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ORIGINAL RESEARCH

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COMPARISON OF THE PHYSICAL EXAMINATION SKILLS LEARNING PROCESS BEFORE AND DURING COVID-19 PANDEMIC BASED ON EXPERIENTIAL LEARNING THEORY: A MIXED-METHOD STUDY

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ABSTRACT

Background: COVID-19 pandemic has changed learning physical examination skills. Online learning physical examination skills are challenging because it needs standard practice facilities, and students need opportunities to practice. Physical examination skills are essential in clinical medical practice, but research before pandemic demonstrated students' lack of skills acquisition. Evaluation is needed to determine the differences in the learning process before and during pandemic. This study aims to compare the learning physical examination skills process before and during COVID-19 pandemic and find recommendations for the future.
Methods: This research was a mixed-method study with a convergent design. The samples are students and lecturers in the Faculty of Medicine Universitas Pendidikan Ganesha. Quantitative data was obtained from a developed questionnaire about students' perception of the physical examination skills learning process, then analyzed descriptively and using the ANOVA test. Qualitative data was obtained by interview, then analyzed using thematic analysis.
Results: There are significant differences in the learning process of face-to-face, online, and blended physical examination skills ($p<0.05$) but no difference between face-to-face and blended. Interview results have seven themes, four themes about difference in the learning process based on Kolb Experiential Learning Theory, other themes about preparation before learning, factors in the learning process, and recommendations.
Conclusion: Differences in the physical examination skills learning process are in the skills demonstration, practice opportunities, feedback, and interactions. If learning physical examination skills is carried out face-to-face, online, or blended in the future, it will have different needs to be considered in the design and implementation.

Keywords: learning process, physical examination skills, comparison, COVID-19 pandemic

PRACTICE POINTS

- If learning physical examination skills is carried out face-to-face, online, or blended in the future, different important parts must be considered. The parts are skill demonstrations, the use of learning media, practice opportunities, feedback, discussions, and standard learning activities.
- Some interactions in face-to-face learning are important in learning physical examination skills, such as the opportunity to practice doctor-patient communication and feedback from students as simulated patients.

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INTRODUCTION

Physical examination skills are an important component of clinical skills in medical practice and are considered a core competency in patient care.[1] Physical examination and communication are critical in the doctor-patient relationship, patient safety, and treatment efficiency.[2] However, some literature mentions that final-year medical students cannot perform detailed physical examination skills using standardized patients.[3] This requires attention to improving the learning of physical examination skills with communication aspect for medical students.[3]

In 2020, the COVID-19 pandemic changed the learning process, including clinical skills learning, to be blended and online. Clinical skills learning (CSL) before the pandemic is carried out face-to-face in three phases: demonstration observation, supervised practice, and independent practice.[4] All clinical skills learning processes are conducted in the skills laboratory. When the COVID-19 pandemic happened in 2020, medical faculty made several attempts at distance learning of the clinical skills learning process. Some efforts are mentioned in the literature; for example, the use of videocast in small groups but physical examination skills learning will be learned after the learning process can conduct face-to-face.[5] Another study modified the Peyton 4 Step Approach,[6] or used video conferencing.[7] Literature shows that practical classroom learning and skills laboratory have been replaced with simulation videos, online assignments, or even postponed until face-to-face learning can be carried out.[8] There are some limitations in online learning, such as students feeling the lack of learning history-taking and physical examination, which causes students to feel unprepared in the learning and assessment process and affects their learning motivation.[5] Replacement with digital media is supposed to be insufficient, for example, in learning anatomy, histology, or ultrasound.[5] Changes in the learning session during a pandemic, especially for the skills learning that require skill laboratories resulting in a student's lack of experience for learning motor skills, reduced opportunities for direct supervision with instructors, and a lack of practical assignments.[7]

The challenge in online physical examination learning is how to keep students able to acquire skills properly, even though there are some limitations. There are some areas for improvement in clinical skills learning during the pandemic, so evaluation is needed to determine the differences in the learning process before and during a pandemic. This study aims to compare the process of learning physical examination skills before and during the COVID-19 pandemic based on the perceptions of students and lecturers, then find recommendations for better physical examination skills learning in the future.

METHODS

The study was conducted at the Faculty of Medicine, Universitas Pendidikan Ganesha (Undiksha). Students learn physical examination skills from the first semester. Before the pandemic, learning physical examination skills was carried out face-to-face. The pandemic conditions since 2020 have made learning physical examination skills to be online and also blended. This study uses a mixed method with a convergent research design.

A cross-sectional study is used for the quantitative study. Quantitative data was obtained from a questionnaire on student perceptions of the physical examination skills learning process before and during the COVID-19 pandemic. First, second, and third-year medical students were selected as subjects with the approval of the students. The researcher developed the questionnaire based on the literature and consisted of 3 questionnaires. Each questionnaire consists of 4 constructs based on Kolb Experiential Learning Theory which are adjusted to the Community of Inquiry (CoI) Framework and consist of 18 items. The first questionnaire is for face-to-face learning (Cronbach alpha: 0.902), the second is for online learning (Cronbach alpha: 0.953), and the third is for blended learning (Cronbach alpha: 0.956). The validity score of each item is between 0,396-0,869 (r table 0,355). Quantitative data were analyzed descriptively to describe each process of learning physical examination skills. A comparative test with ANOVA was conducted to compare the face-to-face, online, and blended learning processes.

Qualitative data were obtained by interviewing students selected by their semester and the OSCE grade in physical examination skills. The lecturer was also interviewed for data triangulation and chosen by their experience in teaching both face-to-face; online; and blended teaching experience, physical examination skills taught, and the educational level. Interviews were conducted using an interview guide prepared by the researcher based on Kolb Experiential Learning Theory to know their perception of physical examination skills. The interviews were conducted until data saturation was achieved. Interviews were recorded and then transcribed verbatim for data analysis using thematic analysis.

Kolb's Experiential Learning Theory is one theory that is suitable for clinical skills learning. Kolb's theory explains that learning requires constant adaptation and environmental engagement. People will form knowledge from their experience by learning in a simulated environment.[9] CoI framework is also used as a theoretical basis to understand online and blended learning dynamics.[10]

Research ethics approval was obtained from the Medical and Health Research Ethics Committee (MHREC) Faculty of Medicine, Public Health and Nursing, Universitas Gadjah Mada (Ref. No KE/FK/0168/EC/2022).

RESULTS AND DISCUSSIONS

Quantitative data analysis

One hundred nineteen students filled out the online questionnaire, consisting of 40 third-year (face-to-face, blended, and online learning experience), 41 second-year (blended and online learning experience), and 38 first-year (blended learning experience) from the total number of 159 students (response rate 74,8%). The questionnaire on student perceptions of online learning has the lowest mean compared to face-to-face and blended learning processes (Table 1).

ANOVA test is used to compare student perceptions in the physical examination learning process of face-to-face (third year), online (second year), and blended (first year). The result is shown in Table 2.

The results of the ANOVA test show significant differences in student perceptions of face-to-face, online, and blended physical examination skills learning processes. Further ANOVA tests showed differences in student perceptions of the face-to-face and online physical examination skills learning process and the online and blended physical examination skills learning process. There are no differences in student perceptions of the face-to-face and blended physical examination skills learning process.

Table 1. Description of the Mean of the Questionnaire and Each Construct

No	Questionnaire	Data Distribution	Mean (SD)	Construct	Mean (SD)
1	Face-to-Face	Normal	4,40 (0,22)	Concrete Experience	4,47 (0,20)
				Reflective Observation	4,40 (0,08)
				Abstract Conceptualization	4,38 (0,16)
				Active Experimentation	4,33 (0,35)
2	Online	Normal	3,40 (0,55)	Concrete Experience	3,26 (0,68)
				Reflective Observation	3,72 (0,26)
				Abstract Conceptualization	3,54 (0,26)
				Active Experimentation	3,05 (0,59)
3	Blended	Normal	4,11 (0,19)	Concrete Experience	4,04 (0,13)
				Reflective Observation	4,16 (0,07)
				Abstract Conceptualization	4,13 (0,12)
				Active Experimentation	4,09 (0,33)

Table 2. ANOVA Test Results

Compared Parameters	F value	p-value	α-value	Mean Difference
Student perceptions of the face-to-face, online, and blended physical examination skills learning process.	-74,645	0,000	<0,05	-
R Squared =0,563, Adjusted R Squared = 0,555				
Student perceptions of the face-to-face and online physical examination skills learning process.	-	0,000	<0,05	18,33
Student perceptions of the online and blended physical examination skills learning process.	-	0,000	<0,05	16,01
Student perceptions of the face-to-face and blended physical examination skills learning process.	-	0,383	>0,05	2,32

Based on the questionnaire results, there are some differences in the physical examination skills learning process, such as flexibility and internet use, demonstrations, feedback, discussion, and practice opportunities. Lecturers can still help students understand the skills. The difference is in online learning; the discussion is only from student questions, but in face-to-face and blended learning; the lecturer and student can discuss from student practice.

Qualitative data analysis

Interviews were conducted with 12 students (S) and 6 lecturers (L). From the interview, there are seven themes, five about the learning process and two about factors in learning and recommendations. Four themes about the learning process are created based on the Kolb Experiential Learning Theory that becomes the study's theoretical basis. The seven themes each have sub-themes, that shown in Figure 1.

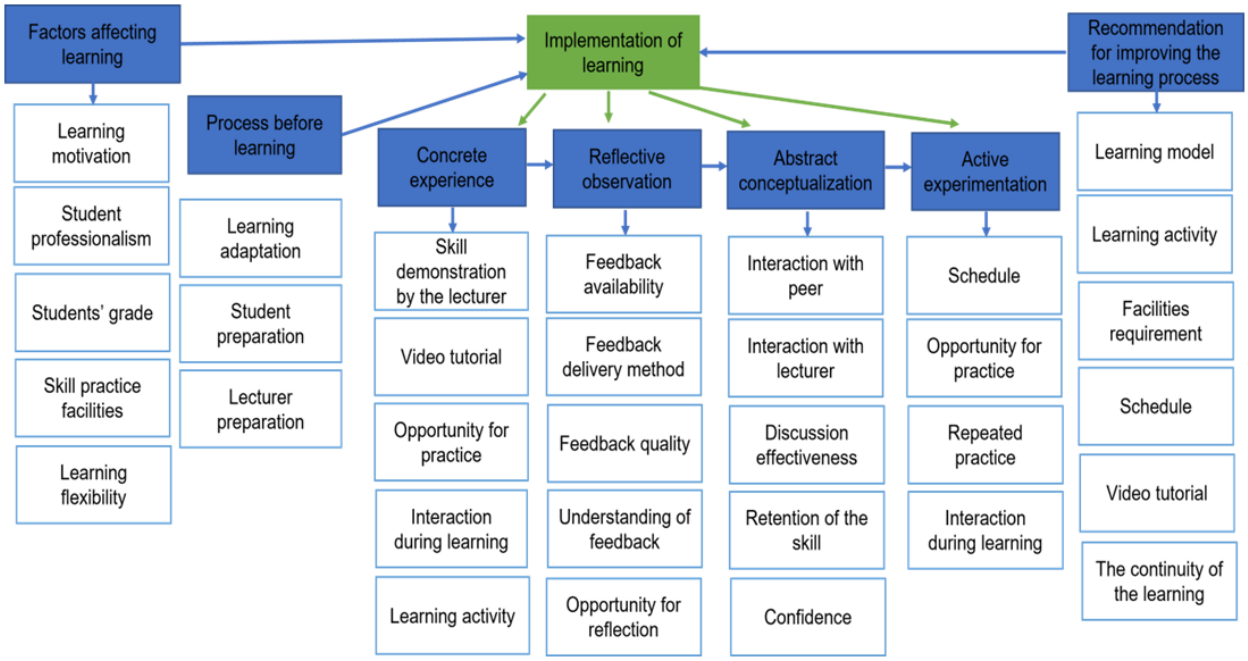

Figure 1. Theme Map

Table 3 shows theme identification and some excerpts of participants.

Table 3. Theme Identification and Participants' Excerpts

Theme and Definition	Excerpts
Process before learning Preparation from lecturers and students before physical examination skills learning.	**Student preparation.** "*…. In face-to-face learning, I should prepare myself because each student is expected to be able to try the practice…….*" (S-02). "*...in online learning, I feel I wasn't to prepare myself because I know that only a few people are appointed...*" (S- 02). **Lecturer preparation.** "*…for face-to-face learning, preparing the facilities also requires more effort when learning in large class…*" (L-01).
Concrete experience Introductory lecture sessions with lecturer explanations and skill demonstrations continued with a supervised practice session for students' practice opportunities.	**Skill demonstration by the lecturer.** "*...although there are some physical examination skills that only need a few materials, the technique and the placement of the tools are explained in more detail in face-to-face learning so that I can practice the skills better...*" (S-06). **Opportunity for practice.** "*...when supervised practice by face-to-face, we learn in small groups with enough time, so almost all students can try the skills. I can give feedback and make corrections directly...*" (L-06). "*…. Face-to-face is very good for students because it familiarizes them with meeting people and patients….. When online learning, they cannot practice well because they practice with dolls or not standardized patients and facilities….*" (L-06). **Learning activity.** "*… in online learning, there are several lecturers or several skills who provide supervised practice sessions as same as introductory lectures, so the explanation is only repeated without practice opportunity….*" (S-05). "*… in some skills, we were asked to record our practice and put it in Google Drive for supervised practice. But in other skills, we directly practice in Zoom…*". (S-06).
Reflective observation Reflection and feedback session after some students have practised the skills in the supervised practice session of physical examination skills learning	**Opportunity for reflection.** "*…. Several lecturers gave reflection in online and blended skill learning, but some lecturers didn't, so not all skills learning provided an opportunity for reflection….*" (S-09). **Feedback availability.** "*… We can get feedback from friends who become simulated patients. For example, they comment about the discomfort they should not feel as patients. When online, the simulated patients are not medical students and don't understand how the practice should be done….*" (S-01). **Feedback quality.** "*…. if it's offline, we can assess it more deeply directly and then give feedback properly. When online, it will be affected by students' video angle, so we are limited to observing students' practice and can't give feedback properly....*" (L-01). **Understanding of feedback.** "*…In face-to-face or blended learning, we can give feedback directly if they make a mistake, then they will repeat the practice…*" (L-02). "*…. In online learning, if there is something we don't understand from the feedback, it is more difficult to ask the doctor than face-to-face learning….*" (S-10).
Abstract conceptualization Discussion session in the supervised practice session of	**Interaction with peers.** "*….in face-to-face learning, when some friend has an opportunity to practice, we can directly ask what I don't understand. Because they have practised, they will*

Theme and Definition	Excerpts
physical examination skills learning.	*know more clearly than their friend who doesn't have a chance to practice because of the limited learning time…*" (S-01). "*…. For online, we don't interact directly, so even with the excellent virtual world, we are still limited to discuss in online learning….*" (S-08).
	Interaction with lecturers. "*… if it's blended or face-to-face, we can directly ask doctors because we are in the same location...*" (S-04).
	Discussion effectiveness. "*…. for the discussion, it runs more optimal in blended and face-to-face learning. We will meet the real problem because we practice with the standard tool in face-to-face learning. After that, we can directly discuss it with the lecturer…..*" (S- 09). "*…. If online learning, we don't practice directly with standard tools. We rarely find difficulties, so there are few or no discussions….*" (S-09).
Active Experimentation Students' independent practice session in physical examination skills learning.	**Opportunity for practice.** "*….. in face-to-face independent practice, even though there is no lecturer, they use standard tools so that they will do independent practice better….*" (L-02). "*…For online learning, not all students do independent practice, because the standard facilities are not available or when supervised or introductory learning they still don't understand the skills, so it is difficult to do independent practice….*" (S-02)
Factors in the learning process Some factors affect the physical examination skills learning process before and during the pandemic.	**Skill practice facilities.** "*….in online learning, we don't have standard facilities at home, so we must find other materials as tools replacement. For example, I replaced a tuning fork with a fork because I didn't have the tools. I have limited chances to practice and don't know the interpretation well...*" (S-08). "*…. When online learning, I find it difficult to find simulated patients….*" (S-07).
Recommendation for improving the learning process Some recommendations and suggestions for a better learning model of physical examination skills learning in the future.	**Learning model.** "*… I prefer offline. The learning also can be done by blended if there are still some cases of COVID pandemic. I get some benefit from that learning….*" (S-05).
	Facilities requirement. "*….for skills, it's better to be face-to-face for all learning sessions because they will practice with a standard mannequin and tools. Even if the practice doesn't use tools, they need simulated patients for practice...*" (L-05).
	The continuity of the learning. "*… because the booster vaccination already exists for the community, it can be considered to continue implementing face-to-face skills learning. But if the worst case happens, it can be a consideration to change the learning….*" (S-02). "*…. Good health protocols are a concern in this situation. It's already good by making a different schedule for each class, so the conditions are not too crowded....*" (M-11).

Comparison between face-to-face, online, and blended physical examination skills learning process

Several differences were found in learning physical examination skills before and during the pandemic, both at introductory lectures, supervised practice, and independent practice at FM Undiksha, where this research was carried out. From some of these studies, it was concluded that eight aspects of the differences were found: skill demonstration, practice opportunity in supervised practice, learning activities, reflection, feedback, discussion with lectures and peers, discussion effectiveness, and practice opportunity in independent practice.

Skills Demonstration

Participants in this study said there are differences in opportunities to observe skill demonstrations. Participants felt it was better to see face-to-face demonstrations than if they used video, like in online learning. Because the video quality is still insufficient, students are limited to seeing the whole practice. Visibility is a crucial component of successful learning. Therefore, providing opportunities to access expert practice clinical skills is essential.[11] Good quality video tutorials can provide an overview of the skills taught.[12]

Practice Opportunity in Supervised Practice

Participants in this study felt less opportunity to practice during online learning rather than face-to-face and blended. Online learning is ineffective for skills learning because it requires experience, so it is challenging to teach online physical examinations. These difficulties make there no/ or limited practice opportunities where this session is for students can adequately practice physical examination skills.[13] Students can learn doctor-patient interaction during face-to-face supervised practice because medical students have an educational background regarding the practice and related diseases.[14] So when medical students practice on each other in face-to-face learning, the role play will be more interactive[14], and they can learn doctor-patient interaction.

Learning activities

There are differences in online supervised practice learning activities. The differences are lecturer accompanies student practice in the same way in face-to-face supervised practice but in online supervised practice, several supervised practices are carried out by asking students to make videos, or lecturers will explain the material again using video demonstrations. The difference in online supervised practice learning activity makes a difference in the opportunity to practice. One crucial factor in learning is determining teaching standards. Setting minimum standards maintains teaching quality and prevents poor learning.[15]

Reflection

Some students said there was some reflection during face-to-face learning but none during online learning. Students still lack understanding of reflection, whereas some students still think reflection is the same as feedback. Therefore, it is necessary to provide a common perception through training on reflection for lecturers and students about reflection in the learning process. Systematic reflection will improve learning and competency.[16]

Feedback

Constructive feedback can improve understanding and performance, encouraging and motivating students to learn in clinical examinations.[17] In online learning, lecturers and students interact at a distance, creating communication challenges, such as delivering feedback about students' understanding and performance.[18] Face-to-face interaction will give better feedback to improve learning because the feedback was given directly.[18] Students can immediately clarify to the lecturers to understand the feedback given by the lecturer. This situation is more difficult to do in online learning because the feedback is given in the form of written feedback. In face-to-face supervised practice, students also can get advice from their friends who act as simulated patients, which is not obtained during online learning. Peer feedback can provide a valid and reliable assessment of professionalism and give positive results.[18] In Dannefer et al.'s and Clark's research, peers often provide suggestions for improving performance that provides positive behavior change.[19]

Interaction with lecturers and peers

Participants felt that the interaction during online learning was not as good as during face-to-face learning. Interaction during learning can help students have better learning engagement, improve academic performance and become the basis for peer-assisted learning.[20] Students will get the benefits during face-to-face learning. Peer learning can provide more readily accepted information for

students.[21] Online learning is less effective because of the difficulty of interaction and involving students in learning[13], reducing both lecturers-students and students-student interaction.[22] Although online media are very diverse nowadays, participants still find it challenging to interact using online media in online learning.[21]

Discussion effectiveness

Some questions cannot be answered in online learning because the question needs skill demonstration directly. The lack of interaction with peers and lecturers in online learning is a problem and causes a lack of clarification of goals and expected learning outcomes.[23] In face-to-face learning, participants feel the discussion is better because all questions can answer completely by lecture or facilitator.

Practice Opportunity in Independent Practice

In asynchronous online learning sessions, such as independent practice, each student needs to plan, monitor, and manage their learning independently.[23] In independent practice, self-directed learning (SDL) skills become indispensable. Students can use self-directed learning skills when involved in group learning, giving them confidence that their learning efforts are conducive. Self-directed learning with high self-motivation needs to be supported by high-quality feedback.[18] But in online learning, students only learn individually in their homes, so they cannot practice with each other with standard learning facilities. Feedback is also less given in online learning due to a lack of practice opportunities. This condition is unlike face-to-face learning, where students can practice with each other with standard facilities.

In online learning, most students use non-standard facilities to practice, while in face-to-face learning, students practice using standard facilities. The lack of availability of learning facilities can cause limitations on practice. Access to the equipment or facilities which needed to practice clinical skills is essential in learning clinical skills.[24] Limited access to facilities can reduce student motivation to practice.[25] Student creativity increases to provide practical facilities when learning online, but the facilities are still not standard. Students also have difficulty finding simulated patients for practice skills in online learning, so learning is not instructive.[7]

Recommendation for Future Learning

Based on these results, recommendations are made by examining whether learning physical examination skills is conducted face-to-face, online, or blended. In face-to-face learning, the skills demonstration is carried out at a normal pace and then continued by explaining in small steps to demonstrate precisely what is required in skills practice.[26] This explanation helps students see how the examination is carried out in the proper stages and gives students time to confirm.[27] After the demonstration, followed by a discussion. The session then continued with the supervised practice, which consisted of opportunities to practice, active observation, reflection, feedback, and discussion at the end of the session. Students can practice independently in the laboratory skills in small groups by providing scenarios to increase student motivation.[28]

In online learning, the quality and variability of learning media are important because they can help the learning process and skills acquisition. Demonstrations are replaced with video tutorials and then continued with discussion synchronously. Learning materials (videos) must be peer-reviewed to ensure that these learning materials can achieve learning objectives.[29] Supervised practice can be in the form of students' assignments to make skills practice videos then lectures will give written feedback. The synchronous student-lecturer discussion will follow the online supervised practice session. One of the important activities in this discussion session is to confirm feedback. The last session is an independent practice with scenarios for practicing independently.

Blended learning combines online and face-to-face learning, whereas skills demonstrations use videos like in online learning. Discussions were carried out by face-to-face learning at the beginning of the supervised practice sessions, then continued with

students' opportunity to practice, reflection, and feedback. The last session, independent practice, is carried out in the laboratory skills in small groups with scenarios for practice.

The study was only conducted at one institution, so it cannot generalize the results about the learning process of physical examination skills before and during the pandemic to other settings. In this study, data collection was only carried out once, so there could be potential for recall bias even though the subject has received an explanation about the study framework before data collection

CONCLUSION

This study shows significant differences in the learning process of face-to-face, online, and blended physical examination skills, but no difference between learning face-to-face and blended. Differences in the learning process of physical examination skills are in the demonstration of skills, practice opportunities, giving feedback, and interactions with lecturers and friends, which result in differences in the effectiveness of discussions. If in the future, learning physical examination skills, whether carried out face-to-face, online, or blended, will have different needs in the learning process that will be carried out, both in the demonstration of skills, practice opportunities, feedback, reflection, and discussion. It will become an important thing in the design and implementation of learning physical examination skills.

RECOMMENDATION

Kolb's Experiential Learning Theory can be used as a physical examination skill learning framework, where reflection, feedback, and discussion are essential components. This study should be carried out using longitudinal research to reduce recall bias. It is also recommended that this research involve several institutions so that it is expected to describe the process of learning physical examination skills better.

COMPETING INTEREST

The authors declare that there are no competing interests related to the study.

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AUTHORS' CONTRIBUTION

Ni Luh Putu Pranena Sastri – developing research proposal, collecting data, data analysis, and publication manuscript.

Rachmadya Nur Hidayah – supervising all research steps and manuscript's review.

Widyandana – supervising all research steps and manuscript's review.

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