

Research

In inpatient rehabilitation, large amounts of practice can occur safely without direct therapist supervision: an observational study

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KEY WORDS

Stroke
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ABSTRACT

Questions: When a hospital gymnasium used for inpatient rehabilitation is set up to allow semi-supervised practice: what percentage of practice is performed as semi-supervised practice, what percentage of patients in the gym are actively engaged in practice at one time, and is the semi-supervised practice that occurs safe? **Design:** An observational study using periodic behaviour mapping. **Participants:** Patients in general and stroke rehabilitation units of a metropolitan hospital. **Outcome measures:** Observations in the rehabilitation gym quantified the number of patients in the gym and the numbers of patients practising and resting. In observations of patients practising, the condition of practice was recorded as being with a therapist, with a family member, or with no direct supervision. The number of adverse events during the data collection period was collected from the hospital Incident Information Management System. **Results:** The rehabilitation gym was observed on 113 occasions, resulting in 1319 individual patient observations. An average of 12 patients were in the gym during the observations. Practice was being performed with family supervision in 15% of observations and with no direct supervision in 26% of observations, resulting in semi-supervised practice accounting for 41% of all observations of practice. The percentage of observations that were of patients taking part in active practice was 78%. There were no adverse events in the gym. **Conclusion:** In an inpatient setting, a large percentage of practice can be performed as semi-supervised practice. This does not appear to compromise the time spent in active practice or patient safety. [Dorsch S, Weeks K, King L, Polman E (2019) In inpatient rehabilitation, large amounts of practice can occur safely without direct therapist supervision: an observational study. *Journal of Physiotherapy* 65:23–27]

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Introduction

Following orthopaedic injury or stroke, there is clear evidence that people who do more practice in rehabilitation achieve better outcomes.^{1–5} In stroke survivors, a pooled analysis of eight trials³ established that if the therapy dose provided is increased by more than two times, the effect size on activity outcomes is 0.59 (95% CI 0.23 to 0.94). Scrivener et al established that the number of lower limb repetitions achieved in the first week of rehabilitation after a stroke is a good clinical predictor of walking speed at discharge from rehabilitation.⁴ This dose-response relationship has also been shown in people with orthopaedic conditions. Inpatients having rehabilitation following a hip fracture achieved better functional outcomes if they were more active in therapy sessions.⁶ Inpatients with lower limb orthopaedic conditions achieved better functional outcomes and had a shorter length of stay if they were more active throughout the entire day.²

Despite the evidence that increased amounts of practice result in better outcomes, patients in rehabilitation do not generally engage in large amounts of physical practice. The time spent in physiotherapy for stroke survivors in inpatient rehabilitation ranges from 24 to 87 minutes

per day.^{7–16} Similarly, the time spent in physiotherapy for patients with orthopaedic conditions is only 45 minutes per day.¹³ Additionally, the time spent in active practice during therapy sessions is low, with many studies reporting that less than half of a therapy session is spent in active practice.^{11,17–20} The main reason for these short times spent in therapy and in active practice is that the most common mode of delivery of therapy in the gym area is one-to-one therapy (ie, the patient practises under direct supervision of one or more therapists, therapy students or therapy assistants). This results in a very limited number of patients being in the therapy area at one time, and high therapist to patient ratios. A recent study on inpatient stroke rehabilitation reported that the mean number of staff per patient was two, and patients were participating in less than 30 minutes of physiotherapy a day.²¹ One potential solution to this problem is to provide opportunities for 'semi-supervised practice', meaning that patients practise in the therapy area without the direct supervision of a therapist. This provides the opportunity for patients to spend much longer periods of the day in the gym area with the potential for achieving more time in active practice.

The following strategies can be used to facilitate the provision of semi-supervised practice for patients in rehabilitation. First, the

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environment of the therapy area can be structured to provide permanent practice areas.²² For example, all the required equipment for different exercises can be placed at workstations, allowing efficient set up for practice. Second, the environment at these workstations can be modified to provide safety when patients are practising without a therapist (eg, the use of adjacent walls, benches and plinths). Third, therapists or therapy assistants can supervise many patients at the same time in class or group settings.⁷ Additionally, members of the patient's family can provide assistance with practice. Interestingly, when families are involved in therapy, this not only improves outcomes for stroke survivors but decreases the caregiver strain experienced by the family members.²³

Currently, in the risk-averse setting of a hospital, semi-supervised practice is generally not provided²⁴ and in some settings is actually not permitted. To date, it appears that the provision of semi-supervised practice has not been evaluated to establish what percentage of practice occurs as semi-supervised practice when that option is provided, whether patients continue to practise when they are not under direct supervision of a therapist, and whether semi-supervised practice can be provided without compromising patient safety. This information could help to change current clinical management to include more semi-supervised practice, thereby enabling patients in rehabilitation to achieve greater amounts of practice and spend more of their time active.

Therefore, the research questions for this observational study were as follows. When a hospital gymnasium used for inpatient rehabilitation is set up to facilitate semi-supervised practice:

1. What percentage of practice is performed as semi-supervised practice?
2. What percentage of patients in the gym are actively engaged in practice (as opposed to resting) at any time?
3. Is the semi-supervised practice that occurs safe?

Method

Design

A cross-sectional observational study with periodic behaviour mapping was conducted. This involved an observer recording the

number of patients in the gym, the number of patients actively practising, and the conditions of patient practice. This occurred four times a day during the data collection period.

Participants, therapists, centres

The study was conducted in the rehabilitation gym area of a large metropolitan hospital. The rehabilitation gym is used by patients from two wards: a 20-bed stroke unit and a 20-bed general rehabilitation unit. The stroke unit is predominantly used by patients who have had a stroke and the general rehabilitation unit is predominantly used by patients with orthopaedic conditions and frail older patients with falls or inability to cope. As the collected data were purely observational and patients were never identified in the data, the need for individual consent was waived by the approving ethics committee. Flyers were attached to the walls of the gym area and patients who were potentially going to be in the gym area during the data collection were given a participant information sheet. This informed the patients of when the study would take place and whom they could contact if they had any concerns or did not wish to be included in the study. The strategies used to facilitate semi-supervised practice are summarised in [Box 1](#) with greater detail of the environment set-up of the gym and equipment in Appendices 1 and 2 (available on the eAddenda).

Procedure

Data were collected four times per day, three times per week, for 15 weeks. The days observed were chosen to represent a spread across all weekdays. The times of observation were between 09:30 to 12:00 and 14:00 to 16:00. Two observations were performed in the morning session and two in the afternoon session, with at least 1 hour between the observations. The observer stood in the gym in an unobtrusive location for data collection.

Outcome measures

The following demographic data were collected for all patients on the rehabilitation wards who were participating in therapy: age, gender and presenting condition. Any of these patients could have

Box 1. Strategies implemented to foster semi-supervised practice in the rehabilitation unit.

Educate patients and relatives

- Explain to patients, relatives and/or carers that there is an expectation of participation in semi-supervised practice upon introduction to the rehabilitation environment, and reinforce this during their admission.
- Advise relatives and/or carers that they can assist the patient's practice by providing physical assistance or supervision.
- Teach patients to count their repetitions of practice. This encourages patients to continue to practise without a therapist (as the amount of practice they do is evident) and to increase the amounts of practice they are doing day by day.

Change the expectations and practice of the staff

- Create an expectation among staff that patients remain in the gym outside of their one-to-one therapy and continue to practise.
- Document patients' exercises as semi-supervised or one-to-one exercise on a practice record. This means that other therapists can set up semi-supervised practice for an unfamiliar patient when the usual treating therapist is not in the gym.
- Encourage large numbers of repetitions of practice and provide goals for the numbers of repetitions to be completed.
- Discuss the above expectation within the multidisciplinary team and encourage them to come into the gym to see patients. For example, multidisciplinary and medical ward rounds, routine nursing observations and/or pathology collections can be performed in the gym.

Adapt the physical environment to maximise safety^a

- Arrange the gym area to enable semi-supervised practice to be set up safely (eg, place all plinths near walls so that patients can practise next to a wall for safety).
- Arrange the gym area so that small groups of patients can practise together while being supervised by one therapist (ie, place two plinths close together to allow several patients to practise in close proximity, with one therapist supervising several patients at the same time).

Use equipment to maximise the safety and quality of semi-supervised practice^b

- Use equipment to provide added safety (eg, a patient who is practising standing or stepping exercises may have a height adjustable plinth behind them and height adjustable tables placed on either side of them).
- Use equipment and walls as external cues to maximise the quality of exercises (eg, a patient may practise an exercise with legs, back and shoulders against a wall to cue them to maintain hip extension during a standing exercise, or practice stepping forward and back with a block to the side to cue them to reduce compensatory hip abduction during their stepping).
- Provide common therapy equipment such as stepping blocks, counters, cups and tape in accessible shelving in the centre of the gym. This promotes efficient set-up of semi-supervised practice.

^a See Appendix 1 on the eAddenda for detail on the physical environment of the gym.

^b See Appendix 2 on the eAddenda for detail on the use of equipment to increase the safety and quality of semi-supervised practice.

been present in the gym during data collection. The data collected in the gym were: the numbers of patients, therapists/therapy assistants and therapy students in the gym; the number of patients resting; and the number of patients actively practising (including the number of patients practising with a therapist, therapy assistant or therapy student and the number of patients practising with a family member or practising independently in the gym). Actively practising was defined as moving one or more limbs to perform a therapeutic exercise. Practising with a therapist or family member was defined as the therapist or family member being involved in providing physical assistance or verbal instructions during the patient's practice. Semi-supervised practice was defined as the patient practising in the gym area with no therapist assisting their practice (ie, practising with a family member or independently), as summarised in [Box 2](#). The incidence of falls was ascertained through the Incident Information Management System of the hospital, in which all falls are recorded.

Data analysis

The demographic characteristics of the patients on the rehabilitation wards during the period of data collection and who were intended to be participating in therapy were described. The mean, standard deviation and range of percentages of observations were calculated to describe the number of patients practising versus resting. The number of patients practising was counted for each of the observation periods and these counts were summarised using the mean, SD and range. To give a percentage of practising patients for each observation session, the count of practising patients for each observation period was also divided by the number of patients who were present in the gym at that time. These percentages were also summarised using the mean, SD and range. The descriptive statistics for counts and percentages (outlined above) were calculated for the following practice conditions: therapist-supervised practice, all semi-supervised practice, family-supervised practice, and independent practice. The number of adverse events was reported.

Results

Compliance with the study protocol

During the period of data collection, no patients in the participating wards had concerns or wished to be excluded from the study. There were no deviations from the planned methods for the study.

Flow of participants and therapists through the study

The characteristics of the patients on the rehabilitation wards who were meant to be participating in therapy during this period are summarised in [Table 1](#). The gym area was observed on 113 occasions and 1319 individual patient observations were recorded. The mean number of patients in the gym was 12, the mean number of therapists and therapy assistants in the gym was three and the mean number of therapy students was three.

Table 1

Characteristics of the inpatients on the rehabilitation wards who were meant to be participating in therapy during the period of data collection.

Characteristics	Participants (n = 214)
Age (yr), mean (SD)	78 (13)
Gender (female: male), n (%)	118:96 (55:45)
Primary diagnosis, n (%)	
orthopaedic injury/surgery	17 (8)
stroke	92 (43)
falls	29 (14)
frailty/deconditioning	22 (10)
amputation	2 (1)
other	52 (24)

What percentage of practice was performed as semi-supervised practice?

The conditions of practice are summarised in [Table 2](#). Averaged across the 113 gym observations, the mean percentage of patients in the gym who were practising, were practising under the following conditions: practice with therapist supervision by 59% (SD 19, range 17 to 100) of practising patients; practice with a family member by 15% (SD 15, range 0 to 73) of practising patients, and practice without direct supervision by 26% (SD 22, range 0 to 83) of practising patients. Hence, the percentage of observed practice that was semi-supervised practice was 41% (SD 19, range 0 to 83).

What percentage of patients in the gym were actively engaged in practice at one time?

The percentage of observations of patients engaged in active practice versus inactivity are summarised in [Table 3](#). The mean number of patients in the gym area was 12 (SD 4, range 2 to 22). The mean number of patients actively practising was 9 (SD 3, range 2 to 18). This represented a mean of 78% (SD 15, range 47 to 100) of patient observations being of patients engaged in active practice.

Was the semi-supervised practice safe?

During the period of data collection, no adverse events in the gym area were recorded on the hospital Incident Information Management System; therefore, there were no falls in the gym area during this period.

Discussion

The amount of semi-supervised practice in an inpatient rehabilitation gym can be large, with an average of 41% of observations of practice being semi-supervised practice. Setting up a rehabilitation gym to facilitate semi-supervised practice does not appear to result in patients spending large amounts of time inactive. A large amount of semi-supervised practice does not appear to result in adverse events such as falls occurring in the rehabilitation gym.

No previous reports were found in the literature about the amount of semi-supervised versus therapist-supervised practice in

Box 2. Conditions of patient practice in the gym area.

Therapist-supervised practice	Semi-supervised practice Practice being performed without direct therapist supervision	
Practice being performed with a therapist, therapy assistant or therapy student	Practice being performed with a family member	Practice being performed without direct supervision

Table 2

Conditions of patient practice in the gym area.

Measure	Semi-supervised practice				
	Therapist-supervised practice	Patients practising with therapist, therapy assistant or therapy student	Patients practising with family	Patients practising with no direct supervision	Total
		mean (SD) range	mean (SD) range	mean (SD) range	mean (SD) range
Number	5 (2) 1 to 12	1 (1) 0 to 8	3 (2) 0 to 10	4 (2) 0 to 11	
Percentage	59 (19) 17 to 100	15 (15) 0 to 73	26 (22) 0 to 83	41 (19) 0 to 83	

Table 3

Observations of active practice.

The total number of patients in the gym, the number of patients in the gym who were engaged in active practice, and the percentage of patients in the gym engaged in active practice out of the total number of patients in the gym.

Patients in the gym	Patients engaged in active practice	
	n	%
mean (SD) range	mean (SD) range	mean (SD) range
12 (4) 2 to 22	9 (3) 2 to 18	78 (15) 47 to 100

rehabilitation. Generally, patients in rehabilitation receive most of their therapy as one-to-one therapy and are not offered opportunities to spend longer in the gym area performing practice that is not directly supervised by a therapist.²⁵ A scoping review of studies that increased the amounts of practice for stroke survivors found that in more than three-quarters of these studies the extra therapy was delivered with full therapist supervision.²⁴ Our study appears to be the first to examine the option of increasing practice in the therapy area with the use of semi-supervised practice.

Our study shows that the patients were engaged in active practice on 78% of gym observations. This is a far greater percentage of time spent in active practice than in other reports of time in active practice in a therapy area. Many studies have reported the percentage of time spent engaged in active practice in a physiotherapy session as < 50%.^{7,11,17–20} A recent observational study reported that patients were active for only 38% of their time in the physiotherapy gym.²⁶ The reasons for the different results in the present study may be that in the therapy area there was a consistent implementation of strategies used to foster semi-supervised practice (see Box 1), including an expectation that patients can and should continue to practise even when not being directly supervised by a therapist. To achieve this, the therapists endeavoured to ensure that patients had exercises to perform when the therapist was not with them.

Our study provides evidence that rehabilitation patients can perform semi-supervised practice without adverse events such as falls. There were no adverse events during this period of data collection, even though there were > 400 individual-patient observations of patients practising without the direct supervision of a therapist. Other studies of group exercise have shown that practice can be performed in a semi-supervised context without compromising patient safety. In a controlled trial investigating the addition of a balance class to usual care in inpatient rehabilitation, participants performed challenging balance exercises with a ratio of two therapists to eight patients. No adverse events occurred during the classes, even though the participants were frail older people with an average age of 83 years and over half of them had been admitted to hospital after having a fall.²⁷ Our study also found a low staff to patient ratio, with a mean of three therapists/therapy assistants and three therapy students to 12 patients in the gym. This is significantly less than the staff to patient ratio of two staff to one patient reported elsewhere.²¹ There is a common perception that rehabilitation patients should not practise without direct therapist supervision, due to the risk of falls. This attitude limits physical activity in rehabilitation and may well prevent patients from performing adequate amounts of exercise to reduce their falls risk. A recent systematic review of exercise to prevent falls found a far greater benefit for falls reduction when people participated in more than 3 hours a week of challenging balance exercise.²⁸

The methods of data collection used in this study allowed the collection of data on a large number of patients and observations of practice; however, there were some limitations to this method of data collection. It did not allow data to be captured on how long patients were in the gym or whether they were in a class or group as they performed their semi-supervised practice, or on the types of exercises performed during semi-supervised practice. Another limitation was that the study design did not provide a comparator against which to determine the specific impact of the strategies involved in setting up the gym for semi-supervised practice. However, it can be logically concluded that a gym that does not encourage semi-supervised

practice, or bans it on presumed safety grounds, will not achieve any significant amounts of semi-supervised practice. Although these limitations affected the ability to compare the effect of allowing and fostering semi-supervised practice to not doing so, the safety data firmly answer the third study question because no adverse events were observed.

The results of this study are important because, while there is a large body of research showing the benefits of repetitive practice²⁹ and that more practice in rehabilitation results in improved outcomes,³ there is very little information on strategies to enable patients to do more practice without increasing staffing levels. There are many barriers to patients practising without direct supervision, including patient and staff concerns for safety³⁰ and lack of knowledge about what to do.²⁵ Consequently, rehabilitation patients spend very little time in self-directed activity. Additionally, semi-supervised practice may be effective in increasing independent practice outside of therapy by bridging the gap between fully supervised and fully independent practice.²⁴

Strategies to increase semi-supervised practice within the therapy area and allow patients to spend longer in the therapy area are likely to be effective for increasing the amount of overall physical activity in rehabilitation. It is likely that much larger amounts of semi-supervised practice in inpatient rehabilitation are possible. The ranges of semi-supervised practice in this study start at zero (Table 2); hence, at times there was no semi-supervised practice taking place and at times there were very low numbers of patients in the gym. Considering this, it seems that patients could be in the gym for longer and perform larger amounts of semi-supervised practice than have been reported here.

In conclusion, the amount of semi-supervised practice in an inpatient rehabilitation gym can be large and does not appear to result in patients spending large amounts of time inactive. Semi-supervised practice does not appear to result in adverse events such as falls occurring in the rehabilitation gym.

What was already known on this topic: Following orthopaedic injury or stroke, people who do more practice in rehabilitation achieve better outcomes. Despite this, patients in rehabilitation do not generally engage in large amounts of physical practice.

What this study adds: In an inpatient setting, a large percentage of practice can be done as semi-supervised practice. This does not appear to compromise the time spent in active practice or patient safety.

eAddenda: Appendices 1 and 2 can be found online at: <https://doi.org/10.1016/j.jphys.2018.11.004>.

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