



The use of a mobile phone to administer visual analogue scales

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Background

Handheld computer systems are increasingly being used to administer cognitive and psychomotor tasks, being relatively inexpensive and highly portable (Totterdell & Folkard, 1992; Tiplady, 1994). Mobile phones are even more compact than handhelds, and are regularly used by a much greater proportion of the population. Thus many people are already comfortable with their use, and there is the possibility of carrying out assessments on the user's own mobile phone.

Mobile phones have certain limitations. The screens tend to be rather small, and touch screens are not generally available. This presents two potential problems for setting up visual analogue scales (VAS):

- Paper scales are usually 100 mm long. Shorter scales (about 40 mm) have been validated on handhelds (Jamison et al., 2001), but mobile phone scales need to be shorter still.
- The scale should start without a cursor, to avoid bias (Palmlad and Tiplady, 2004). With a touch screen, the cursor can appear in the position first tapped, but this approach cannot be used with standard mobile phones.

With careful attention to screen layout and response formats it should be possible to minimise these effects. This work aimed to evaluate one approach to scale design on a mobile phone using an application programmed in Java™.

We used alcohol to produce reliable and substantial changes in subjective state that allowed comparison of paper and mobile phone assessments in an experimental setting

Visual Analogue Scale

The scale was 21 mm long on the phone we used. The scale was initially blank, with no cursor visible:



The first response was made by pressing on the left or right key. The cursor appeared ¼ or ¾ of the way across the scale depending on which button was first pressed.



The cursor was adjusted using right and left keys, then scroll-up to finish. The scale was 26-point, moving in intervals of 4% of scale length.



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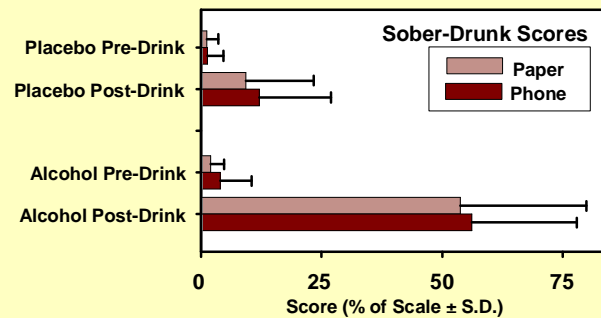
The Studies

Two studies were carried out in which mobile phones were used to assess the subjective effects of ethanol. The combined sample consisted of 65 healthy volunteers (30 male) aged 19-54 years (mean 23) years weighing 52-115 kg (mean 70). 34 volunteers consumed a drink containing vodka and orange juice, the other 31 a placebo drink containing water and orange juice. Assessment were made between 30 and 90 minutes after the start of the drink.

Subjective changes were assessed using 3 visual analogue scales: Alert—Drowsy; Sober—Drunk; and Bored—Interested. They were assessed on mobile phone (21 mm) and on paper (100 mm) in randomized order, with other testing procedures in between. Data are shown only for Sober—Drunk.

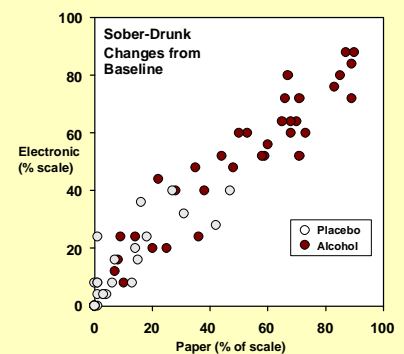
Results

The maximum blood alcohol concentration averaged 94 mg/100 ml. This dose made our volunteers feel more drunk than placebo. The effect was similar whether measured by paper (100 mm line) or mobile phone (21 mm line) as shown on the right



The mean post-drink scores were expressed as change from baseline, and ethanol and placebo scores compared using Student's t-test. For paper, the t-value was 8.35 (p<0.0001) while for mobile phone it was 8.84 (p<0.0001). So if anything, in spite of the shorter length and lower resolution of the phone scale, the phone was more sensitive than paper.

When the change from baseline scores were compared for the volunteers taking ethanol, very good agreement was seen between paper and mobile phone assessments (intraclass correlation, ICC = 0.96). Taken together with the sensitivity data, this indicated that the mobile phone visual analogue scale is an appropriate method for assessing subjective effects of drugs. It also suggests that visual analogue scales are valid over a wide range of sizes.



Conclusions

1. The 21 mm mobile phone visual analogue scale is as sensitive as the 100 mm paper scale in detecting subjective effects of ethanol
2. There is very good agreement between the two methods of assessing alcohol effects (ICC = 0.96).
3. VAS are little unaffected by scale length over a wide range, supporting the use of portable implementations of these scales

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