Feedback on Erroneous Diagnoses on Own Diagnostic Competencies

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Introduction: Diagnostic reasoning is a complex, error-prone core competence of physicians. Instructional methods to decrease diagnostic errors are essential in medical education. A holistic diagnostic competence model includes conceptual knowledge about facts, conditional knowledge about procedures, strategic knowledge about the rationale behind these procedures and error detection skills. Videos of peers performing erroneous diagnoses (erroneous cognitive modeling examples) have been hypothesized to be fruitful for acquiring cognitive skills. Actively providing peer-feedback on these videos might increase this effect.

Methods: N=121 advanced medical students completed a pre-test for diagnostic competence, then watched three cognitive modeling examples on dyspnea and completed a post-test for diagnostic competence. In a 2x2-factorial-design with a control group it was evaluated if (a) type of cognitive modeling example (erroneous vs. correct) or (b) providing peer feedback (yes vs. no) on modeling examples increased learning gain. The control group learned with a textbook. Diagnostic competence was operationalized with 15 multiple-choice-items for conceptual (α=.51), 15 key-feature-questions for strategic (α=.58), six problem-solving-tasks for conditional knowledge (α=.59), and 15 detectable errors in complex diagnoses for error detection skills (α=.61).

Results: Watching cognitive modeling examples led to more conceptual knowledge than learning with a textbook, t(40)=2.651, p=.011. Erroneous versus correct modeling examples did not make a difference for diagnostic knowledge (F(1,95)=2.644, p=.609) but for error detection skills, F(1,95)=4.290, p=.041, η²=.045. Providing peer-feedback negatively impacted knowledge (F(1,95)=8.866, p=.004, η²=.090) and error detection skills (F(1,95)=5.066, p=.027, η²=.053). Cognitive load was higher when providing feedback (M=3.95, SD=.78) than when just observing (M=3.50, SD=.657), t(86)=3.040, p=.003. There was no interaction. Elaboration of feedback was correlated with conditional knowledge (r=.31, p=.035) and cognitive load (r=.38, p=.011).

Discussion: Observing peers’ performance was beneficial for participants’ own learning overall compared to traditional learning methods. Watching erroneous or correct examples did not make a difference concerning diagnostic competence acquisition. Erroneous examples fostered distinct error detection skills. Providing peer feedback had a negative effect on both the acquisition of diagnostic knowledge and error detection skills. Higher elaboration was connected to more cognitive load but also post-test knowledge.

Conclusion: Erroneous performances need to be further integrated in teaching methods as they might decrease flaws in reasoning. The negative effect of providing peer-feedback highlights the importance of training this skill before students provide feedback to avoid overload and superficiality which decreases learning gain. However, the intervention was one-shot and needs to be replicated as well as reasons for the detrimental learning effect need to be examined. A follow-up study examined the effect of modeling how to provide elaborated feedback to improve feedback quality and if providing spoken versus written feedback makes a difference in cognitive load (results are pending).

MMI in an internationally diverse student population (a mixed methods - explanatory sequential study). Organisational justice theories are used to relate and integrate overall findings (2).

**Results:** HPAT-Ireland moderately predicts communication and clinical skills in Year 2 of the course. Stakeholder perceptions of the acceptability and job relatedness of HPAT-Ireland are reasonably good, however not uniformly so across its subsections. Concerns exist regarding potential negative impact on socioeconomic diversity. MMI was perceived as authentic with high levels of job relatedness, by both assessors and candidates. However cultural issues and English language proficiency were identified as potential barriers to international students. While MMI is feasible in an Irish setting this thesis did not demonstrate evidence for its ability to predict performance for the medical class as a whole.

**Discussion:** Predictive validity data suggests that HPAT-Ireland measures something relevant to doctor patient communication. The corresponding subsection (Section 2) was most strongly endorsed by stakeholders. From a procedural justice perspective, job relevance is an important influence on acceptability. Paradoxically stakeholders remained sceptical of HPAT-Ireland’s ability to predict good doctors. The positive views of the job relatedness of MMI were highly influential on assessors’ and students’ perceptions of its acceptability. However stakeholders expressed concerns regarding potential barriers to international students, in violation of distributive justice. They generated a series of recommendations for the design of MMI to minimise these.

**Conclusion:** This thesis provides further evidence regarding the predictive validity and utility of aptitude tests and MMI. It demonstrates that organisational justice theories are a useful lens through which to develop a deeper understanding of the influences on stakeholder acceptability. In terms of policy and practical implications it concludes that HPAT-Ireland has a predictive profile similar to other aptitude tests in its class and that its continued use should be contingent on the outcome of a national predictive validation study and more widespread stakeholder consultation. MMI is feasible in an Irish setting, generally acceptable to stakeholders and worthy of further consideration.

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**Conceptions of learning and teaching in teachers, in student-centred curricula in Medicine**

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**Introduction:** Teachers’ conceptions of learning and teaching affect their teaching behaviour, and indirectly students’ achievements. Therefore, teachers’ conceptions should align with the philosophy of student-centred curricula, to result in effective small group learning formats. We conducted four studies in two medical schools in the Netherlands, with a different tradition (40 yrs vs. 10 yrs) in student-centred education. Several quantitative and qualitative methods were used. In study 1, an instrument was constructed to measure teachers’ conceptions, using a Delphi procedure and confirmatory factor analysis. In study 2, we investigated with a multiple regression analysis the predictors of conceptions. In study 3, using a cluster analysis we explored whether teacher profiles could be assessed. Finally, in study 4 we investigated with individual interviews more in-depth which personal and contextual factors influenced teachers’ conceptions.

**Results:** A valid and reliable 18 item questionnaire was constructed, named COLT, with three scales (teacher centredness, appreciation active learning, orientation to professional practice). The COLT-scores differed significantly in the two medical schools. The most important predictor was medical school. Discipline, gender and teaching experience explained some variance, but 80% of the variance was unexplained. We found five teacher profiles, ranging from ‘Transmitters’ (transmitting knowledge) to ‘Conceptual Change Agents’ (stimulating deep learning). The distribution differed in the medical schools. Next to the different tradition, the interviews yielded personal factors (as agency, motivation to teach) and contextual factors (as leadership department heads).

**Discussion:** In student-centred medical curricula, the partly implicit conceptions of teachers of learning and teaching can be measured with the COLT.
questionnaire. There were five teacher profiles. Medical school was the most important predictor, and discipline, gender and teaching experience also contributed. The impact of medical school can be explained by several factors, e.g. the tradition with student-centred curriculum and the leadership style of department heads (contextual factors). In addition, several new personal factors not included in our multiple regression analysis, seem to account for the large interpersonal range of teachers’ conceptions of learning and teaching.

**Conclusion:** We conclude that insight into teachers’ conceptions and corresponding teacher profiles will be useful for individual teachers, medical schools, departments and also for faculty development initiatives. This holds especially in a curricular change to student-centred education. Teachers’ conceptions can be influenced, for example in long faculty development trajectories or by adaptations in the teaching context, but this requires time. Further, more attention is needed for the pivotal role of department heads and their leadership style.

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**Introduction:** Both veterinary and medical professionals perceive transitions e.g. from university to professional practice or from resident to a position as an attending consultant to be challenging and stressful. Research shows a high level of agreement with respect to the importance of non-technical attributes like problem-solving and coping skills. The aim of the thesis was to identify, in addition to work-related aspects, person related characteristics that affect mental well-being and performance in recently graduated veterinary professionals, and to reach a greater understanding of the role of personal resources in their well-being process.

**Methods:** Based on the Job Demands - Resources (JD-R) model (Demerouti et al., 2001), a questionnaire measuring work engagement, burnout and its potential predictors, was constructed and administered to 1760 veterinarians who graduated in the Netherlands between 1999 and 2009 (response rate 41% of which 73% females). A conceptual model in which the JD-R model was extended with personal resources was analysed using Structural Equation Modeling. Mean levels and prevalence of burnout and engagement were assessed. Relative importance of their potential predictors was assessed by computing Johnson’s Relative Weights. An intervention aiming at increasing personal resources was evaluated using qualitative and quantitative methods.

**Results:** Small effects of gender and years after graduation on exhaustion resulted in 18 percent of female veterinarians developing burnout in the first five years after graduation, while only 13 percent of them could be classified as being highly engaged. While burnout was explained mainly by job-characteristics (demands and resources), work engagement was best explained by job and personal resources. Personal resources appear to have an important mediating and initiating role in explaining work engagement and performance. Self-reported ratings of reflective behaviour, proactive behaviour and self-efficacy were significantly increased after a 1 year resources development programme.

**Discussion:** This thesis contributes to the literature on the role of personal resources in work-related well-being in several respects. First, we showed that personal resources predict performance through the relationship with work engagement. Second, personal resources appear to mediate (partially) the relationship between job resources and work engagement. Practical implications relate to the shared responsibility of employers and employees concerning job (re)design, and to the responsibility of both students, graduates and veterinary educational institutes regarding the development of personal resources, with reflection skills seeming to be essential for development of other personal resources. Strengths and limitations will be discussed.

**Conclusion:** We conclude that female veterinarians in the first five years of their career appear to be more sensitive to developing a burnout and a decrease in work engagement than male veterinarians. Job demands and resources can explain variance in burnout, while job and personal resources explain best variance in work engagement. As personal resources can be developed and deployed in any work environment, they can be important targets for interventions. A multi-module development trajectory for recently graduated veterinary professionals seemed to be an effective intervention for enhancing personal resources.

**References:**

#5F5 (127012)
**Accessing Clinical Wisdom: Mapping Clinical Students’ Experiences of Integrated Learning**

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**Introduction:** Clinical wisdom is usually regarded as phronesis, or as metacognitive, transformative or spiritual capacities. This thesis study investigated health professional students’ clinical learning experiences and whether differences in these and discernment of their critical elements contributed to integrated learning and access to clinical wisdom. Integrated learning refers to contextualised synthesis of some or all of the five domains of a learning experience (thinking/knowing, emotions/feelings, actions/artefacts, attitudes/values and beliefs) to create a personally coherent meaning or interpretation. Based on systems theory, embodied phenomenology and integrative dualism, such integration is proposed to allow access to clinical wisdom as an external resource comprising all situated elements.

**Methods:** Participants from Occupational Therapy and Medicine created up to three modified concept maps each over an eight month period of clinical placement-based learning towards the end of their programmes. They identified connections they perceived between the five domains and documented specific clinical experiences related to these. Visual methodology, ethnography, self-assessment and a phenomenographic approach informed development of the mapping data collection tool and map analysis.

**Results:** Perceived connections to and from emotions/feelings, actions/artefacts, thinking/knowing, beliefs, attitudes and values in clinical learning showed consistent patterns, but also individual variation. Analysis of associated experiences suggested two sets of critical elements in clinical learning. The first set contained contextual factors, related mainly to interpersonal interactions (e.g. with clients/patients, supervising clinicians, academic staff). The second set contained six critical elements of experience, the most prevalent being “Changing or revealing beliefs, attitudes, values)” and “Building or negotiating relationships”, followed by “Experiencing or transforming emotions”, “Altering actions or outcomes”, “Cementing or challenging theory or knowledge” and “Exposing or disrupting identity or sense of self”. These elements related to personal, professional and near-graduate becoming and the (re)formation of identity.

**Discussion:** Students’ beliefs and values were revealed to them and sometimes changed through relationships with patients, clients and educators. Frequently mentioned emotional aspects of clinical learning were often unresolved, while bodily aspects went all but unnoticed. Awareness of integration, beliefs and values appeared central to the (re)formation of student identity, shaping their becoming as persons, graduates and members of identifiable professions. Certain participants integrated three or more critical elements and in some instances this supported the theorisation of clinical wisdom as an external resource comprising all information relevant to each unique, situated interpersonal interaction. The inner self/soul recognised by these participants is proposed to mediate this access. A potential model for this was developed.

**Conclusion:** Clinical students are aware of connections between the domains of learning but integration and access to clinical wisdom appears infrequent. Clinical education needs a more systematic, embodied approach to integrating contextual, cognitive, affective, psychomotor and attitudinal elements with beliefs and values. More attention to supervisory relationships, to developing the inner self and to negotiating conflicts of beliefs and values may enhance student, educator and client/patient becoming. The inner self/soul may mediate integration and sometimes access to the external resource of clinical wisdom.

#5F6 (128266)
**Medical student (and patient) attachment-orientation and clinical communication skills in the simulated and clinical (primary care) setting**

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**Introduction:** Doctor-patient communication influences patients’ health, with clinical communication integrated into the teaching/assessment of medical students. Despite this, the field lacks a strong theoretical framework. Attachment theory is psychological theory that offers insight into why some students struggle with clinical communication. There has also been a lack of research examining the relationship between medical students’ clinical communication skills outside the OSCE and across contexts. The aim of this thesis was therefore: to explore relationships between medical students’ attachment-orientation and clinical communication skills (OSCE and clinical setting); to explore longitudinally medical students’ clinical communication skills (OSCE and clinical setting). Attachment theory is psychological theory that offers insight into why some students struggle with clinical communication. There has also been a lack of research examining the relationship between medical students’ clinical communication skills outside the OSCE and across contexts. The aim of this thesis was therefore: to explore relationships between medical students’ attachment-orientation and clinical communication skills (OSCE and clinical setting); to explore longitudinally medical students’ clinical communication skills (OSCE and clinical setting).

**Methods:** Two empirical studies were conducted. The first study investigated the influence of fourth year medical students’ (n = 508) attachment-orientation on communication ratings in the OSCE. The second study comprised three phases (OSCE; primary care, longitudinal) and provided an analysis of the influence of attachment-orientation on clinical communication with a sample of medical students (n = 37). Medical students were videoed in the OSCE and in several consultations each in primary care (n = 38) to code their responses to emotional cues (1); and to obtain medical students’ communication ratings. Patients also completed questionnaires.

**Results:** Attachment-orientation influenced medical students’ clinical communication. Attachment-avoidance was negatively associated with
communication ratings and responses to simulated patient and patient emotion in the OSCE and clinical setting (primary care). Stronger relationships between attachment-avoidance and clinical communication were found in the clinical setting compared with the OSCE. Outcomes were more influenced by medical students’ attachment-orientation than by that of patients. Longitudinal analysis found a large, significant, and positive relationship between medical students’ communication ratings in the simulated setting (OSCE) and the clinical setting (primary care), and between medical students’ responsiveness to emotion in the simulated setting and the clinical setting.

Discussion: Attachment-orientation was more likely to be influential and activated in authentic clinical environments such as primary care. It is important that medical students develop an understanding of attachment theory in undergraduate medical education to foster understanding of individual differences in clinical communication. Longitudinal analysis indicated that medical students’ clinical communication skills effectively transferred from the simulated OSCE setting to patient encounters in primary care.

Conclusion: This research supported the validity of the current training and assessment of clinical communication at the University of Liverpool.


#5F7 (128135)
The role of social-comparative feedback in novice medical trainees learning procedural skills

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Introduction: Social-comparative feedback has been shown to influence a learner’s psychological and behavioural outcomes during skill acquisition. This feedback is provided to help the learner understand whether he/she is performing better or worse than the group average. Research indicates that motor skill acquisition is facilitated when learners believe they are performing better than the average, regardless of actual performance (1). However, since self-efficacy and motivation are related in terms of their affective influence on learning (2), the goal of this dissertation was to examine the degree to which social-comparative feedback affects highly motivated learners (e.g., medical trainees) during procedural skill learning.

Methods: Regardless of actual performance, we provided manipulated feedback information to novice pre-clerkship medical trainees while they were learning basic suturing techniques to suggest that they were performing better or worse than the average. The first two studies explored the role of social-comparative feedback in medical trainees and tested whether features of the task were important (i.e., basic science task or technical skill task) during the interpretation of this feedback. The final study examined whether the credibility of the feedback provider (i.e., expert versus peer) played a role in how social-comparative feedback was being internalized by novice medical trainees.

Results: Our initial study demonstrated that, compared to those receiving positive or no social-comparative feedback, medical trainees receiving negative social-comparative feedback during technical skill acquisition experienced significant detriments to their performance, learning and self-efficacy. The second study replicated this pattern for technical skill acquisition and also revealed that medical trainees receiving below-average feedback on a basic science task had significant difficulties in learning that task. Our final study found that regardless of the source of the feedback (expert versus another peer), the experience of receiving negative social-comparative feedback impacted self-reported psychological measures and the immediate performance of a basic surgical technique.

Discussion: Regardless of actual task performance, novice medical trainees who were provided with feedback during the learning process, indicating that they were performing worse than the group average, experienced significant detriments to their psychological and behavioural outcomes. This effect was irrespective of task (i.e., key-pressing or suturing) or feedback provider (i.e., hypothetical ‘expert’ or ‘peer’ delivering this feedback). Together these studies suggest that the experience of receiving below-average feedback during the learning process can become detrimental for highly-motivated novice learners.

Conclusion: Our findings are important to consider in both the context of feedback delivery and remediation as they provide evidence that novice medical trainees, regardless of the task and feedback provider, experience difficulty in receiving information that they are performing relatively poorly compared to their peers. This dissertation provides the first demonstration that medical trainees interpret negative social-comparative feedback differently than other learners studied in the literature. Further evidence is needed to understand why medical trainees interpret negative social-comparative feedback in a manner that is both detrimental to
themselves and contrary to other learners receiving the same type of feedback.