IS THE NUMERICAL RATING SCALE (NRS-11) A VALID TOOL TO ASSESS PAIN INTENSITY IN CHILDREN BELOW 8 YEARS OF AGE?

Elena Castarlenas[1,2,3], Elisabet Sánchez-Rodríguez[1,2,3], Jordi Miró[1,2,3].

[1] Unit for the Study and Treatment of Pain – ALGOS; [2] CRAMC; [3] Institut d'Investigació Sanitària Pere Virgili; Universitat Rovira i Virgili; Tarragona, Spain

INTRODUCTION

The NRS-11 is one of the most widely used scales to assess pediatric pain intensity. Independent researchers have studied and reported on its validity and reliability with different samples and under different circumstances [1,4,6]. There is an agreement on the reliability and validity of the NRS-11 to report pain intensity when used with children above the age of 8, but it is unclear whether it could be properly used in children below that age. The aim of this work was to assess whether the NRS-11 is a valid tool when it is used with children aged 6 or 7 years.

METHOD

Participants

72 schoolchildren participated in this study. There were 43 boys (59.7%) and 29 girls (40.3%) with a mean age of 6.68 (SD=.62).

Procedure

Children were individually interviewed during school hours. First of all, participants underwent a screening activity to make sure that they had the appropriate numerical abilities to use the NRS-11.

For this purpose, we implemented three tasks: (1)*Counting*: participants had to count from 0 to 10; (2)*Seriation*: participants had to place several numbers (from 0 to 10) on a horizontal line that had divided in 11 parts, by indicating the position they would occupy; and (3) *Comparison*: participants had to compare two numbers that were verbally presented by the interviewer and indicate which one was the highest.

Following this initial screening phase, participants were asked to report their pain intensity and to answer to other related questionnaires. Firstly, we asked participants if they had experienced pain in any part of their body in the last three months. If the answer to this question was affirmative, we then asked about the highest intensity of the most bothersome pain they had experienced. They were asked to rate their pain intensity on the NRS-11 and the Coloured Analogue Scale (CAS) [3].

Secondly, participants reported the intensity of the pain they would experience in the following situations: 1) "you shut your finger in the door", 2) "you are given an injection" and 3) "you fall over and scrape your knees". These situations, which were taken out from the Painful Events Inventory (PEI) [5], have demonstrated to be appropriate alternatives to study self-report instruments assessing pediatric pain intensity. This time, participants rated their pain intensity on the NRS-11 and the Faces Pain Scale – Revised (FPS-R) [2].
Finally, participants were asked to report the pain related affect in the four cases (most bothersome pain and the three painful events) using the *Facial Affective Scale* (FAS)[3].

Data analysis

-Convergent validity was calculated by correlating the participants' pain intensity ratings on the NRS-11 with those on the CAS/ FPS-R.
- Discriminant validity was estimated by using Fisher's z-transformation to compare the magnitude of the correlation coefficient between ratings on the NRS-11 and the CAS/FPS-R with the magnitude of the correlation coefficient between ratings on the NRS-11 and the FAS.
- Concurrent validity was calculated by correlating the participants' pain intensity ratings on the NRS-11 with those on the FAS
-Scatter plots were created to analyze the linear relation between scores on the NRS and the CAS/FPS-R.

RESULTS

Table 1. Summary of the psychometric properties of the NRS-11

	Intensity scales	n	Construct validity		Criterion Validity
			Convergent	Discriminant	Concurrent
Intensity of most bothersome pain	NRS-11 CAS	72	r=0,82**	z=3,64**	r=0,57**
PEI-1	NRS-11 FPS-R	72	r=0,90**	z=3,69**	r=0,76**
PEI-2	NRS-11 FPS-R	72	r=0,82**	z=3,39**	r=0,64**
PEI-3	NRS-11 FPS-R	72	r=0,77**	z=2,15*	r=0,63**

Painful Event 1= you shut your finger in the door; Painful Event 2= you are given an injection; Painful Event 3= you fall over and scrape your knees
* p<0.05
** p< 0.001
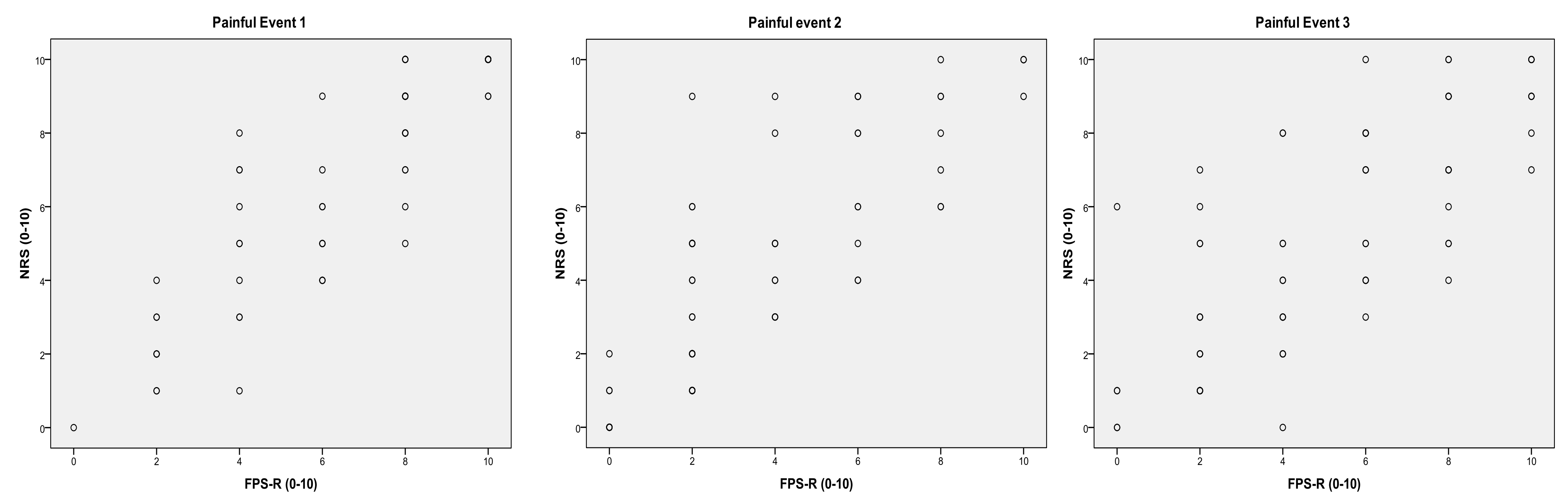
Fig 1. Scatter plot of CAS scores against NRS-11 scores for the highest pain intensity

Fig 2. Scatter plots of FPS-R scores against NRS-11 scores for the three painful events

CONCLUSIONS

Generally speaking, this work provides good evidence for the validity of the NRS-11 when it is used with schoolchildren between 6-7 years of age. In this study, the NRS-11 has demonstrated:
a) Good *convergent validity* when it was compared with the FPS-R and CAS.
b) Good *discriminant validity* when it was contrasted with measures of pain-related affect.
c) Good *criterion-related validity* when it was correlated with pain-related affect measures.
Further research is needed to establish the psychometric properties of the NRS-11 when used in children below the age of 8. Studies with clinical samples and different pain problems are needed (e.g. chronic pain, postoperative pain). These future works should profitable examine additional psychometric properties such as predictive validity and/or reliability.

REFERENCES

[1]Bailey B, Daoust R, Doyon-Trottier E, Dauphin-Pierre S, Gravel J. Validation and properties of the verbal numeric scale in children with acute pain. Pain 2010;149:216-221.
[2]Hicks CL, von Baeyer CL, Spafford PA, van Korlaar I, Goodenough B. The Faces Pain Scale-Revised: toward a common metric in pediatric pain measurement. Pain 2001;93:173-183.
[3]McGrath PA, Seifert CE, Speechley KN, Booth JC, Stitt L, Gibson MC. A new analogue scale for assessing children's pain: an initial validation study. Pain 1996;64:435-443.
[4]Miró J, Castarlenas E, Huguet A. Evidence for the use of a numerical rating scale to assess the intensity of pediatric pain. Eur J Pain 2009;13:1089-1095.
[5]Miró J, Huguet A. Evaluation of reliability, validity, and preference for a pediatric pain intensity scale: the Catalan version of the faces pain scale--revised. Pain 2004;111:59-64.
[6]Von Baeyer CL, Spagrud LJ, McCormick JC, Choo E, Neville K, Connelly MA. Three new datasets supporting use of the Numerical Rating Scale (NRS-11) for children's self-reports of pain intensity. Pain 2009;143:223-227.