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ABSTRACT. ***Objective.*** To evaluate the measurement properties of 21-numbered circle visual analog scales (VAS) and traditional 10-cm horizontal line VAS for physician and parent subjective ratings in children with juvenile idiopathic arthritis (JIA).

Methods. We studied 2 patient samples in whom physician global rating of overall disease activity, parent global rating of the child's overall well-being, and parent rating of intensity of child's pain were performed using traditional 10-cm horizontal line VAS (n = 397) or 21-numbered circle VAS (n = 471). The measurement performances of the 2 VAS formats were examined by assessing construct validity, score distribution, responsiveness to change over time, and minimal clinically important difference (MCID).

Results. Most Spearman correlations with other JIA outcome measures yielded by 21-numbered circle VAS were greater than those obtained with 10-cm horizontal line VAS, revealing that the circle VAS format has better construct validity. Ceiling effects (i.e., score = 0) for physician and parent global ratings were 43.7% and 32.9%, respectively, on 21-numbered circle VAS, and 31.6% and 35.3%, respectively, on 10-cm horizontal line VAS. Responsiveness of 21-numbered circle VAS was good (standardized response mean > 0.8) or moderate (standardized response mean > 0.6) among patients classified as improved or worsened, respectively, by the physician or the parent. Overall, MCID values for 21-numbered circle VAS tended to be greater for worsening than for improvement.

Conclusion. The 21-numbered circle VAS are a suitable alternative to the 10-cm horizontal line VAS and may facilitate incorporation of physician and parent subjective ratings in standard clinical practice. (First Release June 15 2010; J Rheumatol 2010;37:1534–41; doi:10.3899/jrheum.091474)

Key Indexing Terms:
JUVENILE IDIOPATHIC ARTHRITIS PAIN ASSESSMENT VISUAL ANALOG SCALES
PHYSICIAN GLOBAL ASSESSMENT PARENT GLOBAL ASSESSMENT

The physician global rating of overall disease activity (Physician Global), parent global rating of the child's overall well-being (Parent Global), and parent rating of intensity of the child's pain (Parent Pain) on visual analog scales (VAS) are important quantitative measures used to assess disease status in children with juvenile idiopathic arthritis (JIA). These measures have been shown to have good measurement properties, including fair responsiveness to clinically important change[1,2,3,4]. The Physician Global and the Parent Global have been selected for inclusion in the American College of Rheumatology (ACR) pediatric response criteria for JIA[5].

Although physician and parent subjective VAS ratings are incorporated in most clinical research, they are not routinely used in most pediatric rheumatology centers. One reason these instruments may be uncommonly adopted in standard clinical care involves the time required to use a ruler to measure the distance from the left border of a traditional 10-cm horizontal line VAS. Another problem with the use of this VAS is that its length may be altered in printing and photocopying. Recently, Pincus, *et al*[6] have shown that a VAS with

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21 circles in 0.5-unit increments yields results similar to the 10-cm horizontal line VAS in adult patients with rheumatoid arthritis and requires less than half the time to score.

We examined the validity of 21-numbered circle VAS and traditional 10-cm horizontal line VAS for physician and parent subjective ratings in children with JIA.

MATERIALS AND METHODS

Study data sets and physician and parent VAS ratings. Two samples of patients seen at study units and fulfilling the International League of Associations for Rheumatology (ILAR) criteria for JIA[7] were investigated. The first sample comprised 397 patients seen between September 2002 and February 2007, who had Physician Global, Parent Global, and Parent Pain rated on a traditional 10-cm horizontal line VAS. The second sample comprised 471 patients seen from March 2007 to December 2008, who had the same ratings performed on 21-numbered circle VAS (Figure 1).

During the period when the first patient sample was assessed, the Physician Global VAS was placed at the bottom of a standardized joint assessment form and the Parent Global and Parent Pain VAS were located at the bottom of the Childhood Health Assessment Questionnaire (CHAQ)[8], which was the physical function tool used at the time. During the period when the second patient sample was assessed, Physician Global VAS was also placed at the bottom of a standardized joint assessment form, but the Parent Global and Parent Pain VAS were included in the Juvenile Arthritis Multidimensional Assessment Report (JAMAR)[9], a new assessment tool that was administered in the study units from March 2007 to the present. In both data sets, Physician Global rating was performed by the same pediatric rheumatologists (AR, SMM, and Stefania Viola, Genova, Italy). These physicians all had specific expertise in standardized assessment of children with JIA. Their experience in pediatric rheumatology practice ranged from 10 to > 20 years.

The study was approved by the Ethics Committee of the Istituto G. Gaslini of Genoa, Italy.

Additional clinical assessments. The following data were recorded for each patient: sex, onset age, ILAR category, and disease duration. At study visit, the attending pediatric rheumatologist performed a standardized assessment of 71 joints and recorded the number of joints with swelling, tenderness/pain on motion, restricted motion, and active disease[10]. A parent was asked to assess the child's physical function and health-related quality of life (HRQOL). Physical function was assessed with the Italian-language version of the CHAQ (0 = best; 3 = worst)[11] in the first patient sample and with the Italian-language version of the Juvenile Arthritis Functionality Scale (0 = best; 30 = worst)[12] in the second patient sample. HRQOL was measured through the Italian-language version of the Child Health Questionnaire (CHQ)[11] in the first patient sample and through the Italian-language version of the Pediatric Rheumatology Quality of Life scale (PRQL)[13] in the second patient sample. Briefly, the CHQ comprises 15 subscales and yields 2 summary measures: the physical score (PhS) and the psychosocial score (PsS). These scores have been standardized in healthy Italian children to have a mean of 50 and a standard deviation of 10. Higher scores indicate better HRQOL. The PRQL is a 10-item HRQOL questionnaire that includes 2 subdimensions, each comprising 5 items: physical health (PhH) and psychosocial health (PsH). The total score ranges from 0 to 30 and the scores for the PhH and PsH subscales range from 0 to 15. Higher scores indicate worse HRQOL. Laboratory variables included the erythrocyte sedimentation rate and C-reactive protein.

Statistics. Assessment of measurement performances of 21-numbered cir-

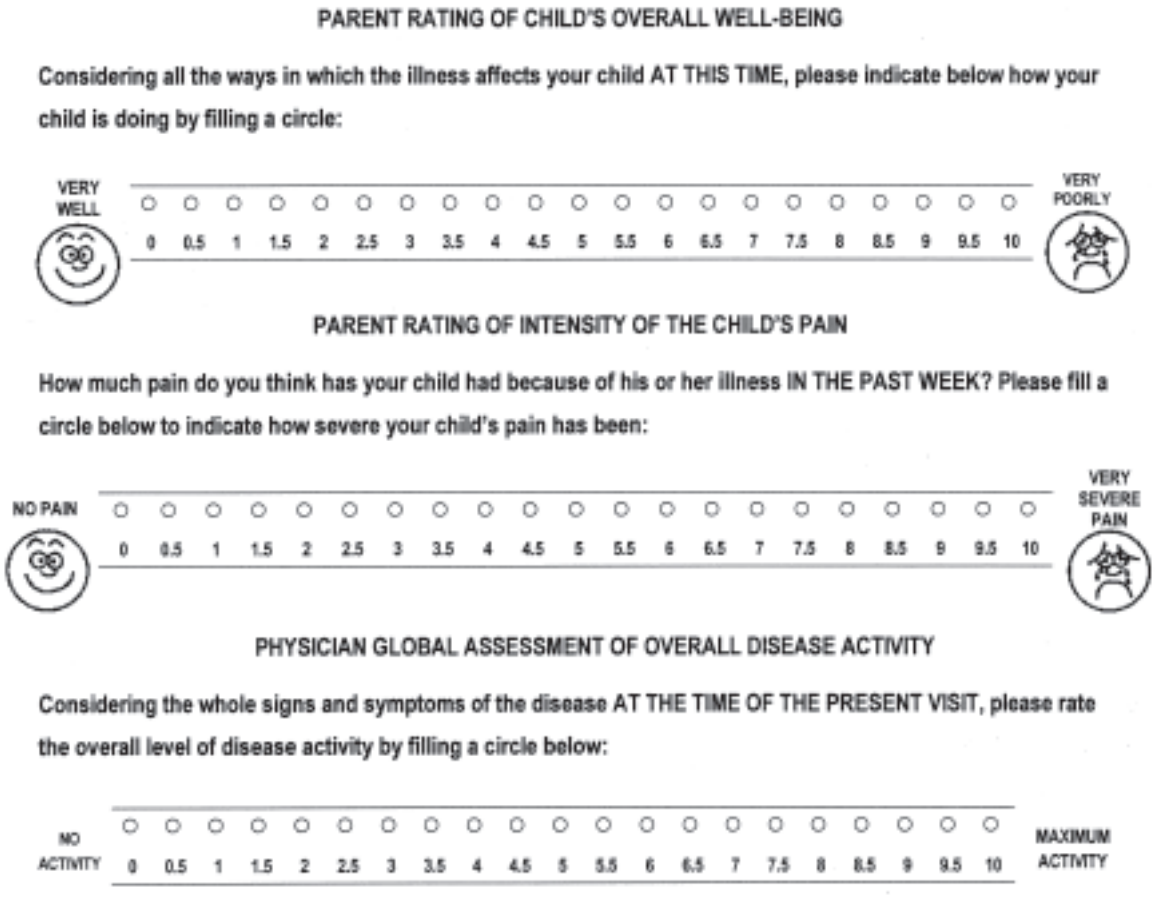

Figure 1. 21-numbered circle VAS for physician and parent subjective ratings in children with juvenile idiopathic arthritis.

cle and 10-cm horizontal line VAS was made by evaluating construct validity and distribution of score values. Construct validity was assessed by examining the correlation of Physician Global, Parent Global, and Parent Pain scores obtained with the 2 VAS formats in the respective patient dataset with scores of other JIA outcome measures. Because all measures assessed were related to the same construct of disease activity, it was considered that a greater correlation meant better construct validity. Correlations were computed using Spearman's rank correlation method. Correlations were considered high if > 0.7, moderate from 0.4 to 0.7, and low if < 0.4[14]. Distribution of score values was evaluated through analysis of ceiling effect (i.e., score = 0), floor effect (i.e., score = 10), skewness, and kurtosis. Skewness measures the symmetry of the distribution. Kurtosis measures whether the distribution is peaked or flat relative to a normal distribution. These statistical tests allow determination of the degree to which a population departs from a normal distribution. In case of a normal distribution, with the software used, a population should have both a kurtosis and skewness of 0. In patients in each dataset who had multiple visits only one visit chosen randomly contributed to these analyses.

We evaluated responsiveness to clinically important change over time and minimal clinically important difference (MCID) only for the 21-numbered circle VAS because the patient sample assessed with the 10-cm horizontal line VAS did not have sufficient longitudinal data. Responsiveness and MCID were assessed on VAS scores obtained at study visit and at a subsequent visit 6 ± 3 months thereafter using the physician or parent perspective of disease course as the external criterion. At second visit, physicians and parents were asked to rate disease course from the previous visit as: much improved, slightly improved, stable, slightly worsened, or much worsened. When doing this assessment, no evaluator (physician or parent) was allowed to see previous scores. Responsiveness statistics included standardized response mean (SRM), calculated as mean score change divided by standard deviation of individual's score change. The threshold levels for SRM were defined as follows: ≥ 0.20 = small, ≥ 0.50 = moderate, and ≥ 0.80 = good[15]. SRM was assessed separately in patients judged by the physician or the parent as improved (much and slightly combined), stable, or worsened (much and slightly combined). The MCID for improvement or worsening was computed separately for physicians and parents by calculating the mean change in score between the 2 visits in patients rated by physicians or parents at second visit as slightly improved or slightly worsened, respectively[16].

All statistical tests were 2-sided; $p > 0.05$ was considered statistically significant. The statistical packages used were Statistica (StatSoft Corp., Tulsa, OK, USA) and Stata release 9.2 (Stata Corp., College Station, TX, USA).

RESULTS

The 2 patient samples included in our study were comparable for gender ratio, distribution of ILAR categories, age at disease onset, age at study visit, and disease duration at study visit (data not shown). The values of JIA outcome measures, including physician and parent subjective ratings, at the time of study visit are presented in Table 1. On average, patients in both samples had a low level of disease activity, and patients assessed with 21-numbered circle VAS tended to have less severe joint disease than those assessed with 10-cm horizontal line VAS.

Table 2 shows Spearman correlations between physician and parent subjective ratings on 21-numbered circle VAS or 10-cm horizontal line VAS, and the other JIA outcome measures. Most correlations yielded by 21-numbered circle VAS were greater than those obtained with 10-cm horizontal line VAS. Exceptions were the slightly greater correlation between Parent Global and Parent Pain and between Parent Pain and tender, restricted, and active joint counts on 10-cm horizontal line VAS. To account for the skewness of scores of all VAS toward the normal (i.e., zero) end of the scale, we recalculated all Spearman correlations on the non-zero scores only for each VAS. Overall, most correla-

Table 1. Values of juvenile idiopathic arthritis outcome measures at study visit in patients assessed with 21-numbered circle VAS and in patients assessed with 10-cm horizontal line VAS.

	21-Numbered Circle VAS, n = 471					10-cm Horizontal Line VAS, n = 397				
	N	Mean (SD)	Median	Lower Quartile	Upper Quartile	N	Mean (SD)	Median	Lower Quartile	Upper Quartile
Physician Global, cm*	437	2.5 (3.1)	0.5	0	5	389	2.9 (3.3)	1.5	0	5.6
Parent Global, cm*	453	2.4 (2.7)	1.0	0	5	382	2.0 (2.5)	0.7	0	3.4
Parent Pain, cm*	454	2.2 (2.8)	0.5	0	4	380	1.9 (2.5)	0.9	0	3.0
JAFS score**	460	2.3 (4.1)	0	0	3	—	—	—	—	—
CHAQ score***	—	—	—	—	—	391	0.3 (0.5)	0.0	0.0	0.5
Swollen joint count	444	1.7 (3.7)	1	0	2	397	2.6 (5.0)	1	0	3
Tender joint count	444	2.3 (5.0)	0	0	2	397	3.1 (6.3)	1	0	3
Restricted joint count	444	2.0 (4.9)	0	0	2	397	3.6 (8.3)	1	0	3
Active joint count	466	2.2 (5.0)	1	0	2	397	3.6 (6.5)	1	0	3
PRQL-PhH score†	452	2.5 (2.8)	1.5	0	4	—	—	—	—	—
PRQL-PsH score†	451	1.7 (2.0)	1	0	3		—	—	—	—
CHQ-PhS††	—	—	—	—	—	212	46.4 (11.5)	50.0	39.8	55.0
CHQ-PsS††	—	—	—	—	—	212	48.5 (8.1)	49.4	43.0	53.8
ESR, mm/h§	327	20.6 (16.7)	15	9	25	348	20.6 (18.3)	14.5	9	24
CRP, mg/dl#	334	1.1 (2.2)	0.46	0.46	0.54	346	1.2 (2.9)	0.5	0.1	0.9

* 0 = best, 10 = worst; ** 0 = best, 30 = worst; †† norm-based score: mean 56 ± SD 10; *** 0 = best, 3 = worst; † 0 = best, 15 = worst; § normal < 20 mm/h; # normal < 0.3 mg/dl. VAS: visual analog scale; JAFS: Juvenile Arthritis Functionality Scale; CHAQ: Childhood Health Assessment Questionnaire; PRQL: Pediatric Rheumatology Quality of Life scale; PhH: Physical health; PsH: Psychosocial health; CHQ: Child Health Questionnaire; PhS: Physical summary score; PsS: Psychosocial summary score; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein.

Table 2. Spearman correlation coefficients of physician and parent rating on 21-numbered circle or 10-cm horizontal line VAS with other JIA outcome measures.

	N	MD Global	Parent Global	Parent Pain	Functional Scale*	Swollen Joint Count	Tender Joint Count	Restricted Joint Count	Active Joint Count	HRQOL Physical†	HRQOL Psychosocial†	ESR	CRP
21-numbered circle VAS													
MD global	437	—	0.63	0.62	0.50	0.86	0.78	0.64	0.88	0.49	0.30	0.54	0.38
Parent global	453	0.63	—	0.78	0.62	0.52	0.58	0.48	0.49	0.71	0.44	0.40	0.33
Parent pain	454	0.62	0.78	—	0.58	0.52	0.58	0.42	0.51	0.75	0.47	0.40	0.35
10-cm horizontal line VAS													
MD global	389	—	0.54	0.61	0.39	0.76	0.70	0.58	0.77	–0.53	–0.13	0.45	0.38
Parent global	382	0.54	—	0.82	0.53	0.43	0.53	0.48	0.49	–0.70	–0.29	0.27	0.33
Parent pain	380	0.61	0.82	—	0.54	0.49	0.60	0.48	0.55	–0.75	–0.24	0.31	0.33

* The functional scale used was the Juvenile Arthritis Functionality Scale (JAFS) for correlations with 21-circle VAS and the Childhood Health Assessment Questionnaire (CHAQ) for correlations with horizontal VAS. † The HRQOL measure used was the Pediatric Rheumatology Quality of Life scale (PRQL) for correlations with 21-circle VAS and the Child Health Questionnaire (CHQ) for correlations with horizontal VAS. MD: physician; HRQOL: health-related quality of life; ESR: erythrocyte sedimentation rate; CRP: C-reactive protein; VAS: visual analog scale.

tion values dropped. However, the correlation trends for the 2 VAS formats remained very similar to those observed when correlations were assessed on the total scores (results not shown).

Figures 2 and 3 show the score distribution of 21-numbered circle VAS and 10-cm horizontal line VAS for Physician and Parent Global, respectively. For the Physician Global, scores on the 21-numbered circle VAS were more skewed toward the normal end of the scale, with a proportionally higher proportion of values being = 0, whereas scores on the 10-cm horizontal line VAS revealed a greater tendency to cluster at the 2 ends of the scale. For the Parent Global, score distribution of the 2 VAS formats was comparable overall. Score values = 0 or = 10 (i.e., ceiling and floor effects) and skewness and kurtosis on the total scores and on the non-zero scores only for all VAS are presented in Table 3.

Responsiveness to clinical change over time and MCID for the 21-numbered circle VAS are reported in Table 4. SRM values in patients who were classified as improved from previous visit by physician or parent were all above or near 0.8 (good responsiveness). All SRM values but one for patients classified as worsened were between 0.6 and 0.8 (moderate responsiveness). As expected, SRM values in patients judged as stable were close to 0. Overall, SRM values were greater for Physician Global than for both Parent Global and Parent Pain. SRM values for Physician Global were greater when physician evaluation of disease course was used as an external standard, whereas SRM values for parent ratings were similar when either physician or parent evaluation of disease course was used as the external standard.

Overall, MCID values tended to be greater in patients judged as slightly worsened than in those classified as slightly improved by either physician or parent. MCID values ranged from –0.6 to –2.2 for improvement and from 1.4 to 2.3 for worsening. MCID values for improvement tended to be greater with the use of physician judgment as the external standard, whereas MCID values for worsening

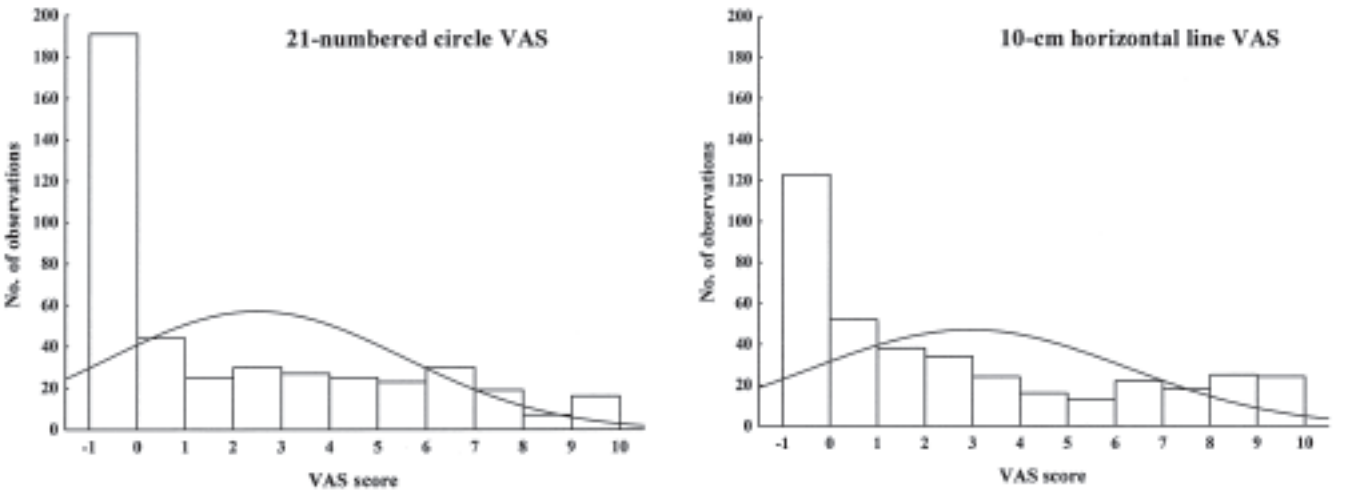

Figure 2. Score distribution of 21-numbered circle VAS and 10-cm horizontal line VAS for physician rating of overall disease activity. The line above the histograms represents the theoretical curve of normal distribution of VAS scores, based on the mean and standard deviation of the observed values.

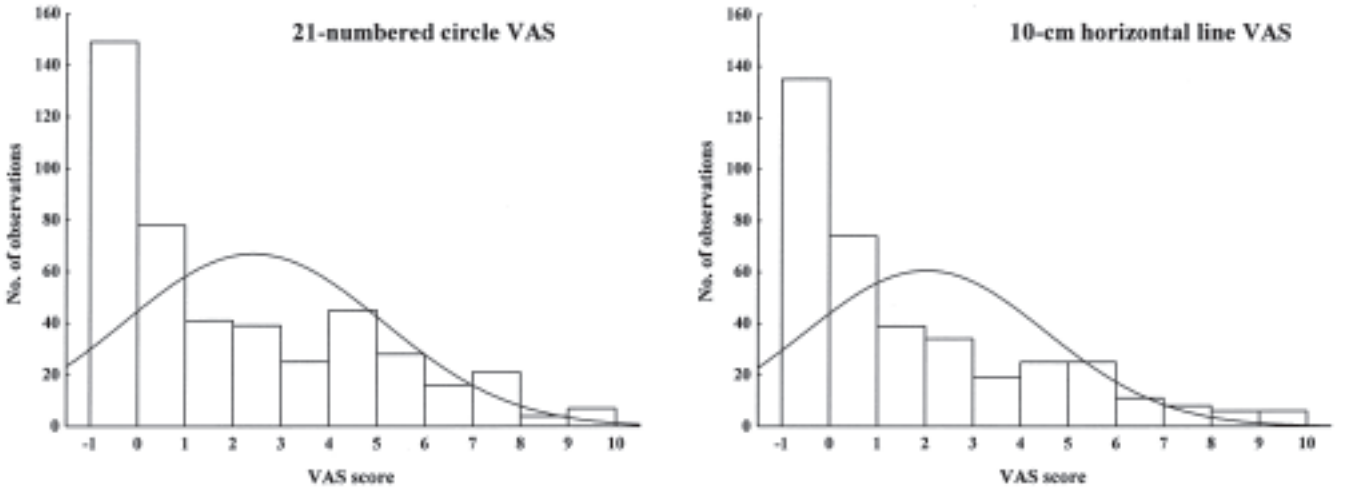

Figure 3. Score distribution of 21-numbered circle VAS and 10-cm horizontal line VAS for parent rating of the child's overall well-being. The line above the histograms represents the theoretical curve of normal distribution of VAS scores, based on the mean and standard deviation of the observed values.

tended to be greater with the use of parent judgment as the external standard. As expected, all MCID values were around 0 in patients classified as stable.

DISCUSSION

Pincus and coworkers[6] suggested that the 21-numbered circle VAS has at least 3 advantages over the traditional 10-cm

Table 3. Ceiling effect, floor effect, skewness, and kurtosis of the 2 VAS formats.

	Score = 0 No. Positive/No. Tested (%)	Score = 10, No. Positive/No. Tested (%)	Skewness, All Scores	Kurtosis, All Scores	Skewness, Non-zero Scores Only	Kurtosis, Non-zero Scores Only
21-numbered circle VAS						
MD global	191/437 (43.7)	15/437 (3.4)	0.96	–0.36	0.30	–0.96
Parent global	149/453 (32.9)	6/453 (1.3)	0.93	–0.22	0.55	–0.64
Parent pain	200/454 (44.1)	6/454 (1.3)	1.12	0.04	0.46	–0.87
10-cm horizontal line VAS						
MD global	123/389 (31.6)	17/389 (4.4)	0.85	–0.70	0.40	1.24
Parent global	135/382 (35.3)	0/382 (0)	1.21	0.48	0.76	–0.38
Parent pain	148/380 (38.9)	1/380 (0.3)	1.36	0.89	0.86	–0.27

MD: physician; VAS: visual analog scale.

Table 4. Responsiveness, measured with standardized response mean (SRM), and minimal clinically important difference (MCID) of the 21-numbered circle VAS in patients who had the disease outcome rated by the physician or the parent at a second visit after study entry.

	SRM (95% CI)			MCID (95% CI)		
	External Standard: Physician					
	Improved*†, n = 63	Stable, n = 84	Worsened#, n = 40	Slightly Improved, n = 28	Stable, n = 84	Slightly Worsened, n = 19
MD global	1.21 (0.98; 1.42)	0.19 (0.00; 0.40)	1.08 (0.78; 1.35)	–1.30 (–1.76: –0.85)	–0.23 (–0.49; 0.03)	1.39 (0.59; 2.20)
Parent global	0.74 (0.45; 1.02)	0.06 (0.00; 0.28)	0.66 (0.31; 0.99)	–0.71 (–1.77; 0.34)	–0.14 (–0.64; 0.35)	1.68 (0.74; 2.63)
Parent pain	0.93 (0.56; 1.26)	0.05 (0.00; 0.27)	0.74 (0.31; 1.13)	–2.20 (–3.58; –0.82)	0.11 (–0.37; 0.58)	1.87 (0.78; 2.95)
	External Standard: Parent					
	n = 84	n = 89	n = 47	n = 36	n = 89	n = 42
MD global	0.98 (0.71; 1.23)	0.09 (0.00; 0.33)	0.71 (0.40; 1.00)	–1.31 (–2.45; –0.17)	–0.17 (–0.98; 0.65)	1.93 (–0.19; 4.06)
Parent global	0.83 (0.60; 1.05)	0.00 (0.00; 0.24)	0.66 (0.34; 0.97)	–0.64 (–1.60; 0.33)	–0.01 (–0.53; 0.51)	1.61 (0.80: 2.41)
Parent pain	0.81 (0.53; 1.07)	0.14 (0.00; 0.35)	0.75 (0.43; 1.05)	–1.09 (–2.45; –0.17)	0.27 (–0.34; 0.88)	2.26 (0.75; 3.78)

* Much improved and slightly improved combined. # Much worsened and slightly worsened combined. † Patients whose baseline scores were at the floor (score 0) for the questionnaire and could not further improve were excluded from assessment of responsiveness in the group judged as improved. CI: confidence interval.

horizontal line format: (1) the assessor can score the VAS without a ruler, implying a simpler and quicker calculation; (2) it eliminates the need to reproduce an exact 10-cm line in printing or photocopying questionnaires, averting the problem of minor distortion frequently seen with these procedures; (3) it is better understood by patients. Concerning the latter point, we included the happy and sad faces at the 2 ends of the new VAS because in preliminary testing of the scales we noticed some assessors (parents or, less frequently, children) misinterpreted the score rule, particularly regarding the assessment of overall well-being, by interpreting the score 10 as the best and the score 0 as the worst. After adding the faces, misinterpretation was no longer observed.

Correlational analyses showed that most Spearman correlations among Physician Global, Parent Global, Parent Pain, and the other JIA outcome measures were greater for the 21-numbered circle VAS than for the 10-cm horizontal line VAS. The correlation of Physician Global with articular indices, i.e., swollen and active joint counts, reached a very high level (close to 0.9) when this rating was done on a 21-numbered circle VAS. These correlations are greater than those obtained in previous studies that used traditional 10-cm horizontal line VAS[17,18,19]. This suggests that use of the 21-numbered circle VAS enhances incorporation of findings of joint examination in the physician subjective global assessment, thus improving the construct validity of this measure. The greater correlation between Parent Global and Parent Pain obtained with the use of the 10-cm horizontal line VAS may be due to the close proximity of these scales in the CHAQ, which may lead to a reciprocal influence between the 2 assessments[20].

Analysis of score distribution revealed that Physician Global tended to be more skewed and to show a greater ceiling effect (i.e., a greater proportion of scores = 0) with the use of the 21-numbered circle VAS. This phenomenon may depend, at least partially, on either greater frequency of disease remission in the patient sample assessed with this VAS or greater precision of such a scale in the assessment of inactive disease (see below). On the other hand, scores on the 10-cm horizontal line VAS revealed a greater tendency to cluster at the 2 ends of the scale. This suggests that use of a 21-numbered circle VAS may lead the physician to place his/her marks more uniformly throughout the scale. Distribution of scores for the Parent Global was similar across the 2 VAS formats. As expected, skewness decreased for all VAS when only the non-zero values were examined.

Responsiveness of the 21-numbered circle VAS to clinical change over time was satisfactory, with SRM values being above or close to 0.8 in patients judged as improved, and above 0.6 in patients judged as worsened by both physicians or parents. SRM values obtained in this study compare favorably with those obtained with the use of the 10-cm horizontal line VAS in previous analyses[1,2,3]. In keeping with previous studies, use of a 21-numbered circle VAS revealed that the Physician Global is more responsive to clinical change than both parent subjective ratings.

The MCID has been defined as the smallest change in an outcome measure that is perceived by patients as beneficial and that would result in a change in treatment[21]. Knowledge of MCID of a clinical measure is important for the interpretation of changes in its score. Only changes beyond the MCID of a measure constitute relevant changes, whereas smaller changes are of minimal or no clinical relevance[22]. Based on our results, only improvement above 0.5–1.0 or worsening greater than 1.0–1.5 in the 21-numbered circle VAS for physician or parent subjective ratings are important. We found that MCID was greater for worsening than for improvement, particularly when the parent estimate of disease course was used as the external standard. This finding contrasts with results obtained in adult rheumatoid arthritis clinical trials, where MCID for deterioration are usually smaller than those for improvement[16]. This discordance may be explained by most of our patients having a low level of disease activity. It has been suggested that, at lower scores, patients with chronic arthritis may be more optimistic and require larger changes for worsening than for improvement[16,23]. To our knowledge, no information exists on the MCID of 10-cm horizontal line VAS in children with JIA.

In JIA, use of the 21-circle VAS has the potential advantage of increasing the accuracy of assessment of clinical remission. One of the criteria that make up the definition of inactive disease in JIA[24] requires that for a patient to be classified inactive, he/she should have a Physician Global rating of disease activity of the best score attainable on the scale used. If this rating is done on a VAS, the best score attainable is 0. This assessment is problematic, however, due to the relative aversion to extremes seen when using a traditional linear VAS. Often, very low values (0.1 or 0.2 cm) are obtained when the assessor really intended to mark the end of the line. To overcome this problem, some investigators have set the physician global VAS threshold for inactive disease at 1 cm[25] or even 2 cm[26]. We recently examined 386 visits made by children with JIA from March 2007 to December 2008, in which the attending physician was asked to do a series of clinical assessments that included physician global rating of disease activity on a 21-circle VAS and physician categorical rating of disease status as "persistent activity," "flare," or "remission." In as many as 173 (95.1%) of the 182 visits in which the physician declared that disease was in remission, the physician global VAS was = 0 (Filocamo, *et al*, unpublished observations). This finding suggests that use of a 21-circle numbered VAS facilitates adherence to JIA criteria for inactive disease and enhances reliability of their assessment. It remains to be established whether a more relaxed threshold for inactive disease (e.g., < 1 cm) may be more suitable for use in daily clinical practice.

Our study should be interpreted in the light of some

potential limitations. The low level of disease activity in most of our patients may have limited generalizability of our findings. However, study patients represent consecutive samplings of our clinic population and are likely representative of patients seen in most tertiary pediatric rheumatology centers. The lower level of disease activity seen in the more recent patient sample could be due, at least partially, to a greater use of biologic medications. Comparisons between the 2 VAS formats were made on different patient datasets. Face-to-face comparison on the same patient sample would have enhanced the quality of the data. However, global assessments in both datasets were performed by the same physicians. Further, most parents who did parent ratings were the same. The uniformity of the evaluators over time ensures that assessments made on the 2 different VAS are comparable to a large extent. That the assessment of the "external criterion" was done by the same evaluator who rated the VAS constitutes another limitation of our study. However, when making this assessment, neither physicians nor parents were allowed to see their previous scores. Comparison of the 2 VAS formats was made on patients followed in standard clinical practice. Further information on the relative validity of the 2 VAS formats should be obtained in the context of a clinical trial. Moreover, it is important to examine the performance of the new VAS format in assessing children's self-reports.

We found that the 21-numbered circle VAS has good measurement properties and performs similarly to the traditional 10-cm horizontal line VAS. Use of the simpler 21-numbered circle VAS may be more feasible and may increase the precision of patient assessment, particularly regarding the definition of remission. It is proposed to substitute the 10-cm horizontal line VAS with the 21-numbered circle VAS both in standard clinical practice and in research, including clinical trials.

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