The Effectiveness of Physiotherapy to Enable an Elderly Person to Get up from the Floor

A single case study

Summary  The aim of this study was to assess the effectiveness of teaching an elderly person to get up from the floor using a backward chaining method. A single case (A-B) design was used. The subject was a 79-year-old woman who had previously fallen and suffered a ‘long lie’. Treatment produced a significant improvement in her ability to get up from the floor.

Introduction
Approximately 2,500 elderly people die each year as the result of a fall, or the consequences of a ‘long lie’ on the floor because they are unable to get up without help (DoH, 1993). Falls and an inability to get up are distressing, and the fear of falling and the prospect of a long lie may lead to inactivity, functional decline, decreased well-being and emotional trauma (Simpson, 1993; Tinetti et al, 1993; Vellas et al, 1987; Reece and Simpson, 1996). A long lie has also been associated with increased mortality and physical complications such as pneumonia, pressure sores, hypothermia and dehydration (Wild et al, 1981; Tinetti et al, 1993; Simpson and Salkin, 1993; McCabe, 1985).

Accident prevention strategies have been called for to prevent falls and a long lie, and to reduce the consequent need for hospital treatment (DoH, 1993). Physiotherapy would appear to have an obvious role to play in establishing such strategies, yet therapists rarely attempt to teach people how to get up from the floor, possibly because they assume that patients will not be able to perform the task or would be unwilling to try (Simpson and Salkin, 1993).

There are a number of reasons for not being able to get up from the floor. Often elderly people simply do not know how to attempt to get up safely and effectively. Tinetti et al (1993) found that many panic and adopt ineffective strategies, such as rising directly from supine. Impairments such as inadequate muscle strength or joint mobility have also been implicated (Brown et al, 1995; Hodkinson, 1962; Reece and Simpson, 1996). Numerous studies have noted the efficacy of exercise for older people in preventing falls and improving muscle strength, flexibility and balance (see Effective Health Care Bulletin, 1996, for a review), but few have looked at the effects of therapy to enable people who have previously fallen and were unable to get up to learn how to get up from the floor.

Reece and Simpson (1996) compared two methods of teaching elderly people to rise from the floor with patients admitted to an elder rehabilitation unit following a fall: a conventional method and backward chaining. The sequence of movements is similar for both methods. With the conventional method the person starts on the floor and then gets up, while with backward chaining the process starts in a sitting or standing position. Steps are mastered at the end of the sequence and the subject gradually moves down to the floor with the knowledge that the rest of the sequence can be performed to get back up again. Patients do not have to try to get up directly from the floor which many elderly people are reluctant to attempt (Simpson and Salkin, 1993). This method proved to be less stressful and was therefore considered a more acceptable way of teaching elderly people how to get up from the floor, though the differences in effectiveness did not reach statistical significance.

The aim of this study was to assess the effect of teaching and enabling an elderly person with a history of falls to get up from the floor by using backward chaining.

Method
A single case (A-B) design was used. There were two phases. During the baseline (A) phase the ability of the subject ‘Mary’ to get up from the floor was tested daily, but no treatment was offered. During the treatment (B) phase Mary’s ability to get up from the floor was tested daily in the same way before a treatment session in which she was taught...
Fig 1: Movement sequences during training

Starting position: Stride standing

Moves 1 and 2: To half-kneeling on to a large foam wedge and up (using a small wedge = move 2)

Move 3: To half kneeling on a mat and up

Move 4: To high kneeling and up

Move 5: To prone kneeling and up

Moves 6 and 7: To half sitting on two pillows and up (using one pillow = move 7)

Move 8: Half sitting on mat and up

Moves 9 and 10: Side lying on a large wedge and up (using a small wedge = move 10)

Move 11: Side lying on a mat and up

Move 12: Supine lying and up
how to get up from the floor. The data collection and treatment sessions were performed at the same time daily, and testing was performed before the treatment session to avoid immediate practice or fatigue effects due to the therapy. Each phase lasted for five days.

The treatment sessions involved teaching Mary how to get up from the floor using the backward chaining method described by Reece and Simpson (1996). The training sequence is illustrated in figure 1. Mary practised moving down the sequence as far as she was able, and then getting back up again. When she was able to achieve a move easily she was encouraged to progress to the next stage. She also received demonstrations of the correct moves and practised some specific moves (rolling and moving from side lying to side sitting). Each treatment session lasted approximately 20 minutes. At the start of the study Mary was able to reach move 3 (rising from half kneeling on a mat). The ability to get up from the floor was assessed with a score system based on the training sequence (table 1).

### Table 1: Score system

<table>
<thead>
<tr>
<th>No</th>
<th>Moves</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stride standing to half kneeling on a large wedge and up</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Stride standing to half kneeling on a small wedge and up</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Stride standing to half kneeling on a mat and up</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Half kneeling on a mat to high kneeling and up</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>High kneeling to prone kneeling and up</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>Prone kneeling to half sitting on two pillows and up</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Prone kneeling to half sitting on one pillow and up</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>Prone kneeling to half sitting on mat and up</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>Half sitting to side lying on large wedge and up</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>Half sitting to side lying on small wedge and up</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>Half sitting to side lying on mat and up</td>
<td>11</td>
</tr>
<tr>
<td>12</td>
<td>Side lying to supine lying and up</td>
<td>12</td>
</tr>
</tbody>
</table>

‘And up’ indicates that the subject should move through the backward chaining sequence in order to achieve a stride standing position.

### Analysis

In order to assess any differences between the A and B phases a two-standard-deviation (SD) band method as described by Gottman and Leiblum (1974) was used. First, autocorrelations and Bartlett’s test were used to assess for serial dependency (whether change in score is a product of repeated measures rather than a change in behaviour) as described by Ottenbacher (1986, detailed in table 2). Then the data were plotted graphically, and two standard deviations were calculated from the baseline data. If at least two data points from the intervention phase fall outside the 2SD band, then the intervention is said to be statistically significant. There are two advantages of this form of analysis that made it the most suitable choice for this study. First, it can be used in studies with few data points, as the number of data points is not relevant to the calculation. Secondly, it is effective for studies that do not display stable baseline data which was a possibility in a study involving a frail elderly woman with limited stamina and concentration who could produce a variable performance. If the baseline data are highly variable, this is reflected by a large 2SD band, and at least two data points in the intervention phase need to be outside this band to display a statistical significance.

### Table 2: Method used to assess serial dependency

(On Pettenbacher, 1986, pages 170-174)

To calculate the auto-correlation coefficient a number of steps are taken:

1. A mean of the scores for the baseline (A) phase is calculated.
2. The difference between each score and the mean score is calculated.
3. Each value calculated in step 2 is multiplied by the adjacent value, ie the value for the first difference is multiplied by the second, the second by the third and so on and then the products are added.
4. The square of each of the values calculated in step 2 is calculated and the results added.
5. The results of step 3 are divided by the results of step 4. The result is the autocorrelation coefficient. In this case it was 0.41.

In order to determine whether the auto-correlation is statistically significant the Bartlett’s test is used. If the auto-correlation coefficient is greater than $2\sqrt{n}$, where $n =$ the number of baseline observations, then auto-correlation is said to be statistically significant, that is the data are serially dependent. In this case, the Bartlett’s value was 0.89, which was greater than the auto-correlation coefficient, indicating that the data were not serially dependent, so further analysis could continue.

### Subject Selection

Criteria for the subject of the study were:

- Aged over 65 years.
- Ambulant (with or without a walking aid).
- A history of falls and inability to get up unaided.
- Not receiving any other treatment that could affect ability to get up from the floor.

The inclusion of frail elderly people in research has been thought to be ethically controversial, as they can be considered vulnerable. Therefore a number of actions were taken to ensure that the patient was fairly treated:
Ethical approval for the study was obtained from Brunel University and the participating hospital trust.

Agreement that the patient was physically and cognitively fit to participate was obtained from her consultant before she was approached.

Informed, written consent was obtained in the presence of a carer.

The Subject
Mary was 79 years old. She lived alone and was admitted to hospital with a Colles fracture following a fall. She had been unable to get up and had lain for 14 hours before help arrived. Past medical history included mild osteoporosis, a fractured neck of humerus (two years previously), and a suspected transient ischaemic attack. At the time of the study, the Colles fracture had healed and Mary was awaiting discharge. This had been delayed for several months as her family had raised issues preventing her return home. She was not receiving any physiotherapy and had not received any treatment to enable her to get up from the floor before the start of this study, as she was assumed to be too frail and unable to attempt it.

Results
During the treatment phase Mary showed an improvement in her ability to get up from the floor. At the beginning of the study she could reach move 3 (stride standing to half kneeling and up) and at the end of the study she could reach move 8 (prone kneeling to half sitting and up). The scores are shown graphically in figure 2. The data were not serially dependent (appendix 2) and change in performance reached a significant level as three of the intervention scores were outside the 2SD band.

Discussion
This study showed that using the backward chaining method could produce an improvement in ability to rise from the floor in a frail elderly patient, although at the end of the treatment period she was still unable to complete the task. During the study there were also anecdotal reports of a change in behaviour, as both Mary and her primary nurses reported increased confidence when she was walking and increased mobility in the ward. Only one other study has looked at the effectiveness of teaching elderly people how to get up from the floor. Reece and Simpson (1996) demonstrated some success using conventional and backward chaining methods, but backward chaining was found to be less stressful, and slightly more successful. Subjects who learnt how to get up took between four and 15 sessions to achieve this. Mary received only five sessions, so it may be that further treatment would have enabled her to get up completely unaided.

This study is unusual in that it used an A-B design and there were only five data points in each phase. This was done to minimise the demands made on the patient, as at the beginning of the study it was unclear how well she would be able to tolerate the treatment and data collection regime. This weakens the study methodologically, but it nevertheless addressed the study aim: to find out whether training using backward chaining can affect a patient’s ability to get up from the floor.

An alternative would have been to select a more robust patient who could tolerate a more demanding treatment and data collection process, such as an A-B-A-B design. However, this would have negated the aim of the study which specifically aimed to investigate the effects with a frail elderly patient who would normally be considered unsuitable for training using a ‘conventional’ method. On balance it was considered more important to adapt the method to suit the patient’s abilities and the study aim, than to choose the patient and aims to fit the method, particularly as a method of analysis suitable for small amounts of data and possible variable performance within each phase was available.
Conclusion

This study has shown that backward chaining can be used to improve ability to get up from the floor in an elderly frail person with a history of falls and a long lie.

Teaching how to get up from the floor is a rarely-used treatment option, possibly because it is assumed that frail elderly people will be unable or unwilling to attempt such activity.

References


Department of Health (1993). The Health of the Nation - Key Area Handbook, Accidents, HMSO.


A single case design considers change in only one person and so any generalisations must be treated with caution, but the results of this study suggest that such training can be possible and backward chaining may be a suitable method. Further research is needed to establish criteria to identify those most likely to benefit from training, and to consider the most effective methods.

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Key Messages

- Backwards chaining was a suitable method to teach a frail elderly person to get up from the floor.
- Physiotherapy intervention led to a significant improvement in the patient’s ability to get up from the floor.