

ON THE VALIDITY OF PAIN INTENSITY REPORTS PROVIDED WITH *PAINOMETER*: A STUDY WITH YOUTH

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Introduction: The use of electronic versions of questionnaires in the assessment of people with pain is increasing. Our research group has developed a smartphone application, *Painometer*, that allows to measure pain intensity with four widely used scales: the Numerical Rating Scale-11 (NRS-11), the Faces Pain Scale-Revised (FPS-R), the Visual Analogue Scale (VAS) and the Coloured Analogue Scale (CAS). The aim of this work is to analyze the validity properties of the electronic versions of the four scales included in *Painometer* when used to measure pain intensity in youth. We hypothesized that the four scales would be valid enough to be used to measure pain intensity in this population.

Methods:

Participants: 180 children and adolescents between 12 and 19 years old participated in this study (mean age= 14.88; sd= 1.64).

Procedure: Participants were asked to report the maximum intensity of their most frequent pain in the last three months using the NRS-11, the FPS-R, the CAS and the VAS both with the paper-and-pencil and electronic versions of the scales. Participants were also asked to report their level of fatigue (on a 0-10 numerical rating scale) and to complete the Pain Catastrophizing Scale-Children (PCS-C).

Data analysis: Construct validity was evaluated by a confirmatory factor analysis (CFA) and by convergent and discriminant validity. Criterion validity was assessed as concurrent validity.

Results:

Table 1. Construct validity (convergent).

| | Maximum intensity of pain |
|----------------------------|---------------------------|
| Construct validity | |
| <i>Convergent validity</i> | |
| eNRS-11 – NRS-11 | r= .90 ⁺ |
| eNRS-11 – CAS | r= .75 ⁺ |
| eNRS-11 – FPS-R | r= .60 ⁺ |
| eNRS-11 – VAS | r= .81 ⁺ |
| eCAS – CAS | r= .88 ⁺ |
| eCAS – NRS-11 | r= .77 ⁺ |
| eCAS – FPS-R | r= .61 ⁺ |
| eCAS – VAS | r= .86 ⁺ |
| eFPS-R – FPS-R | r= .89 ⁺ |
| eFPS-R – NRS-11 | r= .58 ⁺ |
| eFPS-R – CAS | r= .61 ⁺ |
| eFPS-R – VAS | r= .62 ⁺ |
| eVAS – VAS | r= .92 ⁺ |
| eVAS – NRS-11 | r= .79 ⁺ |
| eVAS – CAS | r= .85 ⁺ |
| eVAS – FPS-R | r= .65 ⁺ |

⁰ p<.05 * p<.01 + p<.001

Table 2. Construct validity (discriminant)

| | Maximum intensity of pain |
|------------------------------------|---------------------------|
| Construct validity | |
| <i>Discriminant validity</i> | |
| eNRS-11-eCAS – eNRS-NRS-Fatigue | z= 7.1 ⁺ |
| eNRS-11-eFPS-R – eNRS-NRS-Fatigue | z= 2.4 ⁰ |
| eNRS-11-eVAS – eNRS-NRS-Fatigue | z= 8.08 ⁺ |
| eFPS-R-NRS-11 – eFPS-R-NRS-Fatigue | z= 5.07 ⁺ |
| eFPS-R-eCAS – eFPS-R-NRS-Fatigue | z= 4.91 ⁺ |
| eFPS-R-eVAS – eFPS-R-NRS-Fatigue | z= 5.80 ⁺ |
| eCAS-eNRS-11 – eCAS-NRS-Fatigue | z= 8.37 ⁺ |
| eCAS-eFPS-R – eCAS-NRS-Fatigue | z= 3.22 ⁺ |
| eCAS-eVAS – eCAS-NRS-Fatigue | z= 12.99 ⁺ |
| eVAS-eNRS-11 – eVAS-NRS-Fatigue | z= 8.06 ⁺ |
| eVAS-eFPS-R – eVAS-NRS-Fatigue | z= 3.01 ⁺ |
| eVAS-eCAS – eVAS-NRS-Fatigue | z= 11.43 ⁺ |

⁰ p<.05 * p<.01 + p<.001

Table 3. Criterion validity.

| | Maximum intensity of pain |
|--|---------------------------|
| Criterion validity (concurrent) | |
| eNRS-11 – PCS-C ⁿ | r= .30 ⁺ |
| CAS – PCS-C ⁿ | r= .32 ⁺ |
| FPS-R – PCS-C ⁿ | r= .29 ⁺ |
| VAS – PCS-C ⁿ | r= .31 ⁺ |
| eNRS-11 – NRS-Fatigue | r= .46 ⁺ |
| CAS – NRS-Fatigue | r= .40 ⁺ |
| FPS-R – NRS-Fatigue | r= .29 ⁺ |
| VAS – NRS-Fatigue | r= .46 ⁺ |

⁰ p<.05 * p<.01 + p<.001

Note: ⁿ = results based on information from 159 participants

Conclusion: The four scales included in *Painometer* provide valid scores when used to measure pain intensity in youth. All showed (a) moderate to high convergent validity (b) adequate discriminant validity with fatigue ratings, and (c) adequate concurrent validity with fatigue and pain catastrophizing ratings. Further studies are needed to determine whether data reported with the electronic versions are concordant or not with those obtained with the traditional paper and pencil versions of the scales.

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