data was collected involving BDS (Undergraduate Bachelor of Dental Surgery) Year 1 psychometric scores from three cohorts (2007/2008, 2008/2009 and 2009/2010). These data were obtained for this research in order to examine any correlation with the scores of CSE and OSCE and psychometric scores during the following BDS years.

Results

Preliminary results from the three BDS Year 1 groups showed a moderate association between some of the psychomotor skills and CSE and OSCE results (1st Cohort BDS1 2007/2008, 2nd Cohort BDS1 2008/2009 and 3rd Cohort BDS1 2009/2010). Further work is now being completed to analyse the entire dataset.

Conclusion

This research will extend the investigation to include Technology Enhanced Learning (TEL) feedback from a haptic virtual-reality simulation system such as the hapTEL (haptics in TEL). The hapTEL was developed at King's College London Dental Institute to identify whether TEL systems can objectively and explicitly assess psychomotor skills.

Figure 1 The author presenting the poster to delegates

The effects of a Virtual Reality Simulator on Formative and Summative Assessment Methods for Dental Clinical Skills

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In the first two phases of this research moderate correlation suggested that some psychometric tests (Gross Motor Skills and Block Design Test) may be used to identify students who require additional support in learning practical skills in dentistry.

These psychometric tests can provide an indication of students' spatial reasoning, depth perception and hand-eye coordination skills and potentially their clinical skills. This poster reports on the recent findings of this research as part of an investigation about the effects of a Virtual Reality Simulator (e.g. hapTEL system) on reforming assessment methods for dental clinical skills.

Materials and Methods

Samples: The number of dental students who took part varied between the psychometric tests (volunteers), the clinical skills exams and OSCE exams as part of their summative assessment. The participants of this study started their BDS 1 in 2007. The psychometric test scores are correlated with their conventional clinical skills exams 2010 and OSCE Year 3 and 4 results using Spearman's rho coefficient.

Tests: Psychometric tests and conventional clinical skill exams used in this study are:
Fine Motor Skills (FMS);
Gross Motor Skills (GMS);
Spatial Reasoning Test (SRT);
Block Design Test (BDT);
Oral Exam Result (OER);
Practical Exam Result (PER);
Objective Structured Clinical Exam (OSCE).

The findings of this study (1st Cohort) and the following studies will help us to understand to what extent the use of haptic immediate feedback and other features can enhance the conventional formative and summative assessment methods.

Table 1: Significant correlations between the psychometric tests and clinical skills exam results

Spearman's rho; p-value; n	BDT2008	GMS2008	PER2010
FMS 2008		-0.306; 0.006; n=80	
PER 2010	0.308; 0.011; n=68	-0.342; 0.002; n=79	
OSCE 3 - 2010		-0.326; 0.004; n=78	0.279; 0.006; n=95
OSCE 4 - 2011		-0.319; 0.005; n=76	0.304; 0.003; n=93
BDT 2012	0.701; 0.000; n=32		
GMS 2012		0.520; 0.002; n=32	
FMS 2012		-0.414; 0.017; n=33	

Table 2: Mean comparison for GMS, FMS and BDT tests between 2008 and 2012

Year	Gross Motor Skills (Seconds) n = 32	Fine Motor Skills (No. of pins) n = 34	Block Design Test (Scores) n = 28
2008	199.89	17	36.93
2012	182.44	18	53.96
Difference	17.45 Seconds	1 pin	17.03 (max = 68)
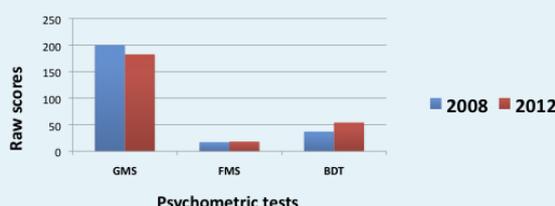
Figure 1: Comparing the mean values of three psychometric tests (GMS, FMS and BDT) within the same cohort (first series in 2008 and the second series in 2012).

Results

- FMS and GMS are correlated in the Years 2008 and 2012;
- The PER 2010 exam correlated with BDT 2008 (0.308; 0.011; n=68) and with GMS 2008 (-0.342; 0.002; n=79) significantly.
- OSCE 3-2010 and OSCE 4-2011 are correlated with GMS 2008 and PER 2010 with high confidence levels.

Conclusions

- These findings confirm that practiced performance of dental skills is associated with high level of fine motor skills and visuospatial abilities (correlations between PER and GMS and BDT);
- Correlation between the performance in OSCE in Years 3 and 4 in 2010 and 2011 and GMS 2008 suggests that pre-course innate-abilities might be used for future clinical performances;
- These findings give an indication that the five year dental undergraduate programme and clinical training is likely to improve some of the personal innate-abilities.

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Figure 2 Copy of poster presented at Colloquium