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Selection of student-selected component [SSCs] modules across the medical undergraduate curriculum: Relationship with motivational factors

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Abstract

Student-selected components (SSCs) encourage the following within the undergraduate medical curriculum: greater exploration of core curriculum topics; exploration of non-core subjects/experiences; research and self-directed learning; and personal and professional development opportunities. This study examined the motivational factors which influence SSC choice to assess (a) SSC selection patterns across each year of the curriculum (direct and graduate entry) and (b) motivation underlying SSC selection across the curriculum. During SSC registration at University College Cork, all medical undergraduates (years 1–3, graduate-entry medicine) were required to select an SSC and provide a written justification for their selection. Five primary motivational factors were identified: correction of perceived deficits; genuine interest in subject and wish to study in more depth; career strategy; exam strategy; and taking a chance. A complex pattern of relationships emerged in relation to matching of motivational factors with SSC categories, e.g. selection of research skills SSCs was strongly associated with the 'career strategy' motivation. Significant differences were observed across curriculum years, as well as between direct-entry versus graduate-entry undergraduates, with respect to SSC selections and underlying motivation. This study provides insight into changing patterns of SSC selection in medicine, as well as accompanying motivational factors, across the undergraduate years.

Introduction

Operating within the constraints of preparing medical undergraduates as competent practitioners, the introduction of student-selected component (SSC) modules has provided opportunities for choice within the medical curriculum (Murphy et al. 2008). SSCs are optional courses selected by students from a range of options which are separate from the core curriculum. The role and value of introducing SSCs to the core undergraduate medical curriculum has been discussed in detail elsewhere (Riley et al. 2008, 2009; Riley 2009). Briefly, their purpose is to extend the depth of study, support evidence-based medicine (EBM), enhance professionalism and personal skills and encourage effective communication (Murdoch-Eaton et al. 2004). They are delivered across a variety of teaching formats and cover topics ranging from research projects, the study of core curriculum-related topics in greater depth, as well as providing the opportunity to cover topics outside medicine, including the arts and humanities (Riley et al. 2008, 2009). A great deal of variability exists across medical schools with respect to SSC programmes offered, with some authors emphasising the consequent necessity for explicit statement of learning outcomes and clear assessment methods for each module available (Murdoch-Eaton et al. 2004; Murphy et al. 2008; Riley et al. 2009).

Practice points

- SSC modules should provide opportunities for choice within the undergraduate medical curriculum.
- Selection of SSC topics related to 'research and self-directed learning' is strongly associated with a 'career strategy' focus.
- Both the SSC topic category selections and the motivational responses provided are found to vary greatly depending upon the year of study.
- Significant differences exist between direct-entry versus graduate-entry medical undergraduates with respect to SSC subject category selections and underlying motivational factors.
- Designing new SSC modules must involve consideration of pre-existing skills and knowledge as well as motivational factors.

Originally published in 1993 (subsequently revised, most recently in 2009), the seminal document 'Tommorow's doctors', published by the General Medical Council (GMC), recommended a radical revision of medical curricula, with 'core curriculum' comprising two-thirds of the course, and

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Table 1. Summary of SSC modules offered at UCC.

SSC category	SSC module title	Year of curriculum
Topics closely aligned to curriculum	Epidemiology I	1
	Medical statistics	1, 2
	Human embryology and developmental anatomy	2
	Epidemiology II	2
	Introduction to clinical nutrition	2
	Cell and epithelial physiology	2
	Chemotherapy and pharmacology of inflammation	2
	Medical ethics and law	3, GEM
	Decision making in medicine and health	3, GEM
	Psychological medicine	3, GEM
	Public health advocacy	3, GEM
	Primary care epidemiology	3, GEM
	Maritime medicine	3, GEM
	Genetic research in human disease	3, GEM
	Mountain and wilderness medicine	3, GEM
	Physical activity, exercise and sports medicine	3, GEM
Humanities	Threshold French	1
	Towards vantage French II	2
	Italian language for medical students	2
	Spanish language for medical students	1, 2
	Introduction to Irish language	1, 2
	Advanced Irish language	1, 2
	Film, medicine and society	1, 2, 3
	Science in society for medicine	1, 2, 3, GEM
	History and philosophy of science for medical students	1, 2, 3, GEM
	Medical English	1, 2, 3, GEM
	Appreciation of visual arts in medicine	3, GEM
	Writing skills for medical students – fiction and fact	3, GEM
IT	Health information systems and e-health	3, GEM
	Biomedical signal analysis	3, GEM
	Computer applications in medicine	3, GEM
	Computer skills and basic database administration	1, 2
Research and self-directed learning	Library project in medicine	1, 2, 3, GEM
	Student-directed special study module	1, 2, 3, GEM
	Medical research project	1, 2, 3, GEM
	Social research and survey methods	2

optional modules comprising the remaining third (GMC 1993, 2003). As originally conceptualised, they were to provide opportunities for depth of study and choice and were driven by transformation from a straightforward didactic approach which promoted rote learning to a more lifelong learning approach characterised by choice and student-centred learning, and professionalism (Lowry 1992). Globally, while there is a corresponding movement towards integration of greater choice component within the undergraduate medical curriculum (Karle 2004), the commitment to devoting a significant portion of the timetable to such optional modules has not been replicated outside the UK (Riley 2009). Interestingly, the World Federation of Medical Education has identified 'optional content' as an important component of curriculum design (Karle 2007). The Tuning Project, an EU-funded initiative designed to increase harmonisation of learning outcomes across European medical schools, has prioritised as level 1 learning outcomes many of the skills and competencies typically associated with SSCs, including communication skills, professionalism and research skills (Cumming & Ross 2007).

University College Cork (UCC) School of Medicine offers both 5-year direct-entry and 4-year graduate-entry medicine (GEM) undergraduate degree programmes; there are typically 130 students in the former and 40 in the GEM programme. Typically, SSCs are offered across a variety of topics, with an emphasis on subjects which map onto learning outcomes and competencies outlined in the institution's medical graduate profile. A diverse range of SSCs are offered across the following areas (see Table 1 for full summary): (a) topics closely aligned to the core curriculum; (b) experience outside the field of medicine – humanities; (c) experience outside the field of medicine – information technology (IT); and (d) research and self-directed learning. In line with the trend towards establishing SSC programmes which are reflective of the specific strengths of a given medical school (Riley et al. 2008), UCC places a strong emphasis on the acquisition of skills in EBM; students across the undergraduate medical curriculum are encouraged to be involved in a range of research, audit, or mixed research and audit projects (Burgoyne et al. 2010). Additionally, final year undergraduate students at UCC are required to complete a self-proposed research project as part of their undergraduate degree in medicine.

The matter of SSC content and choice and, specifically, whether SSC options should include topics outside medicine has been the subject of some debate. Riley (2009) has pointed out that the experiences of the Scottish medical schools are that most students are stratified according to underlying, as yet

unspecified, motivational factors. In order to both assist us in designing SSC programmes and fully appreciate the relationship between knowledge and skills acquired during their undergraduate degree and subsequent career choice, it is important that individual motivational factors contributing to SSC selection are considered (Richardson 2009). Specifically, we need to know whether students are strategic in their selections or whether they are guided by short-term and less challenging criteria (Babad & Tayeb 2008). A recent questionnaire-based analysis of motivational factors contributing to selection of SSC modules by first year undergraduates at a London medical school demonstrated that SSC selections were stratified across the following identified motivational factors: future achievements, prior information, internal motivation, personal recommendation, convenience and certainty (Richardson 2009). However, it is recognised that students also select different SSCs across the curriculum depending on evolving skills, knowledge, motivations, as well as awareness of future career possibilities. A cross-sectional analysis of SSC choice and motivation relationships at different points in the undergraduate course would help us to understand how and what selection criteria come into play at each developmental time-point. In light of this gap in knowledge, in this study, we have examined the selection process of SSC modules across the undergraduate medical curriculum in relation to identified motivational factors. This was performed in both direct-entry and GEM cohorts.

Methods

Background

SSCs are offered to undergraduate medical students during the first three years of the UCC curriculum and are collectively grouped under 'Stream 4' of the curriculum. Across the first three years, SSCs are completed during two teaching periods. Total number and range of SSC topics varied depending on the year of study (Table 1). They have been classified as: topics closely related to the core curriculum, IT, humanities, research and student-directed learning. The period of this study consisted of the academic years 2007–2010.

Subjects

Study participants were medical undergraduate students enrolled in either direct-entry undergraduate programme (years 1–3) or the GEM programme (GEM, year 2) during the academic years 2007–2010. A consecutive sampling method was employed. This study was approved by the Clinical Research Ethics Committee of UCC.

SSC selection procedure

During the introductory week of the academic term, all students were directed to complete a web-based selection form. Students were required to indicate their first to fifth preferred choice from a drop-down menu of the available SSC modules. They were then required to state briefly, in 150 words or less, why they had selected their first choice module.

Categorisation of SSC motivation responses

Students' qualitative responses related to motivation for selecting their first choice SSC module preference were analysed using a thematic approach and constant comparison techniques by two assessors from the School of Medicine, as detailed previously (Burgoyne et al. 2010). The data presented the following five distinct themes related to the motivational responses provided by students: correction of perceived deficits; genuine interest in subject and wish to study in more depth; career strategy; exam strategy; and taking a chance. 'Correction of perceived deficits' was operationally defined as motivation to address personal shortcoming(s) in subject areas relevant to their undergraduate degree and/or to facilitate overall personal growth in these areas. 'Genuine interest in subject and wish to study in more depth' was operationally defined as motivation to study a particular topic (not necessarily related to medicine) in greater depth based on personal interest. 'Career strategy' was operationally defined as motivation to select an SSC module with a view to enhance future career opportunities in medicine. 'Exam strategy' was operationally defined as motivation to select an SSC module based on alignment between SSC content and predicted future assessment content. 'Taking a chance' was operationally defined as motivation to select an SSC module due to personal curiosity or the absence of any favourable alternatives.

Data analysis

All data are summarised as percentages and are illustrated in tables and figures. To examine the relationship between the categorical variables sex, year of curriculum and SSC category selections or motivation response category, χ^2 or Fisher's exact tests were used as appropriate. Multinomial logistic regression analysis, with correction for repeated measures on the same subject, was conducted to determine the association between motivation response category and SSC selection. Multinomial logistic regression is an extension of binary logistic regression and is used when the dependent categorical variable has more than two levels (Chan 2004). In the logistic regression analysis, the dependent variable was SSC category selection (four levels – humanities [reference category], topics closely aligned to curriculum, IT and research and self-directed learning), and the explanatory variables were motivation response category (five levels – correction of perceived deficits [reference category], genuine interest in subject, career strategy, exam strategy and taking a chance), sex (male [reference category] and female) and year of curriculum (four levels – year 1 [reference category], year 2, year 3 and GEM). The threshold set for statistical significance was set at 0.05. Statistical analyses were carried out using STATA (version 10; StataCorp, College Station, TX).

Results

Data were collected for 1346 SSC selections between the period 2007 and 2010. The proportion of SSC selections for each year of the curriculum was as follows (percentage of absolute total/total year number): year 1 (34.75/468); year 2

(24.37/328); year 3 (34.33/462); and GEM (6.54/88). The ratio between women and men students was similar with respect to total number of selections (males versus females: 46.36% versus 52.64%); this ratio did not differ depending on year of curriculum ($\chi^2 = 3.51$, $p = 0.32$). A total number of 219 SSC selections were accompanied by a motivational response which could not be coded for analysis due to either insufficient text or ambiguous response content. These selections were not included in the multinomial logistic analysis. The proportion of excluded selections varied according to year in curriculum, with the highest percentage (relative to total for year of curriculum) observed in the GEM class (31.8%), followed by second year (23%), first year (12.8%) and third year (12%). The final number of responses included in the logistic regression analysis was 1127; 65% of the total number were independent selections, with the remaining cases comprising same participant selections across each of the years sampled.

The pattern of SSC selection varied significantly according to year of curriculum ($\chi^2 = 236$, $p < 0.001$; Figure 1A). During the first year, the most preferred option was a topic in the humanities (64%), followed by topics closely aligned to the curriculum (16.5%), research and self-directed learning modules (10.9%) and IT options (8.33%). This selection pattern changed in the second and third years, with the most popular choice now being topics closely aligned to the curriculum (year 2, 56.4%; year 3, 43.3%), while number of humanities module selections decreased in a corresponding manner across both years (year 2, 30.5%; year 3, 30.3%). While the selection of IT topics in second year (3.35%) was similar to that observed in first year, a relative increase in IT-related modules was observed in third year (16.2%). Selection of research and self-directed learning modules remained stable across both second and third years (year 2, 10%; year 3, 10.2%). GEM students showed a different selection profile compared to their direct-entry colleagues, with the highest preference observed for topics closely aligned to the curriculum (62.5%), followed by humanities (13.6%) and research and self-directed learning modules (12.5%), with IT topics selected least (11.4%). SSC selections did not vary according to sex ($\chi^2 = 0.87$, $p = 0.83$; Figure 2A).

Percentage of responses belonging to each motivational category differed significantly according to year of curriculum ($\chi^2 = 61.52$, $p < 0.001$; Figure 1B). Percentage of responses belonging to the category 'genuine interest in subject and wish to study in more depth' was consistent across each year of the direct-entry curriculum (year 1, 44.6%; year 2, 44.4%; year 3, 44.5%), but was highest overall in the GEM class (51.7%). Responses coded as 'taking a chance' were reported least by GEM students (11.7%), followed by second year (12.7%), with first and third year undergraduates citing this response most frequently (first year, 21.3%; third year, 25.8%). 'Career strategy' responses were highest in the GEM cohort (28.33), with direct-entry colleagues showing a consistent proportion of responses belonging to this category across the curriculum (year 1, 16.5%; year 2, 19.4%; year 3, 17.2%). Percentage of responses in the category 'correction of perceived deficits' decreased progressively from years 1 to 3 of the direct-entry curriculum (year 1, 12.75%; year 2, 7.1%; year 3, 6.4%), with

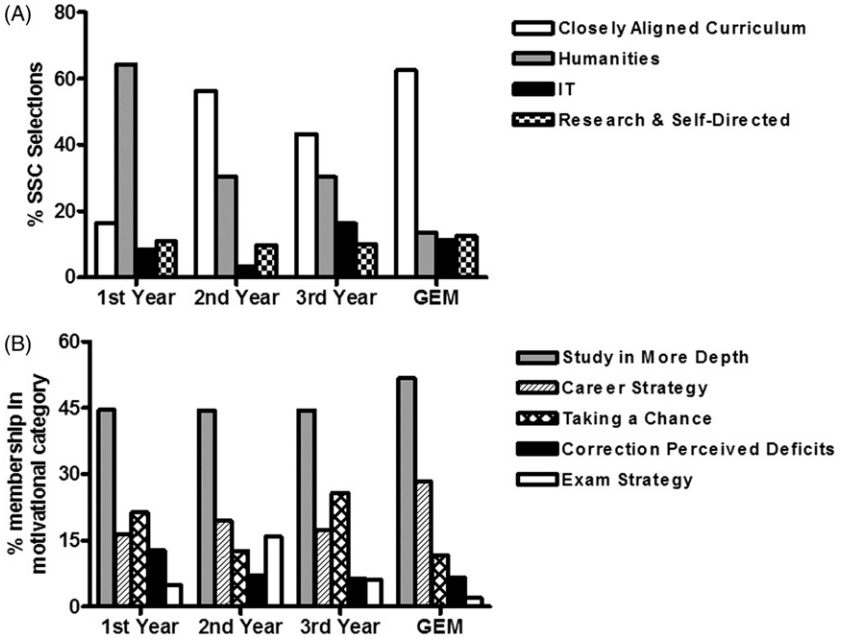

Figure 1. (A) Overall percentage of SSC selections for each year in the direct-entry and GEM undergraduate curriculum (year 1, year 2, year 3 and GEM) across the following topic categories: topics closely aligned to curriculum (closely aligned curriculum), humanities (humanities), information technology (IT) and research and self-directed learning (research and self-directed). (B) Overall percentage of motivational responses for each year in the direct-entry and GEM undergraduate curriculum (year 1, year 2, year 3 and GEM) across the following motivational response categories: genuine interest and wish to study in more depth (study in more depth), career strategy (career strategy), taking a chance (taking a chance), correction of perceived deficits (correction perceived deficits) and exam strategy (exam strategy).

the GEM class response value (6.6%) similar to that reported for third year students. The motivation category with the lowest response percentage was 'exam strategy' in first and third year students (year 1, 4.9%; year 3, 6.1%), with GEM students showing the lowest response rate for this category (2%). Second year students, however, were almost thrice more likely to make a response belonging to this category relative to other year groups (16%). Motivation category responses did not change depending on sex ($\chi^2 = 4.95$, $p = 0.29$; Figure 2B).

The proportion of SSC category selections significantly varied across each motivational response category (Figure 3). Table 2 presents the results of the multinomial logistic regression analysis, presenting odds ratios (OR) and confidence intervals (95% CI) and indicating p-values. With 'humanities' as the SSC reference category, and 'correction of perceived deficits' as the motivation reference category, students were significantly more likely to select modules 'closely aligned to curriculum' due to a 'genuine interest and wish to study in more depth' ($p = 0.02$) or based on an 'exam strategy' ($p < 0.001$). In contrast, selection of IT topics was significantly more associated with 'correction of perceived deficits' relative to 'genuine interest and wish to study in more depth', 'exam strategy' or 'taking a chance' (all $p < 0.001$). In comparison with humanities module selection, choice of research and self-directed learning modules was more associated with 'exam strategy' ($p < 0.001$) or 'career strategy' ($p = 0.01$), but was significantly less associated with 'genuine interest and wish to study in more depth' ($p = 0.007$) or 'taking a chance' ($p < 0.001$). The choice of humanities topic was linked with increased 'taking a chance' responding relative to IT and research and self-directed module selection (both $p < 0.001$) (Table 2).

In contrast with year 1 SSC selection, selection of topics closely aligned to curriculum was significantly higher in year 3

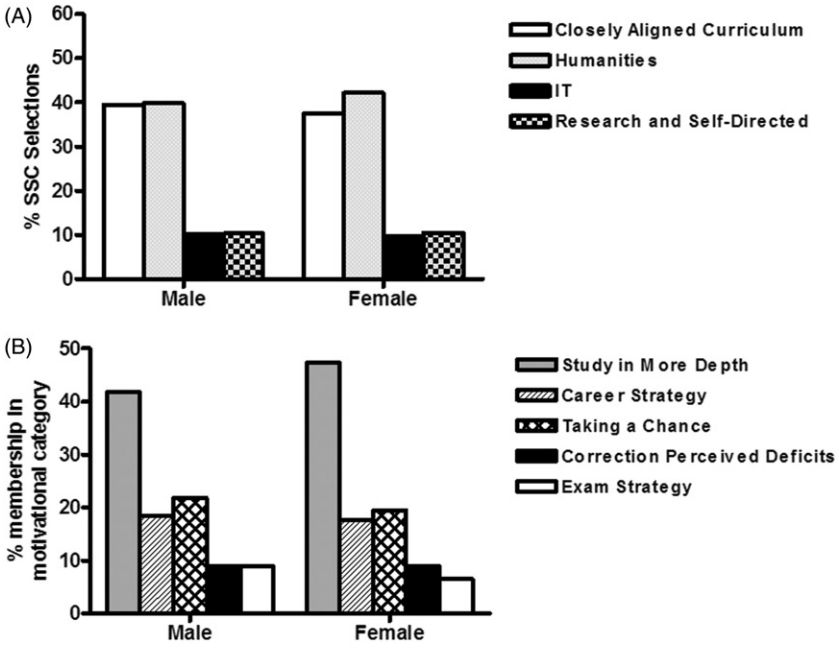

Figure 2. (A) Overall percentage of SSC selections for each year in the direct-entry and GEM undergraduate curriculum (year 1, year 2, year 3 and GEM) across the topic categories in males and females. (B) Overall percentage of motivational responses for each year in the direct-entry and GEM undergraduate curriculum (year 1, year 2, year 3 and GEM) across the motivational response categories in males and females.

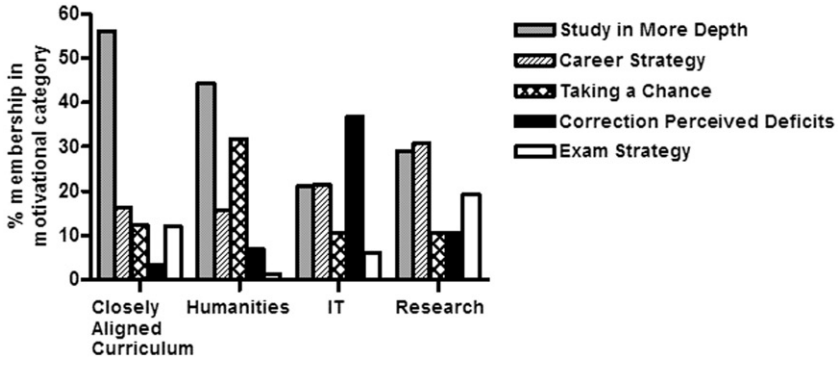

Figure 3. Overall percentage of selection for each SSC category as a function of motivational response category membership.

Table 2. Summary of multinomial logistic regression analysis examining motivational response category, sex and year of curriculum, as predictors of SSC category selection.

	SSC category[a]		
	Closely aligned to curriculum	IT	Research
Variable	OR [95% CI]	OR [95% CI]	OR [95% CI]
Motivation response category			
Correction of perceived deficits	1.00	1.00	1.00
Genuine interest in subject	2.31 [1.14–4.69]*	0.04 [0.02–0.09]***	0.34 [0.16–0.75]**
Career strategy	1.91 [0.88–4.17]	0.45 [0.12–1.65]	2.64 [1.22–4.90]*
Exam strategy	18.21 [5.99–55.29]***	0.08 [0.04–0.19]***	8.68 [2.77–27.21]***
Taking a chance	0.60 [0.28–1.30]	0.02 [0.01–0.06]***	0.14 [0.06–0.37]***
Sex			
Male	1.00	1.00	1.00
Female	0.82 [0.60–1.10]	0.92 [0.57–1.49]	0.94 [0.61–1.45]
Year of curriculum			
Year 1	1.00	1.00	1.00
Year 2	1.02 [0.59–1.76]	0.88 [0.49–1.59]	0.68 [0.35–1.33]
Year 3	1.57 [1.02–2.39]*	0.03 [0.01–0.08]***	0.41 [0.22–0.76]**
GEM	2.17 [1.41–3.35]***	0.18 [0.08–0.39]***	0.70 [0.39–1.28]

Notes: The data indicated are OR and 95% CI (within brackets).
[a]Reference category: humanities.
*$p < 0.05$; **$p < 0.01$; and ***$p < 0.001$.

($p = 0.04$) and GEM students ($p < 0.001$), while the converse was observed for IT module selection (both $p < 0.001$). Year 3 students were also significantly less likely to select research and self-directed learning modules ($p = 0.005$). No differences were observed between the sexes in relation to SSC module selection.

Discussion

This study indicates that both SSC selections and underlying motivational factors change and evolve across each academic year in the curriculum. The proportion of both IT and research and self-directed learning module selections remained relatively stable across each year. However, while humanities topics were the preferred option during first year, with topics closely aligned to the core curriculum occupying the next position, the opposite selection pattern was observed in the second and, to a lesser extent, third years. While SSCs offered at UCC across the four topic categories are evenly spread across the curriculum, it is evident from 'Practice points' that the range of topics closely aligned to the curriculum is limited during the first year as compared to subsequent years. This slightly skewed distribution was based on the principle that the projected SSC knowledge and skills are realistic, complement core learning outcomes and build upon existing skills and knowledge (Riley 2009). However, while our data may be partially attributable to module availability, they also support the proposition that undergraduate course selection decision-making is a progressive process which involves both motivational changes across the curriculum as well as, potentially, weighing up of additional items of information (e.g. time-tabling, module lecturer, etc.) (Babad & Tayeb 2003).

Based on the analysis of the qualitative motivational response data, four distinct motivational categories emerged. As observed with SSC module selections, a progressive curriculum year-specific profile was present for several of these motivational response categories. As might be expected, the percentage of 'correction of perceived deficits' category responses steadily decreased from year 1 to year 3 of the direct-entry curriculum and was low in the GEM class; we can presume this is due to a progressive decrease in the need to get 'up to speed' in some fundamental areas, particularly IT skills, with this motivational response category strongly associated with IT modules. GEM students also demonstrated the highest percentage of responses belonging to the 'genuine interest and wish to study in more depth' and 'career strategy' categories, supporting earlier evidence for a different motivational profile in this cohort (Shehmar et al. 2010).

The results of the logistic regression analysis indicated that selection of humanities topics was strongly associated with the 'taking a chance' motivation category, which is consistent with the high level of humanities module selection during the first year of the curriculum. In contrast, students who were either career or exam focused, or wished to study a topic in greater depth, were generally less likely to select humanities modules. This finding is in line with the proposal that adding humanities topics as part of the medical curriculum may promote less tangible or quantifiable (but no less valuable perhaps) aspects of personal development (Calman & Downie 1996). Selection of IT topics was strongly associated with a need to self-improve in these areas; this may reflect an increasing recognition of the importance of IT competency to healthcare provision (Poyner et al. 2004). A significant relationship was also observed between both 'exam strategy' and 'career strategy' and the selection of research and self-directed

learning modules. These data are partially in agreement with previously published data regarding the relationship between motivation and SSC selection in first year undergraduate students. In the study by Richardson (2009), students motivated by future achievements, thematically comparable to the 'career strategy' category in this study, were more likely to select SSCs which promoted what they term 'generic skills' – this category included research project experience, as well as teaching and learning in medicine.

This study raises questions concerning the nature of the strong association between research and self-directed learning and a prominent career-focused motivation profile. It has been suggested that integrating EBM with clinical practice produces an increase in both knowledge and skills, with a corresponding improvement in clinical behaviour (Coomarasamy & Khan 2004). A recent experimental study demonstrated that a physician-led workshop promoting EBM skills resulted in improved incorporation of EBM knowledge into subsequent clinical notes. Specifically, EBM teaching encouraged the use of clinical research evidence to guide clinical decision-making for individual patients (Sastre et al. 2011). In this context, increased desire to attain clinically relevant information literacy and decision-making skills may underlie the focus on research-based and self-directed modules in students with a more career-oriented perspective.

Under a framework document agreed between the Forum of Irish Postgraduate Medical Training Bodies and the Irish Medical Council, doctors in all specialities are required to actively engage in audit as part of professional competence (Baxter 2010). Under this agreement, doctors will have to complete an annual clinical audit, defined as a systematic review and evaluation of current practice with reference to research-based standards to improve patient care. Within UCC, research skills and attainment are embedded in the curriculum, recognising that continuous commitment to EBM is an important 'exit outcome' associated with our medical graduate (Burgoyne et al. 2010). In this context, it may be argued that students with a strategic focus on future career possibilities in medicine may be more inclined to select research-based and self-directed learning modules.

The previous decade has seen a significant increase in the availability of graduate-entry places in undergraduate medicine across the UK and Ireland (Carter & Peile 2007). Originally developed to encourage a more diverse student body in medicine, the limited research gathered to date has indicated a different profile for GEM versus direct-entry students in terms of timing and acquisition of clinical skills and biomedical sciences knowledge (Calvert et al. 2009; Manning & Garrud 2009). GEM students also differ from direct-entry students with respect to prior educational experience, learning style and motivational factors (Shehmar et al. 2010). This study supports this contention, with GEM students demonstrating a clearer and more career-focused motivation relative to direct-entry counterparts, as indexed by a greater proportion of career strategy responses. It has been noted elsewhere that GEM students offer a challenge with respect to the design of appropriate SSCs (Riley 2009); specifically, many SSC courses are designed to promote the kind of generic and transferable academic skills already possessed by GEM students. Therefore, designing and tailoring new SSC modules for delivery to GEM students must involve consideration of pre-existing skills and knowledge as well as motivational factors particular to this student cohort.

It has been proposed that a better understanding of the relationship between SSC selection and underlying motivation will assist in relation to evaluation, assessment and measuring quality assurance in SSC modules; interpretation of student feedback on SSCs and awareness of current trends in careers in medicine (Riley et al. 2008; Riley 2009). This study has provided insight into the complex interaction of motivational variables and SSC selections as they occur across the course of the undergraduate degree in medicine, and is expected to assist schools when creating or developing year-appropriate SSC options.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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