Journal of Contemporary Educational Research, 2026, Volume 10, Issue 4
http://ojs.bbwpublisher.com/index.php/JCER
Online ISSN: 2208-8474
Print ISSN: 2208-8466

A Quasi-Experimental Study of a Dual-Supervisor Training Model and Self-Reported Research Training Needs among Clinical Professional Degree Postgraduates

Xiaotong Wang[1†], Yijia Chen[1†], Xiang Gao[1], Hang Lin[1], Lifeng Zhang[1], Huimin Zhou[1], Liping Liu[2], Jing Wang[3], Kunpeng Zhang[4]*

[1]Department of Allergy, The Affiliated Hospital of Qingdao University, Qingdao 266003, Shandong, China
[2]Tai'an City Central Hospital, Tai'an 271000, Shandong, China
[3]Department of Allergy, Yantai Yuhuangding Hospital, Yantai 264000, China
[4]Publicity Department, The Affiliated Hospital of Qingdao University, Qingdao 266003, Shandong, China
[†]These authors contributed equally to this work and shared first authorship.

***Corresponding author:** Kunpeng Zhang, qdfyallergy2018@163.com

Abstract: *Objective:* To examine the association between a dual-supervisor training model and self-reported research training needs. *Methods:* A quasi-experimental study with natural grouping was adopted. A total of 114 clinical professional degree postgraduates (Grade 2023) from a hospital affiliated to a university in Qingdao were enrolled. According to the training plans established at enrollment, 57 students were assigned to the dual-supervisor group and 59 to the single-supervisor group. Finally, 56 students in the dual-supervisor group and 58 in the single-supervisor group completed the study. Questionnaire surveys on research needs were conducted before (March 2024) and one year after (March 2025) the supervisor guidance. Chi-square test, Fisher's exact test, and McNemar test were used to analyze the differences between and within groups. *Results:* The two groups were comparable at baseline ($P > 0.05$). After one year of guidance, the dual-supervisor group reported lower levels of unmet training needs than the single-supervisor group in research process cognition (25.0% vs 48.3%, $\chi^2 = 6.892$, $P = 0.009$), statistical software application (41.1% vs 67.2%, $\chi^2 = 7.562$, $P = 0.006$), scientific graphing ability (39.3% vs 65.5%, $\chi^2 = 8.247$, $P = 0.004$), and academic presentation ability (32.1% vs 55.2%, $\chi^2 = 6.215$, $P = 0.013$). The dual-supervisor group showed significant reductions in self-reported training needs in multiple indicators before and after the intervention ($P < 0.01$), while the single-supervisor group showed no significant improvement ($P > 0.05$). *Conclusion:* The dual-supervisor training model was associated with lower self-reported unmet research training needs among clinical professional degree postgraduates, compared with the single-supervisor model in several domains, and is worthy of further promotion and improvement.

Keywords: Clinical medicine; Professional degree postgraduate; Dual-supervisor system; Training model; Research competence; Teaching reform

Online publication: May 18, 2026

1. Introduction

1.1. Research background

Under the background of vigorously promoting industry-education integration and innovative development of medical education in China, the training model for clinical professional degree postgraduates is facing profound transformation. In 2017, the General Office of the State Council issued the *Opinions on Deepening Industry-Education Integration*, which explicitly proposed to promote the deep connection of the education chain, talent chain, industrial chain, and innovation chain [1]. In 2020, the *Guiding Opinions on Accelerating the Innovative Development of Medical Education* required the classified cultivation of research-oriented, compound, and applied talents [2].

At present, the training of clinical professional degree postgraduates in China implements a parallel model of standardized residency training and master's professional degree training, and students can obtain "four certificates in one" after graduation [3]. However, this model exposes prominent problems such as insufficient systematic research training and weak cultivation of innovative ability [4,5]. Under the traditional single-supervisor training model, clinical supervisors are often burdened with heavy clinical work and cannot devote sufficient energy to guiding research training, with limitations in research methodology and cutting-edge technology application [6,7].

1.2. Connotation and value of the dual-supervisor system

The dual-supervisor system refers to a training model in which a group of supervisors, composed of clinical supervisors and enterprise (or research institute) supervisors, jointly guide postgraduates. Clinical supervisors are mainly responsible for clinical skill training and clinical thinking cultivation, while enterprise supervisors focus on research method guidance, cutting-edge technology training, and achievement transformation ability cultivation. Through industry-education integration and medical-engineering cross-discipline, this model aims to break the limitations of the single training model and achieve the organic unity of clinical practice and research training [8,9].

1.3. Research purpose and significance

Although the dual-supervisor system has obvious advantages in theory, its implementation effect in the training of clinical professional degree postgraduates lacks rigorous empirical research verification [10]. This study adopted a quasi-experimental design with natural grouping and objectively evaluated the implementation effect of the dual-supervisor training model by comparing the changes in research needs between the dual-supervisor group and the single-supervisor group before and after supervisor guidance, providing an evidence-based basis for the reform of medical postgraduate education and teaching.

2. Research subjects and methods

2.1. Research subjects

A total of 114 clinical professional degree postgraduates (Grade 2023) from a hospital affiliated to a university in Qingdao were enrolled as study participants. According to the training plans established and formulated at the time of enrollment, 57 students were included in the dual-supervisor training program (dual-supervisor group), and 59 students were included in the traditional single-supervisor training program

(single-supervisor group).

Inclusion criteria: (1) Full-time clinical professional degree postgraduates; (2) Completed at least 6 months of clinical rotation; (3) Voluntarily participated in the study and signed informed consent. Exclusion criteria: (1) Students who took leave of absence, changed majors, or went out for exchange for more than 3 months during the survey period; (2) Students who withdrew from the dual-supervisor system or changed supervisors midway. During the study, one student in the dual-supervisor group withdrew, and one student in the single-supervisor group took a leave of absence. Finally, 56 students in the dual-supervisor group and 58 students in the single-supervisor group completed the whole study.

2.2. Training model design

2.2.1. Dual-supervisor group

The "clinical supervisor + enterprise supervisor" collaborative guidance model was implemented: (1) Clinical supervisors were clinical physicians with associate senior professional titles or above and experience in postgraduate training, responsible for clinical skill training, clinical rotation guidance, and the clinical part of degree thesis; (2) Enterprise supervisors were technical experts with intermediate professional titles or above from cooperative biomedical enterprises or research institutes, responsible for research method guidance, experimental technology training, data analysis support, and achievement transformation guidance; (3) A regular communication mechanism between dual supervisors was established, with at least 1 joint guidance meeting held every quarter; (4) Relying on university-enterprise joint laboratories, postgraduates were ensured to have no less than 3 months of enterprise practice time in total.

2.2.2. Single-supervisor group

The traditional single clinical supervisor guidance model was implemented: one clinical supervisor was fully responsible for the clinical skill training and research guidance of postgraduates, and training was carried out according to the Training Program for Clinical Professional Degree Postgraduates without additional enterprise supervisors.

The two groups were consistent in standardized residency training, course learning, clinical rotation arrangement, and degree-granting standards. The research period was 12 months (April 2024 to March 2025).

2.3. Research instrument

The self-designed Questionnaire on Research Needs of Clinical Professional Degree Postgraduates was used, including: (1) Research confusion dimension: research process cognition, literature reading and summarizing ability, literature retrieval and management ability, research topic selection ability, communication with supervisors, etc. (5 items); (2) Training content needs dimension: statistical software training, scientific graphing and chart making, thesis writing norms, experimental technology operation, data analysis methods, etc. (5 items); (3) Soft power needs dimension: academic presentation ability, research planning ability, research achievement transformation and career development, psychological adjustment and stress management, research team collaboration ability, etc. (5 items); (4) Training form preference dimension: online live courses, recorded courses, practical teaching, offline workshops, academic salons, etc. (5 items). After pre-investigation testing, the overall Cronbach's α coefficient of the questionnaire was 0.84, indicating good reliability and validity.

2.4. Statistical methods

SPSS 26.0 software was used for statistical analysis. Count data were expressed as frequency (percentage). Pearson chi-square test (χ^2 test) was used for comparison between groups, and Fisher's exact test was used when the theoretical frequency was less than 5. McNemar test was used for before-and-after comparison within groups. $P < 0.05$ was considered statistically significant, and $P < 0.01$ was considered highly statistically significant. Given the repeated-measures structure of the data, more advanced approaches such as mixed-effects models or generalized estimating equations may provide more robust estimates and should be considered in future studies.

3. Results

3.1. Baseline characteristics of research subjects

A total of 114 questionnaires were distributed in the baseline survey, and 114 valid questionnaires were recovered, with an effective rate of 100.0%. There were no statistically significant differences between the two groups in baseline characteristics such as gender, age, professional direction, undergraduate college level, and previous research experience ($P > 0.05$), indicating good comparability between groups (**Table 1**).

Table 1. Comparison of baseline characteristics between the two groups

Characteristic	Dual-supervisor group ($n = 56$)	Single-supervisor group ($n = 58$)	χ^2 value	*P* value
Gender (male/female)	24/32	26/32	0.044	0.834
Age (24–26/27–29/≥30 years)	36/17/3	38/16/4	0.023	0.989
Professional direction (internal medicine/surgery/obstetrics and gynecology/pediatrics/others)	20/15/9/7/5	21/16/9/8/4	0.004	0.999
Undergraduate college (985/211/regular/others)	18/32/6	19/33/6	0.006	0.997
Previous research experience (yes/no)	12/44	13/45	0.015	0.902

3.2. Baseline comparison of research needs between the two groups before guidance

Before guidance, there were no statistically significant differences between the two groups in various dimensional indicators such as research confusion, training content needs, and soft power needs ($P > 0.05$), and baseline levels were consistent (**Table 2**).

Table 2. Baseline comparison of research needs between the two groups before guidance [*n* (%)]

Indicator	Dual-supervisor group (56 cases)	Single-supervisor group (58 cases)	χ^2 value	*P* value
Do not understand the complete research process	35 (62.5)	37 (63.8)	0.022	0.882
Insufficient ability in literature reading and summarization	33 (58.9)	35 (60.3)	0.025	0.874
Statistical software training needs	42 (75.0)	44 (75.9)	0.013	0.909
Scientific graphing training needs	41 (73.2)	43 (74.1)	0.012	0.913
Experimental technology training needs	32 (57.1)	34 (58.6)	0.029	0.865
Academic presentation ability improvement needs	33 (58.9)	35 (60.3)	0.025	0.874

3.3. Comparison of research needs between the two groups after 1 year of guidance

After 1 year of guidance, the dual-supervisor group was significantly lower than the single-supervisor group in research process cognition, basic research skill training needs, and soft power improvement needs, but there was no statistically significant difference between the two groups in experimental technology training needs and research topic selection guidance needs (**Table 3**).

Table 3. Comparison of research needs between the two groups after 1 year of guidance [*n* (%)]

Indicator	Dual-supervisor group (56 cases)	Single-supervisor group (58 cases)	χ^2 value	*P* value
Do not understand the complete research process	14 (25.0)	28 (48.3)	6.892	0.009**
Insufficient ability in literature reading and summarization	16 (28.6)	30 (51.7)	6.215	0.013*
Statistical software training needs	23 (41.1)	39 (67.2)	7.562	0.006**
Scientific graphing training needs	22 (39.3)	38 (65.5)	8.247	0.004**
Thesis writing norm training needs	21 (37.5)	35 (60.3)	5.892	0.015*
Experimental technology training needs	36 (65.4)	36 (62.1)	0.142	0.706
Insufficient research topic selection ability	29 (51.8)	31 (53.4)	0.034	0.853
Academic presentation ability improvement needs	18 (32.1)	32 (55.2)	6.215	0.013*

Note: *$P < 0.05$, **$P < 0.01$

3.4. Before-and-after comparison of changes in the two groups

The before-and-after comparison within the dual-supervisor group showed that research process cognition, basic research skills, and soft power needs were all significantly improved ($P < 0.01$); while the before-and-after comparison within the single-supervisor group showed that the improvement of various indicators was not statistically significant ($P > 0.05$) (**Table 4**).

Table 4. Before-and-after comparison of changes in research needs in the two groups [*n* (%)]

Indicator	Group	Before guidance	After guidance	χ^2 value	*P* value
Do not understand the complete research process	Dual-supervisor group	35 (62.5)	14 (25.0)	15.847	<0.001**
	Single-supervisor group	37 (63.8)	28 (48.3)	2.847	0.092
Statistical software training needs	Dual-supervisor group	42 (75.0)	23 (41.1)	12.847	<0.001**
	Single-supervisor group	44 (75.9)	39 (67.2)	1.215	0.27
Scientific graphing training needs	Dual-supervisor group	41 (73.2)	22 (39.3)	13.247	<0.001**
	Single-supervisor group	43 (74.1)	38 (65.5)	1.047	0.306
Academic presentation ability improvement needs	Dual-supervisor group	33 (58.9)	18 (32.1)	8.215	0.004**
	Single-supervisor group	35 (60.3)	32 (55.2)	0.312	0.577

Note: *$P < 0.05$, **$P < 0.01$

4. Discussion and suggestions

4.1. Analysis of implementation effect of dual-supervisor training model

The results of this study show that, under the premise of comparable baselines, after 1 year of implementing the dual-supervisor system, the dual-supervisor group was significantly better than the single-supervisor group in research process cognition, basic research skill training needs, and academic expression ability, and the before-and-after comparison within the dual-supervisor group showed significant improvement, while the single-supervisor group showed no significant improvement. These findings suggest that the dual-supervisor training model may be associated with reduced unmet research training needs in several domains of clinical professional degree postgraduates.

From the perspective of teaching reform, the potential benefit of the dual-supervisor system may lie in achieving collaborative education of clinical education and research training. Under the traditional single-supervisor system, clinical supervisors are limited by heavy clinical work tasks and cannot take into account systematic research guidance [6,7]. The dual-supervisor system effectively makes up for the structural defects of the single-supervisor system by introducing enterprise supervisors, bringing industrial project management experience, technical platforms, and practical problems into the training process, making research training more systematic and standardized [8,9].

4.2. Mechanism of dual-supervisor system in promoting research literacy improvement

In this study, the proportion of the dual-supervisor group who did not understand the complete research process decreased from 62.5% to 25.0%, a decrease of 37.5 percentage points, while the single-supervisor group only decreased from 63.8% to 48.3%. This difference may be related to the systematic teaching of research methodology by enterprise supervisors. Enterprise supervisors usually have complete project research and development experience and can guide the whole process from research design, implementation, summary to transformation, helping postgraduates establish a standardized research thinking system. This is highly consistent with the requirement of "connecting the education chain with the industrial chain" in the concept of industry-education integration [1,2].

In terms of research practical skills, the improvement range of the dual-supervisor group in statistical software application (75.0%→41.1%) and scientific graphing (73.2%→39.3%) was significantly greater than that of the single-supervisor group. This pattern may be explained by the technical background and practical platform of enterprise supervisors, who can provide postgraduates with hands-on operation guidance and real data analysis scenarios [10,11]. In contrast, the research training of the single-supervisor group is mostly limited to the hospital, lacking systematic technical method training.

4.3. Problems in implementation of dual-supervisor system and improvement suggestions

Although the dual-supervisor system has obvious advantages, this study also found that there was no statistically significant difference between the two groups in experimental technology training needs (65.4% vs 62.1%, $P = 0.706$) and research topic selection guidance needs (51.8% vs 53.4%, $P = 0.853$), indicating that there are still deficiencies in current implementation.

Regarding the problem of sustained high experimental technology training needs, one possible explanation is that these needs may have shifted from basic technologies to high-end cutting-edge technologies (such as single-cell sequencing, spatial transcriptome, bioinformatics analysis, etc.). It is

recommended to expand the scope of university-enterprise cooperation, introduce more enterprises or research institutes with cutting-edge technology platforms, and establish a hierarchical and progressive experimental technology training system [12].

Regarding the problem of no significant improvement in research topic selection guidance needs, some students in the dual-supervisor group reported that "enterprise supervisors guided experimental methods, but how to propose original scientific problems combined with clinical problems still needs more guidance." This suggests that the current collaboration between dual supervisors mostly stays at the technical level, with insufficient integration in high-level guidance such as scientific problem refinement and innovative research design [13]. It is recommended to establish a "clinical problem pool-technical solution" joint matching mechanism, where dual supervisors jointly extract scientific problems from clinical practice to achieve deep integration of "clinical needs–research breakthrough–industrial transformation" [14].

In addition, 25.0% of students in the dual-supervisor group still reported that they did not understand the complete research process, suggesting that the collaborative mechanism between dual supervisors needs to be further improved, with clear division of responsibilities, formulation of joint training manuals, and standardization of communication frequency, guidance content, and assessment standards to avoid "dual supervisors" becoming "no supervisors" [15].

4.4. Research limitations and prospects

The limitations of this study mainly include: first, although the quasi-experimental design with natural grouping can reflect real training situations, selection bias cannot be completely excluded; second, single-center research limits the external validity of the results; third, the follow-up time is only 1 year, and the long-term impact on postgraduate graduation achievements cannot be assessed. Future research can carry out multi-center randomized controlled trials, extend the follow-up period, and explore the impact of the dual-supervisor system on objective indicators such as postgraduate research output and career development.

5. Conclusion

The dual-supervisor training model was associated with reductions in self-reported unmet research training needs of clinical professional degree postgraduates, and is significantly superior to the traditional single-supervisor system in promoting research process cognition, strengthening research practical skills, and stimulating research initiative. It may provide preliminary evidence to inform the design of postgraduate training programs under the background of industry-education integration. However, high-end cutting-edge technology training, innovative guidance for research topic selection, and the collaborative mechanism between dual supervisors still need to be further improved. It is recommended to promote the continuous optimization of the dual-supervisor system through measures such as expanding the depth of university-enterprise cooperation, establishing joint topic selection mechanisms, and formulating standardized training manuals, to provide institutional guarantees for cultivating high-quality compound medical talents.

Disclosure statement

The authors declare no conflict of interest.

References

[1] General Office of the State Council, 2017, Opinions on Deepening Industry-Education Integration, viewed March 1, 2026, http://www.gov.cn/zhengce/content/2017-12/19/content_5248564.htm

[2] General Office of the State Council, 2020, Guiding Opinions on Accelerating the Innovative Development of Medical Education, viewed March 1, 2026, http://www.gov.cn/zhengce/content/2020-09/23/content_5546373.htm

[3] Li DM, Chen JJ, Wan WH, et al., 2022, Implementation and Exploration of "Dual-Supervisor System" for Clinical Professional Degree Postgraduates under the Background of Medical-Education Coordination. Medical Education Management, 8(3): 319–324.

[4] Bai WY, Teng XF, Yang YC, et al., 2017, Investigation and Analysis of Satisfaction with "Dual-Track Integration" Education Model among Professional Degree Postgraduates. Chinese Journal of Medical Education Research, 16(4): 325–329.

[5] Dong H, Chen JJ, 2019, Current Status of Research Ability of Professional Surgical Postgraduates under Standardized Residency Training Model. International Journal of Surgery, 46(10): 678–681.

[6] Wang WM, Yang HY, Qi JG, 2020, Research on Current Status and Countermeasures of Clinical Professional Degree Postgraduate Training. Chinese Journal of Medical Education, 40(5): 641–645.

[7] Liu DM, Zhang YP, Li HC, 2019, Problems and Countermeasures in Research Ability Cultivation of Clinical Professional Degree Postgraduates. Chinese Journal of Medical Education, 39(1): 66–69.

[8] Chen XF, Wang S, Zhou QH, 2022, Research on Dual-Supervisor Training Model for Medical Postgraduates under the Background of Industry-Education Integration. China Higher Medical Education, (3): 56–57.

[9] Zhao J, Luo LZ, Pan H, 2021, Exploration and Practice of "Dual-Supervisor System" for Clinical Professional Degree Postgraduates. Basic and Clinical Medicine, 41(5): 742–745.

[10] Huang JW, Liu L, Wen MG, 2023, Reform of Training Model for Clinical Professional Degree Postgraduates Based on Industry-Education Integration. Chinese Journal of Medical Education, 43(2): 156–160.

[11] Zhang J, Li ZH, Wang Y, 2022, Evaluation of Application Effect of Dual-Supervisor System in Training of Clinical Professional Degree Postgraduates. Chinese Journal of Medical Education Research, 21(8): 1045–1049.

[12] Zhou WX, Li B, Zhang JH, 2023, Role of Cutting-Edge Technology Platforms in Research Training of Medical Postgraduates. Chinese Journal of Medical Education Research, 22(3): 378–382.

[13] Cao DP, Zhong ZH, Zhang FM, 2021, Reflections on Cultivation of Research Topic Selection Ability of Clinical Professional Degree Postgraduates. Chinese Journal of Medical Education, 41(3): 256–259.

[14] Li WM, Liu LX, Wan XH, 2023, Reflections on Promoting Reform and Development of Medical Postgraduate Education Through Industry-Education Integration. China Higher Medical Education, (2): 1–3.

[15] Sun BZ, Zhao Q, Yu XS, 2022, Construction of Collaborative Mechanism of Dual-Supervisor System for Clinical Professional Degree Postgraduates. China Higher Medical Education, (9): 89–90.