

CRITICALLY APPRAISED TOPIC

FOCUSED CLINICAL QUESTION

PICO: Is team-based learning amongst peers in the same cohort (I) or individual (traditional) learning (C) during clinical rotations more effective at increasing clinical competency (O) in a 2nd year Doctor of Physical Therapy student (P)?

AUTHOR

Prepared by	Tejasee Phatak	Date	December 2, 2020
Email address	tphatak@med.unc.edu		

CLINICAL SCENARIO

In the UNC DPT program, I observed that students do not have much communication with each other during clinical affiliations. However, when we return to the classroom, we share our knowledge about patients, treatment methods, and other aspects of physical therapy education we experienced during clinicals. This knowledge is much more applicable, and students seem to retain it more when a classmate is teaching a peer about a personal experience rather than memorizing a fact in the classroom. In order to help students gain as much physical therapy knowledge as possible, I would like to know if 2nd year DPT students would be more clinically competent if team-based learning were utilized over traditional, individual learning during clinical rotations. Specifically, I would like to know where the evidence stands on the use of 1:1, 2:1, and/or 3:1 ratios of students to clinical instructors to increase student clinical competence.

SUMMARY OF SEARCH

[Best evidence appraised and key findings]

Eight studies met the exclusion criteria and at least two of the inclusion criteria. It was difficult to find studies that satisfied all the inclusion criteria, so the search had to be broadened. These eight studies included 5 prospective cohort studies, 2 retrospective cohort studies, and 1 retrospective case series.

Key Findings:

- The 2:1 model of clinical education seems to produce higher clinical competence in students compared to the 1:1 model, especially in the areas of patient evaluation, program planning, implementation of treatment, and professional behavior.
- Students value that the 2:1 model of clinical education allows for collaboration and support among peers, and CIs believe that this model better facilitates teaching.
- Regardless of the model being used, it is critically important that each clinical placement have enough one-on-one time between the student and CI to allow for feedback and goal setting, along with a sufficient patient caseload per student.

CLINICAL BOTTOM LINE

The 2:1 model of clinical education appears to be more effective at increasing clinical competency in physical therapy students. This model has produced better competency scores compared to the 1:1 model, and students value the opportunities for peer collaboration and support that arise in this style of placement. Students preferred the 2:1 model over the 3:1 model because it allows more time for individual feedback and discussion sessions with the clinical instructor. Overall, the 2:1 model provides the benefits of peer-based learning while minimizing drawbacks due to time and patient caseload constraints.

This critically appraised topic has been individually prepared as part of a course requirement and has been peer-reviewed by one other independent course instructor

The above information should fit onto the first page of your CAT

SEARCH STRATEGY

Terms used to guide the search strategy			
Patient/Client Group	Intervention (or Assessment)	Comparison	Outcome(s)
"Doctor of Physical Therapy student" "DPT student" "student" "Physical Therapy student"	"Team-based learning" "Collaborative learning" "Group learning"	"Individual learning" "Self"	"Clinical competency" "Clinical reasoning" "Success"

Final search strategy (history):

Show your final search strategy (full history) from PubMed. Indicate which "line" you chose as the final search strategy.

Search	Actions	Details	Query	Results	Time
#14	...	>	Search: #13 AND #7 AND #9 AND #10	229	20:46:27
#13	...	>	Search: #1 AND #12	7,157	20:46:03
#12	...	>	Search: DPT OR Doctor of Physical Therapy OR Physical Therapy OR Physiotherapy	356,845	20:44:59
#11	...	>	Search: #3 AND #7 AND #9 AND #10	178	20:29:37
#10	...	>	Search: success OR competency OR reasoning	1,793,643	20:29:06
#9	...	>	Search: #5 AND (#4) AND (#8)	78,422	20:28:45
#8	...	>	Search: individual OR self	11,207,382	20:28:24
#7	...	>	Search: #5 AND (#4) AND (#6)	41,284	20:27:22
#6	...	>	Search: team based OR collaborative OR group	4,627,966	20:26:52
#5	...	>	Search: learning	706,566	20:26:28
#4	...	>	Search: clinical education OR rotation OR experience	1,426,641	20:26:18
#3	...	>	Search: #1 AND #2	5,856	20:25:56
#2	...	>	Search: DPT OR Doctor of Physical Therapy OR Physical Therapy	329,567	20:24:58
#1	...	>	Search: student	357,529	20:24:31

Showing 1 to 14 of 14 entries

In the table below, show how many results you got from your search from each database you searched.

Databases and Sites Searched	Number of results	Limits applied, revised number of results (if applicable)
PubMed	178	I ran my original search and received 178 articles as a result. I started browsing through the article titles and automatically eliminated those that included "interprofessional education" and "service-learning." I could have eliminated these articles by building them into my search using the NOT operator, but I chose to do this manually because these extraneous articles mentioned some theoretical team-based models of learning that I thought might be useful to modify my search later if needed. I found 4 promising articles and 1 systematic review from my search. I found 3 additional articles from the systematic review itself. I noticed that some articles were using the word "physiotherapy" instead of "DPT OR Doctor of Physical Therapy OR Physical Therapy," so I added that word to my search terms and it yielded 229 results. Most of these articles were repeats or irrelevant to the original search.
PEDro		I did not find PEDro to be very useful in my search. Since I could not build my search with Boolean operators in this database, I was limited to searching

		singular keywords, which either created a very large number of results or just a few. I could not find any relevant titles among the ones I scrolled through.
CINAHL	18	I ran my original search strategy in CINAHL and got 18 results, 6 of which were relevant to my PICO topic and different from the articles I selected from PubMed.
Cochrane Library	26	I ran my original search in Cochrane library and received 26 trials, but none of them were relevant to my PICO question at all. I broadened the search by removing the "physical therapy" keywords to include other health professions, but still did not get any relevant results.
Journal of Physical Therapy Education	4	I was not able to run an advanced search with all my search terms in the journal itself. However, I tried different combinations of search terms to find 4 relevant articles that were different from those I already found in the other databases.

INCLUSION and EXCLUSION CRITERIA

Inclusion Criteria
<ul style="list-style-type: none"> • Study focused on DPT students on clinical rotations • Student clinical competency/reasoning/success should be evaluated with an outcome measure • Team-based learning should involve interaction with peers in a DPT program • Interactions could be in-person or online
Exclusion Criteria
<ul style="list-style-type: none"> • Interprofessional education • Anecdotal reports from students • Classroom-based learning • Not published in English • Poster presentations

RESULTS OF SEARCH

Summary of articles retrieved that met inclusion and exclusion criteria

For each article being considered for inclusion in the CAT, score for methodological quality on an appropriate scale, categorize the level of evidence, indicate whether the relevance of the study PICO to your PICO is high/mod/low, and note the study design (e.g., RCT, systematic review, case study).

Author (Year)	Risk of bias (quality score)*	Level of Evidence**	Relevance	Study design
Sevenhuysen et al. (2015) ¹	Yes: 5 Can't Tell: 1 No: 3	4 – Although there was an experimental PAL group and a traditional paired control group, cross-over of the groups may have confounded the results.	Mod: Does not directly compare the 1:1 vs 2:1 model, but it does provide valuable qualitative evidence about students' perceptions of their level of clinical competency in the paired PAL model.	Prospective, cross-over, cohort study
O'Connor et al. (2012) ²	Yes: 7 Can't Tell: 2 No: 0	4 – Could be considered a "poor quality cohort study" because all student participants had already experienced both the 1:1 and 2:1 models.	High: This study directly investigates student and CI perceptions on paired learning vs. individual learning. However, student clinical competency was measured anecdotally and not with an outcome measure.	Retrospective cohort study
DeClute & Ladyshevsky (1993)³	Yes: 9 Can't Tell: 3 No: 0	2b – Good quality individual cohort study.	High: This study directly investigates student and CI perceptions on 2:1 vs. 1:1 models of learning. An outcome measure was used, which was part of my inclusion criteria.	Retrospective, cohort study
Alpine et al. (2019) ⁴	Yes: 6 Can't Tell: 2 No: 1	4 – Since this was a pilot study, there was no 1:1 model control group. There was only a 2:1 model group and data was only collected on opinions about this model.	Mod: This study investigates student and CI perceptions of the 2:1 clinical model but does not compare it to the 1:1 clinical model. A questionnaire was used to collect qualitative data.	Retrospective, case series study (pilot)
Moore et al. (2003)⁵	Yes: 7 Can't Tell: 1 No: 1	2b – Good quality individual cohort study with 3 clearly defined groups.	High: This study directly compared student and CI perspectives on the 1:1, 2:1, and 3:1 models of clinical education. However, a standardized outcome measure was not used.	Prospective, cohort study
Ladyshevsky (2004) ⁶	Yes: 8 Can't Tell: 0 No: 1	2b – Individual cohort study. Limited due to small sample size.	Low: This study compared the effects of peer-coaching vs. individual learning when conducting a session with a simulated patient. A limitation could be that real patients were not used and that only one "patient" encounter was studied.	Prospective, cohort study
Ladyshevsky (2002) ⁷	Yes: 10 Can't Tell: 2	2b – Individual cohort study with quantitative data analysis.	Low: This study compared the effects of peer-coaching vs. individual learning when conducting a session with a	Prospective, cohort study

	No: 0		simulated patient. This study did utilize outcome measures, so quantitative data analysis was able to be performed. However, this study used a single simulated patient encounter.	
Jelley et al. (2010) ⁸	Yes: 4 Can't Tell: 2 No: 3	4 – Could be considered a "poor quality cohort study" since there was no 1:1 comparison/control group.	Low: This study investigated the 2:1 model but did not have a 1:1 comparison group. Each PT student was paired with a PTA student, so collaborative education was studied. This is not directly relevant to my topic of interest.	Prospective, cohort study

*Scored on CASP Checklists: Qualitative (Total: 9 "scored" questions) or Cohort (Total: 12 "scored" questions)

**Portney & Watkins Table 16.1 (2009)

BEST EVIDENCE

The following 2 studies were identified as the 'best' evidence and selected for critical appraisal. Rationale for selecting these studies were:

- **DeClute & Ladyshevsky (1993)³**: This study was chosen as the best evidence for this clinical question because it directly compared the 1:1 and 2:1 models of clinical education in physical therapy. The topic of this study allowed for the Relevance to be scored as "High." The Evaluation of Clinical Competence form was used as a validated outcome measure, which was one of the inclusion criteria for the search strategy. Although the study was retrospective, the researchers attempted to control for learning effects that may have occurred as best they could. The Level of Evidence was scored as 2b because this was a good quality individual cohort study. Compared to the Levels of Evidence of the other selected articles, this study scored quite high.
- **Moore et al. (2003)⁵**: This study was chosen as the best evidence for this clinical question because it directly compared the 1:1, 2:1, and 3:1 models of clinical education in physical therapy. The topic of this study allowed for the Relevance to be scored as "High." Although a validated outcome measure was not used, qualitative data was collected and compared in pairs, groups, and individually. The data analysis was very thorough in this study and was more reliable because the study was prospective. The Level of Evidence was scored as 2b because this was a good quality individual cohort study. Compared to the Levels of Evidence of the other selected articles, this study scored quite high.

SUMMARY OF BEST EVIDENCE

(1) Description and appraisal of "Enhancing Clinical Competence Using a Collaborative Clinical Education Model" by DeClute & Ladyshevsky (1993)³

Aim/Objective of the Study/Systematic Review:
The aim of this study by DeClute & Ladyshevsky was to determine whether students in 1:1 and 2:1 clinical placements differed from each other in clinical competence as measured on the Evaluation of Clinical Competence (ECC) form.
Study Design
[e.g., systematic review, cohort, randomised controlled trial, qualitative study, grounded theory. Includes information about study characteristics such as blinding and allocation concealment. When were outcomes measured, if relevant]
Note: For systematic review, use headings 'search strategy', 'selection criteria', 'methods' etc. For qualitative studies, identify data collection/analyses methods.
This study by DeClute & Ladyshevsky is a retrospective cohort study that involved CIs and third year physical therapy students who had previously participated in an independent study (Ladyshevsky 1993 ⁹) at the University of Toronto that investigated barriers in using the 2:1 education model in specialty physical therapy settings. ⁹ All CIs had already completed an ECC form for each student's clinical placement. The clinical placements that were retrospectively examined in this study took place during the third year of the PT program and were in the following specialty fields: cardiorespiratory, orthopedics, and neurology. Each

student was required to have a rotation in each of the specialty areas plus one additional rotation in an area of their choosing (4 total rotations). Initially, 64 third year students consented to participate, which created 256 possible rotations for analysis. 38 of these rotations utilized the 2:1 model, so all of these were considered for the study. The remaining 218 placements used the 1:1 model, but the number of these included in the study were pared down to control for learning effects.

How DeClute & Ladyshevsky Controlled for Learning Effects:

1. If a student had a 2:1 placement and then subsequently had 1:1 placements, the data for that student's 1:1 placements was not included in the study to control for any potential "advantage" in knowledge or skill that the student might have had prior to beginning the 1:1 placements.
2. If a student had a 2:1 placement and then subsequently had additional 2:1 placements (rare), only the first 2:1 placement was included in the study.
3. 28 2:1 placements were identified after using these exclusion criteria. A one-way ANOVA was conducted with the ECC scores to determine if there was a significant difference in clinical competence for students who had a 2:1 placement after already having 1:1 placements, but a significant difference was not found. This is possibly because each rotation was in a different specialty, so all knowledge was not directly compatible with each rotation.
4. Since there were no appreciable differences in scores between placement groups, 20 students with 1:1 clinical experiences were chosen for each rotation (cardiorespiratory, orthopedics, neurology, and student's choice). This created a sample of 80 "subjects" in the 1:1 control group.
5. A one-way ANOVA was also carried out for these subgroups in the 1:1 category, and no significant difference in ECC scores was found. Thus, the authors concluded that this control group of 80 1:1 clinical experiences with their corresponding ECC scores was appropriate to use in the study.

After controlling for learning effects, the authors were left with 28 2:1 placements and 80 1:1 placements for analysis. 19 CIs participated in the 2:1 placements, but the number of CIs scoring the 1:1 placements was not stated. The authors confirmed that there was no significant difference in grade point average between the 2:1 and 1:1 groups, so neither group began with a significant advantage in knowledge.

A two-tailed t-test was conducted at a pre-set p-value of 0.05 to determine if there is a statistically significant difference in ECC scores between the two groups. Two-tailed t-tests were also conducted for each section of the ECC form individually (patient evaluation, program planning, implementation of treatment, communication with patient/family, communication and management skills, documentation, and professional behavior).

Setting

[e.g., locations such as hospital, community; rural; metropolitan; country]

The authors did not clearly state where the clinical rotations utilized in this study took place. However, since the participants were students from the University of Toronto, we could reasonably assume that the study took place in hospitals and clinics in and around the greater Toronto area.

Participants

[N, diagnosis, eligibility criteria, how recruited, type of sample (e.g., purposive, random), key demographics such as mean age, gender, duration of illness/disease, and if groups in an RCT were comparable at baseline on key demographic variables; number of dropouts if relevant, number available for follow-up]

Note: This is not a list of the inclusion and exclusion criteria. This is a description of the actual sample that participated in the study. You can find this descriptive information in the text and tables in the article.

64 third-year students in the Bachelor of Physical Therapy program at the University of Toronto consented to participate in this study. However, not all 64 students may have been included in the 2:1 and 1:1 placement groups for the reasons listed in the "How DeClute & Ladyshevsky Controlled for Learning Effects" portion of the Study Design section. 19 CIs participated in the 2:1 placements, but the number of CIs scoring the 1:1 placements was not stated. All CIs and students that participated in the 2:1 placements had previously participated in an independent study (Ladyshevsky 1993⁹) at the University of Toronto that investigated issues in implementing the 2:1 education model in specialty physical therapy settings.⁹ All students participating in this study had completed the 4 required clinicals in the third year from May-August 1990. Students in the 2:1 placements had an "average grade point percentage³" of 77% (B+) and students in the 1:1 group had an average of 74% (B). The authors confirmed that there was no significant difference in grade point average between the 2:1 and 1:1 groups, so neither group began with a significant advantage in knowledge. Since this study was retrospective, drop-outs and follow-up were not considered.

Demographics were not reported for the students and CIs in the 1:1 model group. The following demographics were reported for the 38 students in the 2:1 model group prior to adjustment to control for learning effects:

Age of Students in the 2:1 Group (n=38):

Age	% of Students
-----	---------------

20 – 24 years	67%
25 – 29 years	27%
30 – 34 years	6%

The authors considered this group to be “fairly similar³” in age.

Highest Level of Education Completed by Students in the 2:1 Group (n=38):

Level of Education	% of Students
High School Diploma	47%
1-2 Years of University Education	19%
3+ Years of University Education	34%

In the precursor to this study, Ladeshewsky 1993⁹, the author recognized the differences in the level of education and grade point average of the students completing a 2:1 placement. Each student was matched with another student who was similar in these characteristics when creating the pairs. This was done to “minimize potential differences in student performance.³”

Amount of Clinical Experience of CIs in the 2:1 Group (n=19):

Years of Clinical Experience	% of CIs
Less than 2 Years	10%
2-5 Years	32%
5+ Years	58%

Additionally, 58% of the CIs in the 2:1 group reported previous supervision of 2 students simultaneously, and 79% of that group reported supervising 3 or more students at the same time in the past.

Intervention Investigated

[Provide details of methods, who provided treatment, when and where, how many hours of treatment provided]

Control

This was a retrospective cohort study, so the participants were not actually randomized into a control group. However, the 1:1 clinical placement model group could be considered the “control group” because clinical rotations are typically conducted in this manner. This paper calls this model the “traditional 1:1 ratio³,” and uses it for comparison with the relatively novel 2:1 model. Each 1:1 placement involved a CI scoring an individual student on the ECC after a 4-week clinical placement in either a cardiorespiratory, orthopedic, or neurology setting.

Experimental

This was a retrospective cohort study, so the participants were not actually randomized into an experimental group. However, the 2:1 clinical placement model group could be considered the “experimental group” because it is a relatively new model of clinical education and researchers are attempting to determine its efficacy in practice. The introduction section of this paper lists ways in which peer collaboration enhances student learning, and this study aims to add to the body of literature about this new teaching technique. Each 2:1 placement in this study involved a CI scoring two students on the ECC after a 4-week clinical placement in either a cardiorespiratory, orthopedic, or neurology setting.

Outcome Measures

[Give details of each measure, maximum possible score and range for each measure, administered by whom, where]

Student clinical competence was measured by using the Evaluation of Clinical Competence (ECC) form, which was developed at the University of Toronto. The CIs scored each student on the ECC after the duration of each clinical rotation. The ECC is made up of "33 items ranked on a progressive ordinal scale.³" There are 7 categories within the form: patient evaluation, program planning, implementation of treatment, communication with patient/family, communication and management skills, documentation, and professional behavior. Each question is scored on a scale from 1-4, with 1 being the lowest level of competency and 4 being the highest. The instructions on the form describe "the expected competency levels the students must exhibit in order to receive a certain score."³ Each category also has a predetermined weight associated with it, as each of them contribute in varying amounts to clinical competency. The weights vary on a scale of 1 to 3. The score on each question is multiplied by its weight to create an overall score. A sample question from the ECC is provided in Figure 2 of the paper. I attempted to find the full document, but was unable to locate it because I could not receive access to the Ladyshevsky 1993⁹ paper, which was the original 2:1 model study that recruited the subjects for this study. The DeClute & Ladyshevsky study reported mean scores for each category of the ECC and the overall ECC, along with their associated percentage scores. Since mean scores were reported, the maximum possible score in any category and overall was 4. It is unclear who administered the ECC and where it was administered in the initial study.

Some psychometric properties about the ECC were reported in this study. I attempted to find additional psychometrics but was unable to locate more information about this measure. This paper quotes an article by Loomis which states that the ECC had a reliability coefficient of 0.591 when administered to fourth-year PT students, and 0.624 with third-year PT students.¹⁰ The authors claim this is a strong measure of reliability because "the maximum reliability coefficient generally achieved is 0.30 for clinical evaluations."³ It is unclear whether this was testing test-retest, intrarater, or interrater reliability, however. The Loomis paper is also said to have found "adequate measures of content, concurrent, and construct validity."¹⁰ I was unable to gain access to this paper to evaluate these claims myself. I have not found any recent use of the ECC, so it may not be the most up-to-date measure of clinical competency.

Main Findings

[Provide summary of mean scores/mean differences/treatment effect, 95% confidence intervals and p-values etc., where provided; you may calculate your own values if necessary/applicable. You may summarize results in a table but you must explain the results with some narrative.]

Table 1: Clinical Competence Scores for Collaborative (2:1) Group (n=28) Versus Individual (1:1) Group (n=80)³

Clinical Competence	1:1 Group		2:1 Group		t
	\bar{x}	%	\bar{x}	%	
Patient Evaluation	3.36	84	3.60	90	2.61 ^a
Program Planning	3.22	80	3.48	87	2.67 ^a
Implementation of Treatment	3.52	88	3.73	93	2.98 ^a
Communication with Patient/Family	3.48	87	3.68	92	2.29 ^b
Communication and Management Skills	3.56	89	3.74	94	2.05 ^b
Documentation	3.36	84	3.61	90	2.16 ^b
Professional Behavior	3.58	90	3.79	95	2.82 ^a
Total Clinical Competence Score	3.42	85	3.66	92	3.34^c

^a Significant at p=0.02
^b Significant at p=0.05
^c Significant at p=0.01

The overall ECC score and each category for the 2:1 and 1:1 groups were found to be statistically different at p=0.05 or lower. Patient evaluation, program planning, implementation of treatment, and professional behavior were even lower, with significance at the p=0.02 level. The overall ECC score was significantly

higher for the 2:1 group at the $p=0.01$ level. I was unable to calculate the confidence intervals for this data because the raw data was not provided – only the differences between group means were reported. Overall, this data shows that the 2:1 model of clinical education produces significantly higher scores in student clinical competency compared to the 1:1 model.

Original Authors' Conclusions

[Paraphrase as required. If providing a direct quote, add page number]

The authors state that the significant differences found in clinical competence scores on the ECC support the implementation of the 2:1 model of clinical education in PT programs. Students who participated in the 2:1 model experienced the greatest improvements in the areas of patient evaluation, program planning, implementation of treatment, and professional behavior, thus justifying the use of collaborative clinical education as "a viable alternative to the traditional 1:1 ratio. (pg. 48.)"³ Two secondary conclusions were also stated: the use of the 2:1 model to increase the number of available clinical placements to meet demand and the ability of the model to emphasize the importance of working on a health care team.

Critical Appraisal

Validity

[Summarize the internal and external validity of the study. Highlight key strengths and weaknesses. Comment on the overall evidence quality provided by this study.]

Internal Validity:

The main strength of this study was the rigorous methodology the authors used to control for learning effects among the large number of possible clinical rotations that were analyzed. The authors carefully considered the effects of sequential learning and mitigated this confounding variable as much as possible. If they had not done so, learning effects may have caused higher ECC scores for some students compared to others. Another strength is that the authors reported data for each category of the ECC. This allowed for the readers to understand which specific categories had a significant difference in competency rather than only recognizing that overall clinical competency was higher in the 2:1 group.

Several weaknesses were noted in this study. The characteristics of the students and CIs in the 1:1 group were not investigated and reported. This means that we do not know the level of education of the students and the amount of experience the CIs had, as was reported for the 2:1 group. Average grade point average was reported for the 1:1 group, but we could not see if any of this data had the potential to skew the ECC scores in either direction compared to the 2:1 group, which did not have any significant differences in these characteristics. I was unable to find a full copy of the ECC or access the Loomis study¹⁰ which reported further psychometric data about the outcome measure. It would have been valuable for the authors to at least report these additional psychometric measures in the "Measurement Instrument" section to justify the use of the ECC.

External Validity:

This study was conducted in Canada in 1993, when Bachelor of Physical Therapy programs were common. This study is not easily generalizable to PT students in the present day because Canada now requires a Master's in Physical Therapy and the US requires a Doctorate degree. PT students today must have completed a bachelor's degree first, so they will have more background knowledge and experience in the education system than the students that participated in this study. The age distribution may also be skewed older today. However, since the ECC measures many of the same items that are currently measured on the CPI, the results may be similar if a 1:1 vs. 2:1 model study was conducted today.

Overall Evidence Quality:

The evidence presented in this study seems reasonable but would be further justified by reporting psychometric data about the outcome measure, characteristics of the 1:1 group, and raw ECC scores. If the standard deviations were reported or could have been calculated from the raw scores, we could have more confidence in the data because the confidence intervals and effect sizes could have been calculated and analyzed.

Interpretation of Results

[This is YOUR interpretation of the results taking into consideration the strengths and limitations as you discussed above. Please comment on clinical significance of effect size / study findings. Describe in your own words what the results mean.]

The evidence presented in this study seems to be very promising, as all of the categories on the ECC and the overall ECC score were significantly different between the 1:1 and 2:1 model groups. The strongest evidence shows that the 2:1 model produces significantly better proficiency scores in patient evaluation, program planning, implementation of treatment, and professional behavior at a p level of 0.02. Overall clinical competency scores were significantly different at $p=0.01$. While this data strongly supports the use of the

2:1 model in PT clinical rotations, the weaknesses in the study make it difficult to fully trust the results being presented. Firstly, just because the results are statistically significant does not mean that they are clinically significant. Since a small sample size was used, especially for the 2:1 group, we do not know if widespread implementation of the 2:1 model would produce the same increases in clinical competency compared to the 1:1 group. If the psychometrics of the ECC were fully justified, I would be more likely to believe that this outcome measure accurately measured clinical competency. It is possible that a different validated outcome measure would have been more appropriate for use. An additional student-reported outcome measure would have been valuable to see how the students would score their own performance in the 1:1 versus 2:1 groups. I am unsure why the authors chose not to report standard deviations and effect sizes in the results section. They would have been helpful to understand the true impact of the 2:1 model over the 1:1 model on clinical competence. I would have at least wanted a table with the raw ECC scores listed, as the standard deviations and effect sizes could have been calculated from this data.

Applicability of Study Results

[Describe the relevance and applicability of the study to your clinical question and scenario. Consider the practicality and feasibility of the intervention in your discussion of the evidence applicability.]

This study was highly relevant and applicable to my clinical question because it used an outcome measure to determine if the 1:1 or 2:1 model of clinical education was more effective at increasing student clinical competency. The risk of bias for this study was relatively low based on the CASP Checklist, and it was ranked as a 2b in level of evidence, which was higher than the other studies that were ranked as level 4. The weaknesses of the study hinder the confidence with which I would utilize these results to inform the way I believe clinical education should be conducted. However, the results reported from the ECC do convey a strong level of evidence to support the use of the 2:1 model to increase student clinical competence. DPT programs would have to perform an overhaul of their current clinical education system to implement the 2:1 model. This is not extremely practical in today's climate of COVID restrictions and limited relationships between DPT programs and clinical sites. However, over time, it may be possible to implement this model if further current evidence strongly supports it.

(2) Description and appraisal of "Evaluation of Physiotherapy Clinical Education Models: Comparing 1:1, 2:1, and 3:1 Placements" by Moore et al. (2003)⁵

Aim/Objective of the Study/Systematic Review:

The main aim of the study by Moore et al. was to determine how the 1:1, 2:1, and 3:1 models of clinical education impact student learning. The authors also aimed to add to the body of literature surrounding different models of clinical education.

Study Design

[e.g., systematic review, cohort, randomised controlled trial, qualitative study, grounded theory. Includes information about study characteristics such as blinding and allocation concealment. When were outcomes measured, if relevant]

Note: For systematic review, use headings 'search strategy', 'selection criteria', 'methods' etc. For qualitative studies, identify data collection/analyses methods.

This study by Moore et al. is a prospective cohort study in which data was collected in a qualitative manner. 8 PT clinical instructors and 48 third-year PT students volunteered to participate in the study. The authors chose to focus the study design on the clinical instructors' experience. Each CI experienced the 1:1, 2:1, and 3:1 model, while the students did not experience each model due to "time constraints and the availability of placement sites."⁵ The CIs were assigned to each of the models in a random order to try and mitigate any order effects that may have taken place. All the rotations took place over a six-month period of time. Four clinic managers from the CIs' clinics also agreed to participate, along with four tutors from the University of Brighton Physiotherapy department who were in regular contact with the placement sites. All instructors, managers, and tutors first took part in a workshop discussing ways to manage learning for multiple students simultaneously. The research aims were discussed, so these individuals were not blind to the study. The students were notified of the research goals prior to data collection, so they also were not blind. Qualitative data was collected after the rotations via "face-to-face semi-structured interviews"⁵ for instructors and students, along with a "focus group interview"⁵ for students only. Each interview was 30-50 minutes long. CIs and 1:1 students were interviewed individually, while the 2:1 and 3:1 students were interviewed in their pairs or groups of three. The students in these group interviews could make private comments at the end if desired. Managers were interviewed individually, and the tutors were interviewed in pairs. 10% of the interviews were observed by a third-party qualitative researcher to give the interviewer feedback. Audio recordings of the interviews were taken and transcribed. The NVIVO 1.0 software was used to code and thematically analyze the data.

Setting

[e.g., locations such as hospital, community; rural; metropolitan; country]

It is unclear exactly where the clinical rotations took place. The data collection interviews were conducted in private rooms in National Health Service centers in Great Britain.

Participants

[N, diagnosis, eligibility criteria, how recruited, type of sample (e.g., purposive, random), key demographics such as mean age, gender, duration of illness/disease, and if groups in an RCT were comparable at baseline on key demographic variables; number of dropouts if relevant, number available for follow-up]

Note: This is not a list of the inclusion and exclusion criteria. This is a description of the actual sample that participated in the study. You can find this descriptive information in the text and tables in the article.

8 PT clinical instructors, 48 third-year PT students, 4 clinic managers, and 4 tutors from the University of Brighton Physiotherapy department volunteered to participate in the study. It is unclear how these participants were recruited or if inclusion/exclusion criteria were considered by the researchers. All of these participants were volunteers, consented to the study, and were not blind to the study aims and procedures. Demographic information was not provided for any of the participants.

Intervention Investigated

[Provide details of methods, who provided treatment, when and where, how many hours of treatment provided]

Control

Although this was a prospective study, it did not have a clear control group. The student and CI interview material that corresponds with the 1:1 model could be considered the control group, but direct comparisons were not made between this model and the others. Rather, qualitative data was collected about different aspects of all the models. Clinical instruction for the "control group" was provided by all 8 CIs, but it was unclear how many students participated in the 1:1 model. The duration of the rotations is also unclear. The rotations were conducted in the following settings: outpatient in a general practitioner clinic, hospital-based outpatient, hydrotherapy, respiratory/ICU, acute elderly care, and amputee care. Data was collected via individual interviews for the CIs and students using the 1:1 model. The students also participated in a focus group to talk about their experiences with students who were placed in the other models of education.

Experimental

Although this was a prospective study, it did not have a clear experimental group. The student and CI interview material that corresponds with the 2:1 and 3:1 models could be considered the experimental groups, but direct comparisons were not made with the 1:1 model. Rather, qualitative data was collected about different aspects of all the models. Clinical instruction for the "experimental groups" was provided by all 8 CIs, but it was unclear how many students participated in the 2:1 and 3:1 models. The duration of the rotations is also unclear. The rotations were conducted in the following settings: outpatient in a general practitioner clinic, hospital-based outpatient, hydrotherapy, respiratory/ICU, acute elderly care, and amputee care. Data was collected via paired interviews for the 2:1 group and in groups of three for the 3:1 group. The students also participated in a focus group to talk about their experiences with students who were placed in the 1:1 model of education.

Outcome Measures

[Give details of each measure, maximum possible score and range for each measure, administered by whom, where]

A standardized outcome measure was not used in this study. Since qualitative data was collected in a "semi-structured⁵" format, the entirety of what was discussed in the interviews and focus groups is unknown. However, a list of covered topics was provided in Table 1 (pg. 492)⁵, which is replicated below. Anonymous quotes are also provided in the Findings and Discussion section of the paper. The interviews and focus group were conducted by a singular research officer. Pilot interviews were conducted first to solidify the structure of the final interviews. The research officer was observed by two third-party qualitative researchers in 10% of the interviews to receive feedback about the format and delivery of the interview questions. All qualitative data was collected in private rooms in National Health Service centers in Great Britain.

Table 1: Synopsis of the broad interview topics covered for both clinical educators and students⁵

Interview topics for clinical educators	Interview topics for students
---	-------------------------------

Previous experience of different models of placement education	Previous experience of different models of placement education
Student support	Learning from each other
Provision of student feedback	Student feedback
Student learning	Other opportunities offered by the different models
Student competition	Student competition
Time spent for supervision	Time for individual supervision
Time spent for discussion	Time for discussion
Advantages and disadvantages of the placement model	Advantages and disadvantages of the placement model
Learning opportunities	

Main Findings

[Provide summary of mean scores/mean differences/treatment effect, 95% confidence intervals and p-values etc., where provided; you may calculate your own values if necessary/applicable. Use a table to summarize results if possible.]

The data in the following tables is extracted and reorganized from **Table 2: Advantages and disadvantages of the three models (pg. 494).**⁵

Advantages and disadvantages of the 1:1 model⁵:

Advantages:	Disadvantages:
<i>(Increased opportunity for students and educators to...)</i> Observe each other	<i>(Many of the disadvantages of the 1:1 model resulted from the students being alone and meant that the students had...)</i> No peer company
Work together	No one at their level to reassure them
Exchange feedback	Lack of peer learning opportunities
Discuss and reflect on practice	No other students to discuss things with
Assess students' strengths and weaknesses	No other students to share ideas
Assess students' progress	No other students to practice techniques with
Build a good relationship with each other	<i>(Some disadvantages of the 1:1 model were associated with educators maintaining a high workload which meant that...)</i> The students had less time with the educators
Experience integrated teamwork	The educator was less accessible

In the 1:1 clinical education framework, students and CIs were able to communicate with each other effectively and build a positive relationship. Students did not receive peer support in this model, which led to a lack of collaborative thinking surrounding patient care. However, CIs were able to give a lot of feedback to shape the students' knowledge and skills. CIs having a "high workload"⁵ was noted as a barrier to student learning and communication, but it is unclear if this was also hindering students in the 2:1 and 3:1 groups.

Advantages and disadvantages of the 2:1 model⁵:

Advantages:	Disadvantages:

<i>(Educators and students believed it was supportive for the students to have another student with them who was "in the same boat." The students...)</i> Felt more relaxed, comfortable, confident, and less intimidated	<i>(Some educators and students indicated that...)</i> It was difficult to maintain privacy
Related to and reassured each other	Peer learning was not used optimally
Understood what the other was experiencing	
Talked to each other about many issues	
<i>(Educators and students believed that learning was enhanced because students...)</i> Discussed patients, assessments, treatment techniques, and treatment plans	
Exchanged ideas and practiced techniques together	
Asked each other questions they did not want to ask their educator	
Solved problems together	
Shared knowledge, experience, and resources	
Motivated each other	
Encouraged each other to be self-directed in their learning	
Observed each other with patients	
Exchanged feedback	
<i>(Educators who experienced the 2:1 model found that...)</i> Demonstrating and practicing techniques was easy	
Preparing and carrying out teaching sessions was more rewarding	
Students' questions made them reflect on their own practice and clinical reasoning and encouraged maintenance of high standards of knowledge and skill	

In the 2:1 clinical education framework, students were able to collaborate on not only their PT knowledge and skills, but also their feelings surrounding the clinical experience. Students felt more comfortable and confident applying their assessment and treatment skills. The CIs who participated in this model felt that they were more efficacious teachers. Minimal disadvantages were noted, but some students reported limited one-on-one time with CIs and differences in personality as drawbacks.

Advantages and Disadvantages of the 3:1 Model⁵:

Advantages:	Disadvantages:
<i>(Benefits cited by both educators and students focused on peer support and peer learning advantages of the students. They provided each other with...)</i> Social support	<i>(Some educators and students identified disadvantages that focused on the limited time they spent together. They found...)</i> It was difficult for educators to keep an eye on three students
Someone to talk to	It took longer for educators and students to build a relationship
Moral support and reassurance	It was difficult for educators to know individual students' strengths and weaknesses

Someone to share ideas with	It was difficult for educators to monitor student progress
Someone to observe	Students were concerned that the educators would not be able to assess them accurately
Feedback	Educators had less time to spend with other staff
Someone to work with	There was less time available for educators to spend with each student individually for observation, feedback, and reflection
Someone to share past experiences and new knowledge with	Space was restricted on some placements
Help and advice	There were not enough patients on some placements
Someone to solve problems with	
Someone to ask questions before going to the educator	

In the 3:1 clinical education framework, both CIs and students noted greater disadvantages than the other two models. CIs had to split their time between three students, so the students each received less opportunity with the instructor for feedback and discussion about patient care. Each student handled fewer patients in this model because the CI's caseload was divided among three people. Many of the advantages noted in the 2:1 model were also found in this model, including peer support and the ability to share assessment and treatment ideas.

Data from the Managers and Tutors:

The managers reported that having more students participate in their clinical education programs may reflect favorably on the department and provide more opportunities for physical therapist recruitment in the future. The tutors' role was to observe students during rotations, so they felt that the 2:1 and 3:1 models would allow for more efficient observations. The tutors also reported a difficulty in finding alternative placements for students in the 3:1 group if a 3:1 placement was cancelled for some reason.

Original Authors' Conclusions

[Paraphrase as required. If providing a direct quote, add page number]

The authors state that in most cases, the 2:1 model of clinical education produces the greatest benefits and fewest drawbacks. The 2:1 model allows for peer support and collaboration, which the students in the study found very valuable. The 2:1 model was also advantageous for the CIs because they prepared better to teach, found the model rewarding, and did not think it was more difficult to implement compared to the 1:1 model. The 3:1 model had many of the same benefits, but a lack of individual time with the CI was a major drawback. The 1:1 model had success but lacked the peer communication found in the other models. The authors concluded that "all three models investigated have a place in physiotherapy clinical education (pg.499).⁵" Finding the model most appropriate for use depends on many factors including patient caseload, personalities of the CI and students, and resources available at the clinical site.

Critical Appraisal

Validity

[Summarize the internal and external validity of the study. Highlight key strengths and weaknesses. Comment on the overall evidence quality provided by this study.]

Internal Validity:

The main strength of this study was that the researchers tested for accuracy of the data at several points in the analysis process. During the data collection interviews, the interviewer was given feedback on their interview skills by having 10% of the interviews observed by qualified qualitative researchers. This ensured that the researcher was asking focused questions and minimizing bias when administering the interviews. 10% of the transcribed interviews were sent back to the students and CIs to check for accuracy of the transcriptions, and no problems were found. Additionally, an "initial analysis stage⁵" was created in which the themes from the NVIVO thematic analysis were approved by students and educators. Another strength of the study was that students were interviewed in groups or pairs depending on their placement to get a full picture of their opinions on different facets of their placement. This allowed for students to converse about how the placement model impacted their education in the context of working with each other. It was also valuable that the interviews were "semi-structured⁵" because students were allowed to stray from the

predetermined topics if they felt it was relevant. The quotes provided in the paper encompassed many topics and increased the credibility of the paper from the readers' perspective.

A weakness of the study was that each student was not able to experience all three models of education due to limited available time. This would have allowed for students to make comparisons between their experiences in each model. This study interviewed students in groups or pairs first, and then provided an opportunity for an individual interview if the student asked for one. Students may have been less likely to request an individual interview unless they had something very important to say anonymously. The study could have been improved by interviewing all students individually first, and then in their pairs or groups to minimize the influence of peers' comments on a student's own opinions.

External Validity:

The authors state that the small sample size used in this study limits the generalizability of the results to other physical therapy students and CIs. This study was also conducted in Great Britain, which has a different healthcare system structure than the United States, making it difficult to know if similar results would arise here.

Overall Evidence Quality:

The main themes that emerged from the qualitative evidence collected in this study seem reasonable and appear to have sufficient face validity. The risk of bias was relatively low based on the CASP Checklist. The quality of evidence was fairly high (2b) compared to other selected studies because the three cohorts were clearly defined, and thematic analysis was conducted with a commonly used software. Areas of improvement have been discussed above and would be valuable additions to any future iteration of this study.

Interpretation of Results

[This is YOUR interpretation of the results taking into consideration the strengths and limitations as you discussed above. Please comment on clinical significance of effect size / study findings. Describe in your own words what the results mean.]

Although this study is qualitative in nature, valuable results were found regarding the benefits and drawbacks of all three models of education. There was no way to quantify the efficacy of one model over another, but the author's conclusions align well with the statements made by the participants and the themes that emerged in the analysis. It was helpful that the student and CI comments were reported separately and collectively as needed. I agree that the 2:1 model seemed to provide the most benefits and least drawbacks, and the authors conveyed appropriate caution when stating that many personal and environmental factors hinder the recommendation of the 2:1 model for each and every student and CI. Table 2 (pg. 494)⁵ allowed for ease of comparison between all three models. As stated above, the authors tested the data at various time points in the study, which makes the results more credible to the readers. This study was opinion-based, so there is naturally a limited scope for data analysis.

Applicability of Study Results

[Describe the relevance and applicability of the study to your clinical question and scenario. Consider the practicality and feasibility of the intervention in your discussion of the evidence applicability.]

In regard to the clinical question posed in this CAT, this study did not directly measure student clinical competence as a result of participation in one of the three models of education. Rather, insight was provided on the factors that contribute to increased clinical competency via a successful and high-quality clinical experience. The factors that were found to impact student learning can be reasonably assumed to affect clinical competence scores if a quantitative outcome measure were used to compare the three models in the future. I agree that this study would be more generalizable if a larger sample size were used. However, the benefits of the 2:1 model noted by the students and CIs indicate its value in use, especially considering that there are minimal harmful effects if implemented. I think that a preliminary meeting between potential CIs, administrative personnel at the clinical site, and the Director of Clinical Education in a university's PT program would be highly useful in determining which model should be implemented based on the specific factors involved. Students should also be speaking with their Director of Clinical Education to determine which model would best serve the student's learning style and personality. Currently, it is impractical to implement the 2:1 model in a widespread manner due to COVID restrictions and limited relationships between DPT programs and clinical sites. However, over time, it may be possible to implement this model if further current evidence strongly supports it.

SYNTHESIS AND CLINICAL IMPLICATIONS

[Synthesize the results, quality/validity, and applicability of the two studies reviewed for the CAT. Future implications for research should be addressed briefly. Limit: 1 page.]

After evaluating both papers in this CAT, we can conclude that the 2:1 model of clinical education shows some promise in producing greater student clinical competency compared to the 1:1 model. The DeClute & Ladyshevsky et al. paper used the Evaluation of Clinical Competency outcome measure to find that the 2:1 model produced significantly higher overall clinical competency scores at a p-level of 0.01. Students displayed significantly greater proficiency in patient evaluation, program planning, implementation of treatment, and professional behavior at a p-level of 0.02. Although these results suggest that the 2:1 model should be implemented in DPT programs to improve student learning, there are some flaws in the study design that require further consideration. Demographic information for the 1:1 group of students and CIs was not reported, which could have contributed to skewed data. Sufficient psychometric data was not provided to justify the use of the ECC. Effect sizes were not reported, so the readers could not determine the value of the 2:1 model in clinical practice. These, along with other minor flaws cause me to somewhat question the credibility of these results. However, the qualitative results found in the Moore et al. study provide some context as to why the results in the DeClute & Ladyshevsky paper may have some credibility, even if the study needs to be improved upon.

The Moore et al. study collected and analyzed qualitative data about student and CI experiences within the 1:1, 2:1 and 3:1 models of clinical education. This paper found that in most cases, the 2:1 model of clinical education produces the greatest benefits and fewest drawbacks. The 2:1 model allows for peer support and collaboration, which the students in the study found very valuable. The 2:1 model was also advantageous for the CIs because they prepared better to teach, found the model rewarding, and did not think it was more difficult to implement compared to the 1:1 model. The 3:1 model had many of the same benefits, but a lack of individual time with the CI was a major drawback. This study ultimately did not directly measure student clinical competence as a result of participation in one of the three models of education. However, it did find several factors that were crucial to the success or failure of a clinical rotation, which indirectly affects clinical competency. Weaknesses were present in the sequencing of interviews and the inability for each student to experience all three models of education. We are unable to know if the effect size of such an intervention is of high enough quality to overcome these weaknesses because the study was qualitative.

When considering both of these studies together, I think it is reasonable to conclude that the 2:1 model of clinical education shows promise over the 1:1 model. Although both studies had several weaknesses in design and execution, the DeClute and Ladyshevsky study provides quantitative evidence suggesting the superiority of the 2:1 model, and the Moore et al. study provides qualitative evidence as context to support this claim. In the future, research should include both quantitative and qualitative outcome measures to determine differences in clinical competency between these models. If a singular study used a validated student-reported outcome measure and CI-reported outcome measure to quantify student clinical competence, we would be able to see differences in scores from both perspectives. If this same study also included interviews, we could attempt to link the factors influencing the success of a clinical placement to the corresponding clinical competency scores.

REFERENCES

[List all references cited in the CAT]

1. Sevenhuysen S, Farlie MK, Keating JL, Haines TP, Molloy E. Physiotherapy students and clinical educators perceive several ways in which incorporating peer-assisted learning could improve clinical placements: a qualitative study. *J Physiother*. 2015;61(2):87-92. doi:10.1016/j.jphys.2015.02.015
2. O'Connor A, Cahill M, McKay EA. Revisiting 1:1 and 2:1 clinical placement models: student and clinical educator perspectives. *Aust Occup Ther J*. 2012;59(4):276-283. doi:10.1111/j.1440-1630.2012.01025.x
3. DeClute J, Ladyshevsky R. Enhancing clinical competence using a collaborative clinical education model. *Phys Ther*. 1993;73(10):683-689; discussion 689. doi:10.1093/ptj/73.10.683
4. Alpine LM, Caldas FT, Barrett EM. Evaluation of a 2 to 1 peer placement supervision model by physiotherapy students and their educators. *Physiother Theory Pract*. 2019;35(8):748-755. doi:10.1080/09593985.2018.1458168
5. Moore A, Morris J, Crouch V, Martin M. *Evaluation of Physiotherapy Clinical Educational Models: Comparing 1:1, 2:1 and 3:1 Placements*. Vol 89 8 489 501. Physiotherapy (PHYSIOTHERAPY); 2003:13.
6. Ladyshevsky RK. Impact of Peer-Coaching on the Clinical Reasoning of the Novice Practitioner. *Physiotherapy Canada*. 2004;56(01):015. doi:10.2310/6640.2004.15341
7. Ladyshevsky RK. A quasi-experimental study of the differences in performance and clinical reasoning using individual learning versus reciprocal peer coaching. *Physiother Theory Pract*. 2002;18(1):17-31. doi:10.1080/095939802753570666
8. Jolley W, Larocque N, Patterson S. Intradisciplinary clinical education for physiotherapists and physiotherapist assistants: a pilot study. *Physiother Can*. 2010;62(1):75-80. doi:10.3138/physio.62.1.75
9. Ladyshevsky R. Clinical teaching and the 2:1 student to clinical instructor ratio. *Journal of Physical Therapy Education*. 1993;7:31-35.
10. Loomis J. Evaluating clinical competence of physical therapy students. Part 2: assessing the reliability, validity and usability of a new instrument. *Physiother Can*. 1985;37(2):91-98.