Collaborative Testing
The Effect of Group Formation Process on Overall Student Performance*

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Purpose: With increased focus on student preparation for high-stakes licensure exams, there is more interest in alternate forms of content delivery and assessment. This interest has focused on factors within the learning environment that may impact student's course performance and program progress. In this project, the impact of the method of group determination (random assignment vs. student selection) on student performance in a neuroanatomy course within a collaborative testing environment is examined. **Methods:** The course performance of two cohorts (cohort one: randomized grouping = 80; cohort two: student-selected grouping = 82) were compared. All students completed weekly quizzes within collaborative groups, while completing unit exams individually. The mean sum of both the quiz scores and examination scores were compared. **Results:** While the two groups differed (Wilks' lambda = 0.211; F = 53.541; df = 10,143; $p < .05$), no pattern was evident among the assessments (ie, one group did not differ significantly on all quizzes or examinations). In overall quiz performance, the randomized groupings scored significantly higher than the student-selected groups (F = 112.252; df = 1152; $p < .05$) while no difference was noted relative to overall exam scores (F = 2.672; df = 1152; $p > .05$). **Conclusions:** While the collaborative testing paradigm has been shown to be a valuable learning tool, no differences are apparent in the course performance between students in randomly assigned groups compared to those in student-selected groups. The very nature of random groups may have encouraged students to be proficient in all of the material, whereas students who were allowed to choose their groups may have divided the material among themselves and not become individually proficient in all concepts. (J Chiropr Educ 2011;25(1):11–15)

Key Indexing Terms: Decision Making; Educational Assessment; Group Process; Teaching

INTRODUCTION

The increasing use of student collaboration as a tool for instruction and motivation is partially derived from the notion that a student's potential for cognitive growth is limited to what he or she may accomplish independently, but that the synergy of collaboration allows students to surpass their individual limitations.[1,2] Other research has suggested that social interaction and collaboration among students increases cognitive development, intrinsic motivation, learning, and classroom community.[1–4] Students involved in peer-to-peer collaboration may benefit from each other's knowledge to develop new attitudes, cognitive skills, and psychomotor skills while improving problem-solving skills and critical thinking abilities.[1,5–7]

The strategy of student collaboration has been extended to the testing and assessment environment where students work in small groups to complete summative evaluations. Investigation into the structure and composition of the collaborative groups has received less research focus. Within the collaborative testing paradigm, researchers have opined

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that randomized groups may be superior to student-selected groups regarding group dynamics, learning potential, and course performance.[8–10]

Research on the use of collaborative groups in education often describes randomization processes.[8–11] Randomizations may be generated by a variety of methods from online randomization applications and programs such as Microsoft Excel or SPSS to a simple method of having students draw unique markers, such as playing cards, to form groups. When groups are formed randomly, students may be more motivated to take responsibility for all of the test material to avoid the stigma of being seen as a weak link in the group.[12] Random groupings may also prevent a certain level of social loafing (coat-tail riding) as students cannot rely on friends or known support systems with confidence.[8,10,12]

Therefore, students in randomly assigned groups may be better prepared to participate in substantive discussions with other group members during assessments, including being able to provide immediate formative feedback.[8–11] This formative feedback process is a key element of peer-to-peer teaching that can occur during assessment-based group discussions, and research has shown that students regard the informal formative feedback process positively.[13]

A possible drawback to randomizing groups for collaborative testing, however, is that students may feel coerced, which could potentially have negative effects on both classroom dynamics and student motivation.[3] Allowing students to self-select groups before collaborative testing is a proposed alternative to group randomization.[8] One advantage of self-selection in advance is that students can form groups with others who have similar schedules, which may allow for more conducive study.[14] It is acknowledged that when students select their own groups they may choose similar team members, resulting in homogenous groups; for example, high-performing students often choose to work together.[14] Advance self-selection could encourage groups to divide the study material among themselves with each member assuming responsibility for a particular topic or area.[15,16] To limit this risk, it has been suggested that students not be grouped until the day of the assessment just before the test materials are distributed.

Previous studies found that randomized collaborative groups performed significantly higher than students taking the assessments individually.[9–11] Furthermore, students who completed quizzes collaboratively scored significantly higher on subsequent unit examinations which they took solo.[10] Earlier studies of collaborative testing have also reported that improved test scores are directly related to the cognitive processes of remembering information, improved ability to think about test items, and having productive discussions.[10,11,17]

Collaborative learning also enhances classroom community and autonomy support (a student's perception about a teacher's level of concern, support for, and trust in a student).[18] The presence of perception of a teacher's concern and trust may have a positive impact on students' intrinsic motivation,[3,19] and increased intrinsic motivation and community have particularly been noted among students who selected their own groups.[3] However, choice alone appears less important than autonomy support for increasing intrinsic motivation. For example, Ciani et al. noted that having a choice among teacher-controlled options did not have the same positive impact on students' intrinsic motivation as having teacher-controlled options coupled with a sense of teacher support and trust for students.[3]

Previous studies have stated that allowing students to choose their own group membership may increase their sense of intrinsic motivation and autonomy, with less intrinsic motivation when the instructor assigned group membership.[3,4] It has also been opined that when students are allowed to choose their groups there may be fewer disputes and more camaraderie.[3] Under the paradigm of collaborative testing, students may teach one another the material in which they have become proficient, and students have reported having productive discussions and an increased ability to think about information being tested.[17]

To date, research has been scant regarding whether randomized groups perform differently than student-selected groups on course assessments. The present project compares the effect of group formation (randomized vs. student-selected) on overall course performance.

METHODS

This study was approved by the Institutional Review Board of Palmer College of Chiropractic. Using a quasi-experimental design,[20] the overall course performances of two cohorts (cohort one:

random grouping = 80 individuals; cohort two: student-selected grouping = 82 individuals) were compared. The instructor, lecture format, and material were identical for both cohorts. Quizzes and unit examinations were multiple-choice format and were identical for both cohorts (except for minor modification in either the stem or the distracters). Grades were calculated from a combination of six weekly quizzes (90 points total) and three unit examinations (120 points total). The mean of the sums of the quiz scores and the mean of the sums of the exam scores were compared for the two groups to examine overall differences in performance. Prior to the course, a 70-question pretest was administered to both cohorts for homogeneity (points were not part of the course point total).

Research Randomizer, an online research randomization program, was used to create the random groups of three to four students for cohort one.[21] Different random group assignments were made before each weekly quiz and students were not aware of their group members before the quiz. Conversely, students in cohort two were allowed to choose their group members through a process of self-selection just before each weekly quiz. Both cohorts were allotted 40 minutes for the quizzes. Question items were discussed in groups, but each student submitted an individual answer form for grading and group consensus was not necessary. All students completed the three unit examinations as individuals. Using pretest scores as the covariate, multivariate analysis of covariance (MANCOVA) was used for statistical comparison of groups using SPSS version 17.0 (SPSS Ltd. Chicago, IL).

RESULTS

While the two cohorts demonstrated a significant difference in performance on the assessments (Wilks' lambda = 0.211; F = 53.541; $df = 10,143$; $p < .05$), there were no discernable patterns of significance for the course assessments. Of the six quizzes, cohort one (random groups) scored significantly higher on quizzes 2, 4, and 6 (Table 1), cohort two (student-selected groups) significantly higher on quiz 1, with no differences on the remaining quizzes (quizzes 3 and 5). Students in cohort two scored significantly higher on the second unit exam (taken individually), with no differences between the groups on both examinations 1 and 3 (Table 1). Cohort one scored significantly more points overall on the quizzes; no differences were noted between the cohorts relative to total examination performance. The final grades of the cohorts were not significantly different.

DISCUSSION

This project compared randomized versus student-selected group testing and overall course performance. Although cohort two was allowed to select its own testing groups immediately prior to each weekly

Table 1. MANCOVA results for grades in an advanced neuroanatomy course (precourse in-program GPA used as covariate)

Dependent Variable	Student-Selected Group Mean (SD)	Random Group Mean (SD)	F Statistic	Degrees of Freedom	Significance
Quiz 1	14.33 (0.944)	12.84 (1.808)	41.730	1152	<.001
Quiz 2	10.79 (1.505)	13.70 (1.588)	141.572	1152	<.001
Quiz 3	13.26 (1.359)	13.54 (1.211)	2.101	1152	.149
Quiz 4	11.35 (1.270)	14.00 (1.201)	172.827	1152	<.001
Quiz 5	13.23 (1.620)	13.61 (1.392)	1.711	1152	.193
Quiz 6	13.17 (1.098)	14.98 (0.157)	213.982	1152	<.001
Exam 1	28.59 (5.065)	27.76 (4.863)	1.151	1152	.285
Exam 2	32.14 (4.597)	30.14 (4.597)	14.225	1152	<.001
Exam 3	38.02 (3.823)	38.90 (2.840)	3.143	1152	.078
Sum of quizzes	76.13 (3.701)	82.33 (4.328)	112.252	1152	<.001
Sum of exams	99.29 (11.013)	96.84 (10.155)	2.672	1152	.104
Final grade (percent)	0.907 (0.060)	0.900 (0.068)	1.739	1152	.189

Note: Wilks' lambda = 0.211; F = 53.541; $df = 10,143$; $p < .01$.

quiz, it was observed anecdotally that the majority of students elected to remain in the same group over time. This was not unexpected, as previous studies have noted that group self-selection may lead to static group membership.[14]

Significant differences were found when comparing the performance of randomly assigned collaborative groups with student-selected collaborative groups for a series of assessments, but no pattern of significant differences was noted. Likewise, these data do not evidence overall performance differences between the two cohorts. While previous researchers noted that student-selected groups became better at their collaboration over time and were able to benefit more from the established (and static) group membership, the results of the present study do not confirm this finding.[3,22] Although the student-selected groups in this study were observed to have static memberships throughout the course, the longer term relationships within the group did not translate to a higher level of course performance. It should be noted that the relative short length of this course (10 weeks) may have been a limiting factor in this aspect of student-selected groups. Furthermore, the data from the current study do not support previous reports that self-selected groups may benefit from an increased sense of autonomy support and classroom community that positively influences subsequent independent work.[3]

It is also interesting to note that although the randomized cohort scored significantly higher on the quizzes overall, their scores for the unit examinations did not differ significantly from the self-selected groups. In terms of quiz performance, this reinforces Klecker's supposition that the randomization process may be beneficial; however, the benefits did not translate to higher unit examination performance.[8]

CONCLUSION

Collaborative group work has been embraced as a tool to benefit learning and motivation. Students who work in collaborative groups may experience improved intrinsic motivation and stronger perceptions of teacher concern and support. Whereas previous researchers have hypothesized that group formation processes may affect student performance, the results of the present study indicate no difference between randomized and self-selected groups. Thus, the positive effects of group collaboration for course assessments appear to have good potential with either group formation technique.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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