## Supplementary Table 2. Methodological Quality and Measurement Property Results

## A. Content validity and internal structure

Manager	Country	age		Content validity			Structural validit (% variance explain				Cross-cultural validity	'			Internal consist	tency	
Measure	(language)	group	n	Result	Rating	Meth qual	n Result	Rating	Meth qual	n	Result (rating)	Rating	Meth qual	n	Result (Cronbach alpha coefficient)	Rating	Meth qual
	Portugal (Portuguese) (Fernandes et al., 2015)	8-17	24 children	Relevance and comprehensibility (patients): assessed with the Q-sort method, 58 words were known by >75% of children, comprehensiveness not assessed.	+	Doub tful				3 Portuguese native reviewers; 2 English native translators	independent translation, back- translation	?	Inadeq uate				
APPT	Turkey		10 paediatric pain experts	Relevance (expert): Content validity index (CVI) = 0.8-1.0 (+)	+	Adeq uate		·			independent						
	(Turkish) (Özalp Gerçeker et al., 2018)	8-17	10 children or adolescents with cancer	Relevance and comprehensibility (patients): assessed with the Q-sort method, 89% of 63 words categorised as "I use this word to describe hurt/ pain" by participants, comprehensiveness not assessed.		Doub tful				5 language experts	translation, back- translation, experts committee were used to provide cross- cultural validity in the development process	+	Doubtf ul	96	ΑΡΡΤ-Τ α=0.78	+	Adequ ate
COMFORT	United States (English) (Ambuel et al., 1992)	n.r.	20 experience d clinicians	Experts were only involved before development of scale, relevance and comprehensibility were not explicitly consulted, patients were not involved in content validation.	+	Inad equa te	PCA: 50 Dimension 1 & 2 (84%) Dimension 1 (58%) Dimension 2 (26%)	+	Adequ ate					50	α=0.90	+	Very good
	The Netherlands (English) (van Dijk et al., 2000)	0-3												158	α=0.90, 0.92, 0.92	+	Very good
	United States (English/ Spanish determined by language					<u>.                                    </u>		·	-					35	α=0.80 in Anglo children	+	
СРІ	use) (Pfefferbaum et al., 1990, Adams, 1988, Adams, 1989)	3- 15.9												43	α=0.72 in Hispanic children	+	Adequ ate
DEGR	France (French)	2-6					Factor 1 (51%) 80 Factor 2 (13,14%) Factor 3 (8, 10%)	+	Doubtf ul								

-			 											_
	(Gauvain- Piquard et al., 1987)													
	France (French) (Gauvain- Piquard et al., 1999)	2-6	152	Factor 1 (50%) Factor 2 (15%)	+	Adequ ate					152	α=0.90, 0.93, 0.84, 0.74 respectively for total score, pain subscale, psychomotor inertia, and anxiety subscale	+	Very good
	France (French)	2-6	59	factorial analysis, correlation coefficients, between score of each item and total scores of other items >0.5 for 7/10 items	+	Inadeq uate					59	α = 0.845	+	Adequ ate
	(Marec- Berard et al., 2015)	2-0	48	factorial analysis, correlation coefficients, between score of each item and total scores of other items >0.5 for 4/10 items	-	Inadeq uate					48	α = 0.777	+	Adequ ate
DOLLS														
FLACC	Brazil (Brazilian Portguese)	7-17									90	α=0.76	+	Adequ ate
	(Da Silva et al., 2011)													
Le Baron and Zeltzer, 1984 / Kuttner	United States (English/ Spanish determined by language use)	3- 15.9									35	α=0.85	+	Adequ ate
and LePage, 1989 Faces Scale	(Pfefferbaum et al., 1990, Adams, 1988, Adams, 1989)										43	α=0.87	+	Adequ ate
FPS-R	Spain (Catalan) (Miro and Huguet, 2004)	7-15					1 bilingual psychologist 1 native English speaker	independent translation and back- translation were used to provide cross- cultural validity in the development process	+	Doubtf ul				
	France (French)										59	α = 0.61 (95% CI: 0.48–0.79)	-	Adequ ate
HEDEN	(Marec- Berard et al., 2015)	2-6									48	α = 0.75 (95% CI: 0.48–0.79)	-	Adequ ate
MSAS (7- 12)	United Kingdom (English) (Collins et al., 2002)	7-12									149	α = 0.67	-	Adequ ate

-													-		-
OMDQ															
OPS															
Pain Squad	Canada (English) (Stinson et	8-18	10 paediatric oncologists 10 paediatric pain experts	Development (expert): expert opinion was used to develop the tool (+)	+	Doub tful						92	8-18 (N=92) α = 0.96	+	Adequ ate
	al., 2015)		18 adolescents with cancer	Relevance (patients): 88% of questions rated as "important" or "very important" by >50% of adolescents (+)	+	Doub tful									
PBCL	United States (English/ Spanish)	3- 15.9										35	α=0.78 in Anglo children	+	Adequ ate
	(Pfefferbaum et al., 1990)	13.3										43	α=0.54 in Hispanic children	-	Adequ ate
PCT															
PII	United States (English) (Martin et al., 2015)	6.6- 24.1										60	α = 0.84	+	Adequ ate
PII-P	United States (English) (Martin et al., 2015)	6.6- 24.1										65	α = 0.94 (mothers) and 0.96 (fathers)	+	Adequ ate
РРР	Brazil (Brazilian Portuguese) (Pasin et al., 2013)	1-18	20 health professiona Is 10 primary caregivers/ parents	Clarity: median between 3.00 (clear) and 4.00 (very clear); mean= 3.49, SD = 0.82) (+)	+	Inad equa te		2 bilingual translators; 2 English translators; 2 registered nurses; 2 doctors; 2 physiothera pists; 1 pain specialist; 1 teacher; researchers; author of original version	independent translation; back- translation; experts committee: experts maintain consensus and semantic equivalence	+	Adequ ate	45	α = 0.864	+	Adequ ate
	United Kingdom (English) (Hunt et al., 2007)	1-18										29	α = 0.88	+	Adequ ate
	United Kingdom (English)	1-18										140	α = 0.75-0.89	+	Adequ ate

	(Hunt et al., 2004)								
RPS	Canada (English) (Mahon et al., 2015)	5-10	·						
SSPedi	Canada and United States (English) (Dupuis et al., 2018)	8- 18.7				502	α = 0.86	+	Adequ ate
WBS									

APPT - Adolescent Paediatric Pain Tool; CPI - Children's Procedural Interview; DEGR scale - Douleur Enfant Gustave Roussy; FPS-R – Faces Pain Scale-Revised; FLACC scale - Face, Legs, Activity, Cry, Consolability scale; HEDEN scale - Hétero Evaluation Douleur Enfant scale; MIPS - Modified Infant Pain Scale; MSAS - Memorial Symptom Assessment Scale; OMDQ - Oral Mucositis Daily Questionnaire; OPS - Objective Pain Scale; PBCL - Pain Behaviour Check List; PCT - Poker Chip Tool; PII - Pain Interference Index; PII-P - Pain Interference Index-Parent; PPP - Paediatric Pain Profile; r - Pearson product moment correlation coefficient; RPS - Rainbow Pain Scale; rs - Spearman correlation coefficient; SSPedi - Symptom Screening in Paediatrics; τ - Kendall's tau (τ) correlation coefficient; WBS - Wong-Baker FACES Pain Rating Scale

## B. Other measurement properties.

	Country (language)				Hypothesis testing		•			Criterion validity				Reliability		
Measure	in which the questionnai re was evaluated	age group	used reference (reported by)	n	Convergent/ Divergent validity: Result	Rating	Meth qual	used reference (reported by)	n	Predictive/ concurrent validity: Result	Rating	Meth qual	N	Results	Rating	Meth qual
АРРТ	Turkey (Turkish) (Özalp Gerçeker et al., 2018)	8-17											30	test-retest:  ICC = 0.84 (total number of body areas marked), 0.73 (pain severity), 0.72 (pain intensity ratings), and 0.82 (total number of word descriptors). No significant differences at repeated measurements (p>0.05) for all sections	+	Adequ ate
	United States (English) (Ambuel et al., 1992)	n.r.	VAS (clinicians)	50	Convergent validity: Significant r=0.75, P<0.01	+	Very good						50	Interrater agreement: r = 0.84, p < 0.01	+	Doubtf ul
COMFORT	The Netherlands (English) (van Dijk et al., 2000)	0-3	VAS (nurses)	26	Convergent validity: before r = 0.64-0.73; after r = 0.79-0.83	+	Very good						158	Interrater agreement: K=0.70 (0.63-0.93)	+	Adequ ate
	al., 2000)		HRV		Convergent validity: Significant r=0.44, 0.31-0.55	-	Adequ ate									
	The Netherlands (English)		HRV	•	Convergent validity: Significant r=0.48, 0.35-0.58	-	Adequ ate									
	(Van Dijk et	0-3	MAP	158	Convergent validity: Significant r=0.0.37, 0.24-0.49	-	Adequ ate									
	al., 2001)		MAPV	•	Convergent validity: Significant r=0.49, 0.36-0.59	-	Adequ ate				•					
	•		PBCL	35	Convergent validity: r=0.66, P<0.001 in Anglo children	-	Very good				•					
	United States		- DCL	43	Convergent validity: r=0.64, P<0.001 in Hispanic children	-	Very good									
	(English/ Spanish determined		Age	35	<b>Divergent validity: significant</b> r =-0.40, p<0.01 in Anglo children	-	Very good									
СРІ	by language use)	3-15.9		43	<b>Divergent validity: significant</b> r=-0.46, p<0.001 in Hispanic children	-	Very good									
	(Pfefferbau m et al.,		Gender	35	Divergent validity: Not significant r =not reported in Anglo children	-	Very good									
	1990, Adams, 1988,			43	Divergent validity: Not significant r=not reported in Hispanic children	-	Very good									
	Adams, 1989)		Duration and stage of	35	<b>Divergent validity: Not significant</b> r =not reported in Anglo children	-	Very good									
			illness	43	<b>Divergent validity: Not significant</b> r=not reported in Hispanic children	-	Very good									

					•											
			Parent	35	<b>Divergent validity: Significant</b> r =0.51, p<0.01 in Anglo children	-	Very good									
			anxiety	43	<b>Divergent validity: Not significant</b> r=not reported in Hispanic children	-	Very good					•				
	France (French) (Gauvain- Piquard et	2-6											80	Interrater agreement: K=0.14-0.60, significantly different from 0, <0.7; agreement was better for auxillaries (0.32-0.60) than nurses (0.14-0.53)	-	Very
	al., 1987)		pain specialists' ratings	53	Convergent validity: r = 0.74-0.87, p<0.001	+	Very good		_			•				
	France		gender	152	Divergent validity: Not significant r = not reported, p >0.05	-	Very good				•	•	152	Interrater agreement: significant weighted kappa coefficients for all items, p<0.001, varied from 0.28-0.45,	+	Ver
DEGR	(French) (Gauvain-	2-6	age	152	Divergent validity: Not significant r = not reported, p >0.05	-	Very good							weighted kappa coefficient for total DEGRR score = 0.71> 0.7		goo
	Piquard et al., 1999)		psychosocia I characteristi cs	152	Divergent validity: Not significant r = not reported, p >0.05	-	Very good									
			medical characteristi cs	152	<b>Divergent validity: Not significant</b> r = not reported, p >0.05	-	Very good						53	Interspecialist agreement: K=0.4 (4 specialists)	-	Doub
	France (French)		HEDEN	59	Convergent validity: r = 0.50	-	Very good		•							
	(Marec- Berard et al., 2015)	2-6	HEDEN	48	Convergent validity: r = 0.6	-	Very good									
			Scores before procedure	45	Divergent validity: Significant t = 12.45, p<0.01	+	Very good		•							
			heart rate	45	Convergent validity: Significant r = 0.78, 0.89, 0.74, p<0.001	+	Very good									
	Lohanan		systolic blood pressure	45	Convergent validity: Significant r = 0.75, 0.81, 0.79 p<0.001	+	Very									
DOLLS	Lebanon (Arabic)	4-10	oxygen saturation	45	Convergent validity: no correlation DOLLS and are not correlated	-	Very good	WBS	45	Concurrent validity: Significant r = 0.90, p<0.01	+	Very				
	(Badr Zahr et al., 2006)		OSBD-R (parents)	45	Convergent validity: Significant r = 0.76, p<0.01	+	Very good			1 = 0.50, p<0.01		good				
			WBS (parents)	45	Convergent validity: Significant r = 0.81, p<0.01	+	Very									
			FLACC (nurses)	45	Convergent validity: Significant r = 0.82, p<0.01	+	Very good									
			OSBD-R (nurses)	45	Convergent validity: Significant r = 0.80, p<0.01	+	Very good									
FLACC	United States (English)	<1-7	postanalges ia scores	89	Divergent validity: Significant Preanalgesia FLACC scores (7.0+/- 2.9) are significantly higher than that postanalgesia at 10, 30, 60: (1.7	+	Adequ ate						89	Interrater agreement: r = 0.94, kappa value >0.5; face: kappa = 0.52; legs: kappa = 0.67;	+	Ver

	(Merkel et al., 1997)				+/- 2.2), (1.0 +/- 1.9),(0.2 +/- 0.5), p<0.001								activity: kappa = 0.72 cry: kappa = 0.82; consolability: kappa = 0.66
			pain global ratings (nurses)	89	Convergent validity: Significant r = 0.41 p<0.005	-	Very good						
			OPS	89	Convergent validity: Significant r = 0.80 p<0.001	+	Very good						
	Lebanon		OSBD-R (parents)	45	Convergent validity: Signifcant r = 0.89	+	Very good						
	(Arabic) (Badr Zahr	4-10	DOLLS (self)	45	Convergent validity: Signifcant r = 0.82	+	Very good	DOLLS	45	Concurrent validity: Significant r = 0.82, p<0.01	+	Very good	
	et al., 2006)		FACES (self)	45	Convergent validity: Signifcant r = 0.78	+	Very good						
	United States (English) (Manworren and Hynan, 2003)	<3	postanalges ia scores	147	Divergent validity: Significant Preanalgesia (Time 1) FLACC scores, 95%CI (7.0, 6.66-7.41) significantly higher than postanalgesia Time 2 (2.05, 1.68-2.43), Time 3 (0.74,0.48- 1.00)	+	Very good						
	Brazil (Brazilian Portuguese) (Da Silva et al., 2011)	7-17	gender	90	<b>Divergent validity: Not significant</b> FLACC-B r = not reported, p =0.36	-	Very good						
Le Baron	United States (English/			35	Convergent validity: Significant r=not reported, p=not reported in Anglo children	?	Doubt ful						
and Zeltzer, 1984 / Kuttner and LePage, 1989 Faces Scale	Spanish determined by language use) (Pfefferbau m et al., 1990, Adams, 1988, Adams, 1989)	3-15.9	PBCL	43	Convergent validity: Significant r=not reported, P=not reported in Hispanic children	?	Doubt ful						
	Brazil (Brazilian		gender	90	<b>Divergent validity: Not significant</b> FPS-R-B r = not reported, p =0.75	-	Doubt ful						Measurement error:
	(Da Silva et al., 2011)	7-17	FLACC-B	90	Convergent validity: Significant FPS-R-B rs=0.74	+	Very good						expected to have a high account of measurement error due to it being a single item instrument
FPS-R	Canada (English)							CAS	45	Predictive validity: significant FPS-R r = 0.84	+	Very	
	(Hicks et al., 2001)	4-12					_	VAS	45	Predictive validity: significant FPS-R r = 0.92	+	Very good	
	Spain (Catalan) (Miro and	7-15	CAS	124	Predictive validity: Significant FPS-R-C r=0.87, p<0.001	+	Very good	FAS	124	Predictive validity: significant FPS-R-C r = 0.32 p <0.01	-	Very good	

	Huguet, 2004)								•							•
	France (French)			59	Convergent validity: r = 0.5, p = not reported	-	Very good		•				59	Interrater agreement: r = 0.62	-	Doubtf ul
HEDEN	(Marec- Berard et al., 2015)	2-6	DEGR	48	<b>Convergent validity:</b> r = 0.6, p = not reported	-	Very good						48	Interrater agreement: r = 0.67 (95% CI: 0.48–0.79)	-	Doubtf ul
MIPS	United States (English)	<1						VAS (nurses)	40	acceptable concordance between MIPS and observer VAS	+	Inadeq uate	40	Interrater agreement: r = 0.85, p = n.r.	+	Doubtf ul
	(Buchholz et al., 1998)															
MSAS (7- 12)	United Kingdom (English) (Collins et al., 2002)	7-12						PAIN-VAS	149	Concurrent validity: Significant MSAS-PAIN r = 0.76 p<0.01	+	Very good	149	Interrater agreement: for pain subscale, parent and child agreement: weighted kappa = 0.46	-	Very good
	Canada (English) (Tomlinson et al., 2011)	1-11											59	Test-retest of pain construct: Significant Day 1 and 2: rs = 0.676 (p <0.0001) Day 14 and 15: rs = 0.889 (0.0001)	+	Doubtf ul
			WHO mucositis	15	Convergent validity: Significant OMDQ-Pain rs = 0.90, p<0.0001	+	Adequ ate									
OMDQ	Canada		VAS mucositis	15	Convergent validity: Significant OMDQ-Pain rs = 0.81, p<0.0001	+	Adequ ate									
	(English) (Manji et al.,	12-17	FACTECS swallow	15	Convergent validity: Significant OMDQ-Pain rs = -0.77, p<0.0001	+	Adequ ate		•			•	15	Test-retest: Significant amount of mouth and throat pain rs = 0.88, P<0.0001	+	Doubtf ul
	2012)		FACTECS eat	15	Convergent validity: Significant OMDQ-Pain rs = -0.62, p<0.0001	-	Adequ ate		•			•		15 5.55). 5.5551		
			FACTECS total	15	Convergent validity: Significant OMDQ-Pain rs = -0.71, p<0.0001	+	Adequ ate									
	United States		FPS (parent)	13	Convergent validity: Significant $\tau$ = 0.26, p =0.10	-	Inade uqate	FPS (self- report)	13	Concurrent validity τ = 0.37, p =0.02	-	Inadeu qate				
OPS	(English) (West et al., 1994)	5-13	PCT (parent)	13	Convergent validity: Significant $\tau = 0.22,  p = 0.16$		Inade uqate	PCT (self- report)	13	Concurrent validity $\tau = 0.27$ , $p = 0.09$	-	Inadeu qate				
	Canada		generic HRQL	92	Convergent validity: Pain Squad VAS r = (-0.20 to -0.46)	-	Very good									
Pain Squad	(English) (Stinson et	8-18	disease- specific HRQL	92	Convergent validity: Pain Squad VAS r = (-0.12 to -0.28)	-	Very good									
	al., 2015)		pain coping HRQL	92	Convergent validity: Pain Squad VAS r = (0.25-0.29)	-	Very good									
PBCL	United States (English/	3-15.9	Le Baron and Zeltzer,	35	Convergent validity: Significant r=not reported, p=not reported in Anglo children	?	Doubt ful	self-report PBCL	35	Concurrent validity: Significant caregiver PBCL r= 0.04, p <0.01 in Anglo children	-	Very good				
FBCL	Spanish determined by language	3-13.9	1984 / Kuttner and LePage,	43	Convergent validity: Significant r=not reported, P=not reported in Hispanic children	?	Doubt ful	self-report PBCL	43	Concurrent validity: not correlated caregiver PBCL r = 0.14, p <0.01 in Hispanic children	-	Very good				

	use)		1989 Faces Scale													
	(Pfefferbau m et al.,		Tuccs scale	35	Convergent validity: r=0.66, P<0.001 in Anglo children	-	Very good									
	1990)		CPI	43	Convergent validity: r=0.64, P<0.001 in Hispanic children	-	Very									
	United States (English)	6-18	Patient self- rating of pain	22	Convergent validity: significant r=0.49, 0.53, 0.21, p<0.001, P<0.001, not significant	-	Doubt ful						22	Interrater agreement:	?	Doubtful
	(LeBaron and Zeltzer, 1984)		Observer rating of pain	22	Convergent validity: significant r=0.42, 0.64, 0.45, p<0.001	-	Doubt ful							r = 0.64, 0.80, 0.86, p <.01		
PCT	United States (English)	5-13	WBS (parent)	30	Convergent validity: Kendall's = 0.7 (PCT parent) P=0.0001	+	Doubt ful	WBS	30	Concurrent validity: significant		Doubtf	30	Interrater agreement: not significant, value not reported	?	Doubtf ul
PCI	(West et al., 1994)	5-13	OPS (nurse)	30	Convergent validity: Kendall's = 0.0.27 (PCT patient) P=0.09	-	Doubt ful	WBS	30	Kendall's=0.67, P=0.0001	-	ul	30	Intrarater agreement: Kendall's = 0.23, p=0.16	?	Doubtf ul
PII	United States (English) (Martin et al., 2015)	6.6- 24.1	PII-P	60	Concurrent validity: r = 0.62, P<0.0001	-	Very good									
PII-P	United States (English) (Martin et al., 2015)	6.6- 24.1						PII (self-report)	60	Concurrent validity: r = 0.62, P<0.0001	-	Very good				•
	United Kingdom (English) (Hunt et al., 2004)	1-18											140	Interrater agreement: ICC=0.74-0.89	+	Adequ ate
PPP	United Kingdom (English)	1-18	Saliva cortisol	29	Concurrent validity:	_	Very	NRS	29	Concurrent validity:	+	Very	3	Interrater agreement: ICC= 0.62 (95%CI: 0.54-0.70) for a single rater; 0.83 (95%CI:0.78-0.88); range: 0.21- 0.71, average: 0.45	+	Adequ ate
	(Hunt et al., 2007)		concentrati on		rs=0.375-0.451		good			r = 0.91		good		Intrarater agreement ICC=0.90 (95%CI: 0.80-0.95, range: 0.21- 1.0, average: 0.72)	+	Adequ ate
	Brazil (Brazilian Portuguese) (Pasin et al.,	1-18												test-retest:  Adequate stability over time: no significant difference between test and retest (P = 0.271)	-	Doubtf ul
RPS	2013) Canada (English) (Mahon et al., 2015)	5-10						FPS-R	49	Concurrent validity: r = 0.96 (first), 0.97 (second), 0.93 (third) clinic visit κ = 1.0 (first), 0.95 (second), 0.87 (third) clinic visit	+	Very good	49	Interrater agreement: Exact agreement between choices made by the participants on both scales: 92% (first), 91% (second), and 87% (third) clinic visit	+	Doubtf ul
SSPedi	Canada (English)	8-18.7	SSPedi scores of more and	502	Divergent validity: Significant Mean difference = 7.8 (95% CI=6.4 to 9.2)	+	Very good						502	test-retest: ICC = 0.88 (95% CI=0.82 to 0.92)	+	Adequ ate

	(Dupuis et al., 2018)		less symptomati									•				
			c FPS-R	502	Convergent validity: Significant Pain items r = 0.52 (95% CI = 0.46 to 0.59), P < .001	-	Very									
			OSBD-R (nurses)	45	Convergent validity: Significant r = 0.81, p<0.01	+	Very good									
			FLACC (nurses)	45	Convergent validity: Significant r = 0.78, p<0.01	+	Very									
			OSBD-R (parents)	45	Convergent validity: Significant r = 0.73, p<0.01	+	Very good									
	Lebanon (Arabic)	4-10	WBS (parents)	45	Convergent validity: Significant r = 0.79, p<0.01	+	Very good	DOLLS	45	<b>Concurrent validity:</b> r = 0.90, p<0.01	+	Very				
	(Badr Zahr et al., 2006)		systolic blood pressure	45	Convergent validity: Significant r = 0.59, 0.78, 0.91, p<0.001	+	Very good			r = 0.90, p<0.01		good				
			heart rate	45	Convergent validity: Significant r = 0.82, 0.71, 0.85, p<0.01	+	Very good									
WBS			oxygen saturation	45	Convergent validity: no correlation r = not reported, p = not reported	-	Very good									
WBS	United States (English) (Holdsworth et al., 1997)	n.r.	OSBD	336	Convergent validity: Significant rs >= 0.807	+	Very good									
	United States (English) (West et al.,	5-13											30	Interrater agreement: significant, value not reported	?	Doubtf ul
	United States (English) (Wiener et al., 2017)	7-21						Distress Thermomete r checklist item: Pain	289	Concurrent validity: Significant r = 0.25 and r = 0.28, p<0.001	-	Adequ ate				

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