The objective of the current review was to update publications comparing data collected using 100 mm pVAS and eVAS of various lengths on different electronic platforms to answer the question whether line length and mode of administration (pVAS or eVAS) affect scale measurement properties.

We performed an informal literature search for studies evaluating the eVAS compared to pVAS. The search was conducted using the OneSearch library database provided by Nottingham Trent University (Nottingham, UK), and used search terms: “visual analogue scale” and “equivalence” or “validation.” Articles providing quantitative comparison between eVAS and pVAS were added to the list if identified.

The following information was available from the catalogue: article participant characteristics - disease indication, age, range, sample size, eVAS and pVAS length, electronic use, patient-generated outcome measures (PROMs) studied; and findings and conclusions of the evaluation.

Nineteen articles (Table 1) were included in the evaluation of measurement comparability [1–30]. Forty-eight studies (42%) were conducted in general population volunteers, the remainder included patients with pain (21%), rheumatoid arthritis (18%), panic disorder (5%), multiple sclerosis (5%), and non-small cell lung cancer (5%). One study was conducted in 8 to 10 year-olds [30], and the remaining studies included adults up to 86 years old. All studies were crossover comparisons of paper to at least one form of electronic administration. Studies varied in size from 8 to 355 participants (median: 65 participants). VAS items included measures of pain, fatigue, global health, anxiety, depression, and alcohol effects.

Electronic modes included: personal digital assistant (PDA) (n=5), personal computer (PC) (n=5), smartphone (n=4), tablet (n=2), feature phone (n=2), and smartwatch (n=1). Figure 2. eVAS length was not reported for 5 studies, and ranged from 2.5 cm (n=1), 5 cm (n=6), 6.1 to 8 cm (n=3), 8.1 to 10 cm (n=2), and >10 cm (n=2, max: 28.9 cm in the remainder (Figure 3).

Authors of all 19 (19) concluded pVAS and eVAS were comparable. However, 2 studies (11%) did not report statistical comparisons due to higher scores on eVAS vs. pVAS [1,2]. 16% towards lower scores on eVAS [4,22,30], and 2 studies (11%) reported no differences on eVAS vs. pVAS.

The objective of the current work was to review publications comparing data collected using 100 mm pVAS and eVAS of various lengths on different electronic platforms to answer the question whether line length and mode of administration (pVAS or eVAS) affect scale measurement properties.

The VAS has additional limitations related to the visual nature of the scale. For example, a VAS is not appropriate for individuals with reduced visual acuity or for individuals who are colourblind (s) [8]. The VAS was defined in the PDA PRO Guidance [6] as a line of fixed length (usually 100 mm) with words at the ends that a patient can use to indicate the location of an intermediate or subjective position [10]. Traditionally, the VAS has been implemented on paper (pVAS) with a 100 mm (10 cm) line that allows participants to indicate a position along the line that is representative of an intermediate or subjective position [10]. More recently, with the advent of electronic modes of clinical outcome assessment (COA) data collection such as electronic diaries, an eVAS can be implemented on a line of any length, provided the respondee fields allow for selection of precisely 101 discrete points on the line. UAs are true and designed to administer and score easily when assessing a single construct with many perceptible gradations due to the continuous nature of the construct and the line. The VAS is now commonplace, and there is a plethora of data in the published literature to demonstrate the psychometric equivalence of pVAS and eVAS scores [15,16,17], which researchers still regularly question whether eVASs with various line lengths are equivalent.

Conclusions

There is evidence in the literature supporting the comparability of eVAS and pVAS regardless of the line length. When implementing a VAS on a screen-based electronic mode, it is critical to follow industry best practices for faithful migration to diminish clinically meaningful statistical differences with pVAS.

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