Clinical observations have shown that some older patients are unable to learn to use a metered dose inhaler (MDI) despite having a normal abbreviated mental test (AMT) score, possibly because of dyspraxia or unrecognised cognitive impairment. Thirty inhaler-naive inpatients (age 76–94) with an AMT score of 8–10 (normal) were studied. Standard MDI training was given and the level of competence reached was scored (inhalation score). A separate observer performed the minimental test (MMT), Barthel index, geriatric depression score (GDS), ideational dyspraxia test (IDT), and ideomotor dyspraxia test (IMD). No correlative or threshold relationship was found between inhalation score and Barthel index, GDS, or IDT. However, a significant correlation was found between inhalation score and IMD ($r = 0.45$, $p = 0.039$) and MMT ($r = 0.48$, $p = 0.032$) and threshold effects emerged in that no subject with a MMT score of less than 23/30 had an inhalation score of 5/10 or more (adequate technique requires 6/10 or more), and all 17/18 with an inhalation score of 6/10 or more had an IMD of 14/20 or more.

The three patients with a MMT $>22$ and inhalation score $<6$ had abnormal IMD scores. Inability to learn an adequate inhaler technique in subjects with a normal AMT score appears to be due to unrecognised cognitive impairment or dyspraxia. The MMT is probably a more useful screening test than the AMT score in this context.

### METHODS

Thirty inpatients on rehabilitation wards consented to take part in the study. To obtain as near a random sample as possible all patients meeting the study criteria were asked consecutively if they were willing to be included, until the required number was reached. All had stable, reproducible, AMT scores of 8–10 when tested four to seven days apart. None had previously used any form of inhaler. All were able to read newsprint, with or without glasses, and hear a voice at conversational level with or without a hearing aid.

Patients were excluded if there was evidence of focal neurological loss on clinical examination, a confusional state, or a painful condition of the hands.

All subjects were given standard MDI training using the National Asthma Campaign recommended method and the level of competence reached was scored on a scale of 0–10 by analogue judgment by an experienced observer, where 0 represented the worst possible technique, 10 a perfect technique, and the threshold for adequate competence” was at 5/6 (5 just incompetent, 6 just competent). The scale is shown in table 1.

### Table 1  The inhaler score. The score was made by observation by an experienced clinician instructed to utilise the whole scale and to treat the division between a score of 5 and 6 as the threshold for an adequate technique

<table>
<thead>
<tr>
<th>Typical errors observed</th>
<th>Inhaler score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A perfect technique</td>
<td>10</td>
</tr>
<tr>
<td>Breath hold &lt;-5 seconds</td>
<td>9</td>
</tr>
<tr>
<td>No breath hold</td>
<td>8</td>
</tr>
<tr>
<td>Actuate inhaler slightly late in inspiration</td>
<td>7</td>
</tr>
<tr>
<td>Actuate late but well before full inspiration</td>
<td>6</td>
</tr>
<tr>
<td>Actuate too late/too early</td>
<td>5</td>
</tr>
<tr>
<td>Poor inspiratory effort with late/early actuation</td>
<td>4</td>
</tr>
<tr>
<td>Very poor coordination of inspiration/actuation</td>
<td>3</td>
</tr>
<tr>
<td>Failure to actuate or no inspiration</td>
<td>2</td>
</tr>
<tr>
<td>Little idea how to use inhaler</td>
<td>1</td>
</tr>
<tr>
<td>No idea what to do with the inhaler</td>
<td>0</td>
</tr>
</tbody>
</table>

Abbreviations: AMT, abbreviated mental test; GDS, geriatric depression score; IDT, ideational dyspraxia test; IMD, ideomotor dyspraxia test; MDI, metered dose inhaler; MMT, minimental test
along with typical observations of technique. A separate observer performed the minimental test (MMT), which is a test of global cognitive status, the Barthel index, a score of performance in the activities of daily living, the geriatric depression scale (GDS), the ideational dyspraxia test (IDT), which tests the ability to describe the use of objects, and the ideomotor dyspraxia test (IMD), which tests the ability to demonstrate the use of objects.

**Statistical analysis**

Correlation coefficients were calculated using Excel software, and categorical data were tested for statistical significance with Fisher’s test.

**RESULTS**

The results are summarised in tables 2 and 3. A significant correlation was found between inhalation score and IMD, and between inhalation score and MMT. Furthermore, a threshold effect emerged with MMT, in that no subject with a MMT of less than 23/30 had an inhalation score of 5/10 or more (6/10 or more required for a competent score), and all subjects with an inhalation score of 6/10 or more had an IMD score of 14/20 or more. Three subjects with MMT scores of 23/30 or more had an inhalation score of less than 6/10; however, all had abnormal IMD scores. Therefore, all subjects with an unsatisfactory inhalation score after training had evidence of cognitive impairment or dyspraxia, or both. No correlative or threshold relationship was found between inhalation score and Barthel index, GDS, or IDT. Only two patients had GDS scores in the depression range, though these were not severe and both had inhalation scores of more than 5/10.

**DISCUSSION**

This study has shown that elderly inpatients who are unable to learn to use a metered dose inhaler despite apparently normal cognitive function and no obvious dyspraxia.

**Learning points**

- Elderly patients are often unable to learn to use a metered dose inhaler despite apparently normal cognitive function and no obvious dyspraxia.
- Unrecognised cognitive impairment and subclinical dyspraxia are important reasons for that difficulty.
- Patients with a minimental test score of less than 23/30 are unlikely to master a metered dose inhaler.
- Patients with an ideomotor dyspraxia score of less than 14/20 are also unlikely to learn to use a metered dose inhaler.
- Clinicians should take these factors into account when prescribing inhaler therapy for elderly patients.

The observed correlations between inhalation score and MMT or IMD are not of clinical value but do reinforce the contention that cognitive function and praxis are the main determinants of whether a patient will be able reliably to learn to use an inhaler device. Of course, the correlation shown between inhalation score and IMD is somewhat tautological since MDI technique is itself a manifestation of ideomotor function. The threshold effects demonstrated are of use in a clinical setting because they provide a means of identifying patients who are unlikely to cope with a self administered inhaler device. It is noteworthy that the threshold found for the MMT was 22, which is generally taken to indicate definite but mild impairment, with scores of 23–25 representing a borderline score. Similarly, the IMD threshold was 14, which is also close to the borderline score of 16 which is deemed be the lower limit of normal. Of course, these are not hard and fast rules, and the overall clinical context needs to be taken into account; nevertheless, these factors add a further indication that the MMT and IMD might be useful as screening tests.

How might the findings help in practice? While the AMT remains a useful quick screening test for likely to be able to use inhaler devices, because an abnormal score is reliably associated with inadequate technique, there will be some patients with a normal AMT score who cannot use an MDI properly if the AMT score alone is relied upon for cognitive screening. Our findings suggest that the more sensitive MMT might be a more suitable screening test in this context. Furthermore, because subclinical dyspraxia is a frequent finding in frail elderly patients, our results support the contention that if such patients require inhaled therapy they should be assessed with a test of praxis, such as the IMD, as well as the MMT before deciding to proceed with an inhaler device. These tests are not particularly time consuming; the MMT takes about five minutes and the IMD about three minutes. If the results are in the impaired range there is not likely to be a successful result if MDI training is attempted. This is consistent with previous work using the AMT and the MMT for MDIs and other complex devices in elderly subjects.

An earlier study showed that some elderly subjects with borderline or slightly impaired AMT scores can learn to use less complex inhalers, such as the Turbhaler (Astra), therefore, further work needs to be conducted to determine whether the MMT and IMD can be used to determine the likelihood of successful acquisition of adequate technique with such inhalers.

**REFERENCES**


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**Table 2**

<table>
<thead>
<tr>
<th>Correlation between inhaler score and the minimental test (MMT), ideomotor dyspraxia test (IMD), ideational dyspraxia test (IDT), Barthel index, and geriatric depression scale (GDS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
</tr>
<tr>
<td>Inhaler score v MMT</td>
</tr>
<tr>
<td>Inhaler score v IMD</td>
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<tr>
<td>Inhaler score v IDT</td>
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<tr>
<td>Inhaler score v Barthel index</td>
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<tr>
<td>Inhaler score v GDS</td>
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</table>

**Table 3**

<table>
<thead>
<tr>
<th>Comparison of the inhaler score competence threshold (≥5) with the minimental test (MMT) score at the ≥22 threshold, and the ideomotor dyspraxia test (IMD) at the &gt;13 threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaler score</td>
</tr>
<tr>
<td>MMT &lt;23</td>
</tr>
<tr>
<td>MMT ≥22</td>
</tr>
<tr>
<td>IMD &lt;14</td>
</tr>
<tr>
<td>IMD ≥15</td>
</tr>
</tbody>
</table>
Ability to learn inhaler technique in relation to cognitive scores and tests of praxis in old age

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