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Commentary

Screening young children for their ability to use self-report pain scales

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Self-report has often been identified as the 'gold standard' for pain measurement (McGrath et al., 1995; McGrath et al., 1996) despite its limitations and complex interpretation (Williams et al., 2000; Hodgins, 2002; Craig & Badali, 2004). One of the limitations is associated with the use of self-report measures with young children, particularly those under 5 years of age. While it has been suggested that some children as young as 3 years old are capable of using self-report measures (Villarruel & Denyes, 1991), data are lacking on whether those children who can validly use pain scales can be identified beforehand.

The cognitive and social abilities necessary to self-report pain through measures such as faces scales and visual analog scales change rapidly as children progress from preschool to early school age. Children younger than 3 years are unable to quantify pain using self-report measures, while most children older than 5 years are able to rate their pain on suitable scales (McGrath, 1990; Shields et al., 2003; Spagrud et al., 2003).

If clinicians routinely ask all 3- or 4-year-old children for their pain ratings, some of these ratings will be invalid (e.g. because the child misunderstands the scale). The ensuing inaccurate pain assessment could lead to suboptimal pain management. On the other hand, if clinicians avoid asking any 4-year-olds for their pain ratings, valuable information will be missed from those children who are able accurately to report their pain intensity. Therefore, screening 3- to 5-year-old children for their ability to complete self-report tasks has the potential to provide a better estimate compared to chronological age (McGrath, 1990).

This review summarizes past methods of screening young children for their ability to use self-report pain scales, and discusses what may make a screening tool practical and efficient in clinical use.

Methods of screening

The purpose of screening is to distinguish between children who can validly and reliably use self-report scales and those who cannot. Numerous strategies have been employed to this end, as shown in Table 1.

Verbal comprehension. Children's verbal descriptions of pain have been proposed as a screening method (McGrath, 1990; St-Laurent-Gagnon et al., 1999). For example, before rating a common acute pain episode, St-Laurent-Gagnon et al. had children talk about the most hurt they had ever experienced and comment on pictures showing painful incidents. It was assumed that children who were unable to talk about pain did not understand the topic and therefore would not succeed in self-reporting pain. These children were excluded from

Table 1. Tasks used in past research to screen for children's ability to self-report pain

Task	Description	Key references
Comprehension	Talking about personally experienced pain as a means of revealing knowledge of the topic.	St-Laurent-Gagnon et al., 1999
Matching	Identifying the correct situation or face that corresponds with a specific point on a scale.	Fanurik et al., 1998
Vignettes	Using the chosen measure to score situations varying in pain intensity.	McGrath, 1990
Rating a known quantity	Using a scale to rate the magnitude of a target that has known physical properties (e.g. VAS ratings of the size of circles).	McGrath, 1990
Seriation	Putting objects in order (sorting on a dimension such as size or facial expression).	Beyer & Aradine, 1986
Classification	Categorizing along a dimension (e.g. size, shape, magnitude).	Fanurik et al., 1998
Counting	Counting by selected intervals (e.g. ones, tens).	Beyer, 1984
Symbols	Using representations to denote abstract concepts not present (linking the representation to the referent).	Denham, 1986*

* screened for preschoolers' ability to understand others' feelings and their cognitive perspective-taking abilities, not pain

the study. However, the reception and comprehension of a concept precede its expression (Stark, 1969). Therefore, many young children who lack the verbal skills and life experiences to describe their pain may nevertheless be able to complete a simple pain-rating task. Verbally discussing pain is not necessarily a required component in children's use of those self-report scales that require no verbal expressive response.

Rating a known quantity. To screen for children's ability to use the visual analog scale (VAS), McGrath (1990) asked children from preschool age through adolescence to use the VAS to rate the size of seven printed circles varying in diameter. The correlation between children's responses and the actual size of the circles was calculated to determine if children could correctly use the VAS. A correlation of $r = 0.7$ or greater was interpreted as indicating adequate skill in using the VAS. Success on the task improved with age – children under 6 years were generally unsuccessful, while most children over 6 years succeeded. The latter finding has since been replicated (Shields et al., 2003; Shields et al., 2005). However, having children rate the size of a concrete object may not indicate their ability to rate the more abstract concept of pain intensity.

Vignettes depicting hypothetical pain. Several studies ask children to use a self-report tool to rate the amount of pain depicted in hypothetical situations. McGrath (1990) had children use the VAS to rate five hypothetical pain situations from her Children's Pain Inventory. The situations depict a variety of combinations of pain intensity and pain affect (e.g. "How much does it hurt when you eat lunch?", "How much does it hurt when you have an operation in the hospital?"). Most children older

than 5 years were able to complete the task. The Charleston Pediatric Pain Pictures (CPPP; Belter et al., 1988) are line-drawings of a child engaged in medical, play, and home activities varying in pain intensity. Children are shown each picture and provided with a brief verbal description of the action taking place. Using a preselected scale, children are asked to rate how much pain they would feel if they were the child in the picture. Moderate to high internal consistency has been observed among children 3 to 6 years old when rating the CPPP with three different instruments (Belter et al., 1988). The CPPP provides a valid index of the pain intensity expected for common painful events in young school-aged children (Adesman & Walco, 1992). However, because preschool-aged children have difficulty taking perspectives other than their own (Siegler, 1991), rating the pain hypothetically experienced by a person in a story or picture may be too complex a screening tool for them.

Lander and Fowler-Kerry (1993) assessed children's comprehension of the VAS by having them use the measure to rate the pain intensity depicted in three pain faces. Most children older than 7 years were able to complete the task accurately. However, the use of this task with preschoolers has not been investigated.

Seriation. Several studies have used seriation, the process of organizing objects into an ordered series (e.g. increasing height), as a screening task (e.g. Beyer & Aradine, 1986; Villarruel & Denyes, 1991; Shih & von Baeyer, 1994; Fanurik et al., 1998). If children are unable to complete the seriation task, it is presumed that they cannot correctly use the self-report measure. Beyer and colleagues have employed a simplified seriation task, asking children to place six triangles in order by having them find the biggest shape, then the smallest shape, and then select the biggest shape among those remaining until no shapes remained. Beyer et al. recommend that only children who successfully completed this simplified seriation task should be asked to use the Oucher (a faces pain scale; Beyer, 1984; Beyer et al., 1992; Beyer et al., 2005; Yeh, 2005). In most of these studies, none of the children who failed the seriation task went on to use the Oucher, so the screening task could not be analyzed for its ability to identify children capable of providing self-reports of pain. However, in one study from Beyer's group, Villarruel and Denyes (1991) allowed all children to continue to the next phase of the study, regardless of their accuracy on the seriation task. The next phase was another seriation task that involved seriating the Oucher faces. Eighty-five percent of children correctly sequenced the six triangles. Correlations between child ranking and actual ranking on the order of the Oucher faces (i.e. the second seriation task) among these children ranged from r = 0.65 to 0.67. Correlations for the 15% of children who failed the initial seriation task ranged from r = 0.16 to 0.22. The discrepancy in accuracy of ranking the Oucher faces between those who passed and failed the initial seriation task suggests that the ability to seriate shapes by size can predict the ability to seriate faces by pain expression, but the data do not provide evidence that the faces scale was validly used to report actual pain intensity. Moreover, the results contrast with those of Shih and von Baeyer (1994) who found no association between preschoolers' accuracy in seriation of shades of gray and their accuracy in seriation of faces by expression on the Affective Faces Scale (McGrath et al., 1985).

Other screening tasks. To screen for 3- to 6-year-olds' accuracy in rating the CPPP with a faces scale, Stanford, Chambers, and Craig (2006) administered a number of screening tasks. Although classification, seriation, language, and cognitive tasks were employed, age was the only significant predictor of children's ability to use the scale to rate the vignettes, accounting for 34% of the variance in children's CPPP errors.

Current research (von Baeyer et al., 2005) is investigating several screening tasks that may be useful in distinguishing 3- to 5-year-olds who are capable of using self-report measures from those who are not. One such task involved choosing the middle-sized cup among three cups of differing sizes; success on this task was moderately correlated with accuracy in use of a simplified three-face pain scale to rate the amount of pain depicted in simple storybook pictures (r = 0.46) and

the CPPP (r = 0.45). Another screening task involved matching a face showing no, medium, or high pain to one of three pictures that varied in pain intensity; success on this task was also related to ability to rate pain depicted in simple storybook pictures (r = 0.53) and the CPPP (r = 0.52). However, none of the screening tasks had uniformly high predictive value across the age range of 3 to 5 years; work is continuing to identify a screening task that has applicability across this range.

Features of a useful screening tool

A task analysis of the language, cognitive, and social skills that normally develop between the ages of 3 and 7 offers a starting point in understanding the developmental requirements of self-report. The skills required for use of any self-report tool are analyzed in Table 2. These skills normally develop in the toddler to early school-age years.

The skills needed to provide a self-report should be screened for in a developmentally appropriate manner; that is, an ideal screening tool should employ clear and simple language, pictures, and response options. Perhaps as a way to simplify tasks that are overly complex, young children tend to respond to Likert, visual analog, and faces scales in a dichotomous manner. That is, they frequently choose the extremes rather than the central values (Goodenough et al., 1997; Hunter et al., 2000; Chambers & Johnston, 2002; Shields et al., 2003). Thus a screening task should reveal which children are likely to provide ratings in an incorrect dichotomous manner.

Screening tasks should be designed to provide a graded score rather than strictly pass/fail. For example, there is a developmental difference between a child who misplaces two out of six circles on a seriation task and a child who misplaces all six. Although the latter child fails to grasp the concept, the former child may understand the concept and be capable of using the self-report measure to some extent. The differing levels of cognitive development among young children should be detected and revealed by the screening task.

Time and simplicity are important practical concerns for health care providers. An effective screening tool should be simple and quick to administer, while keeping the child engaged in the activity. The cost and the amount of training required for health care providers should be kept at a minimum. The tool should also be appropriate for a clinical setting (e.g. materials that can be used in bed or on the bedside table and that can be sterilized or discarded) and for children in pain. Children's stress and anxiety can be high when they are in painful situations; therefore, the tool should not affect children negatively. For example, the screening tool should not contribute to children's anxiety or cause them to feel upset upon failure of the task. As previously mentioned, screening is an important step in pain management because valid and reliable pain ratings may increase pain management. Therefore, it is important to make screening as simple as possible for health care providers so as to not increase the burden of care. If a simple question or two can establish whether a particular young patient is able to make valid use of a self-report tool, then time will be saved and pain management improved.

In summary, an ideal screening tool to assess young children's ability to self-report pain should be sensitive to children's rapid development in the preschool years and their limited attainment of conceptual and language skills. It should be appropriate and acceptable for use in a clinical context. As an incidental benefit, the screening task may also provide some initial training for children on how to use the self-report measure. Furthermore, the screening tool should be cross-culturally validated and highly accepted in a variety of clinical situations. The weakest component in common self-report methods is the assumption that children will interpret the items and rate their pain the way the adult instrument designers intended (Woolley et al., 2004). It remains to be determined whether any such valid screening tool exists, or whether simple chronological age is the best predictor as suggested by Stanford et al. (2006).

Issues for research include: identifying the minimum cognitive skill set required for use of simple pain rating scales; selecting optimum materials (pictures, verbal instructions) for use at ages 3 through 5 years; and validating the resulting screening tasks against known outcomes. Once appropriate candidates for such screening techniques are identified, the latter task can be accomplished by

Table 2. Task analysis of the minimum skills required for use of any self-report tool

Domain	Skill	Example
Receptive language and symbolic processing		
	• Understand the words used by the adult who is giving the instructions	Look, point to, give, tell
	• Recognize a symbol as representing something else	Poker chips as pieces of pain
	• Imagine or remember a situation which is not real at present	Hypothetical child in CPPP; pain of needle given earlier
	• Understand the linguistic connection between the parts of instructions referring to (a) pain, and (b) selecting a symbol such as a face or poker chip, and (c) linking the two	(a) *Which face* (external object) (b) *shows* (symbolic operation) (c) *how much pain you have?* (internal state)
Matching		
	• Recognize one-to-one correspondence of two things	Match a picture of a face to a feeling
Seriation		
	• Place a series in order	Order a series of pictures of faces based on their serial nature (as opposed to matching)
Numeration		
	• Counting number of objects	Count out 1 to 4 poker chips
Estimation of quantities (quantification)		
	• Ordinal estimation	None, some, a lot
	• Graded estimation	None, little, medium, big
Interoception		
	• Perceive, identify, localize pain	Pain present or absent
Social skills, motivation, and trust		
	• Listen to an adult examiner while looking at materials	Looking at the pain scale while listening to instructions
	• Trust the examiner and be willing to listen and follow instructions	

administering the screening tasks along with pain measures to children who are experiencing clinical events that produce pain (such as medical procedures) or relieve pain (such as administration of analgesics). Responsiveness of pain measurement is indicated by expected decreases or increases in pain ratings associated with such known events. Associations between the screening task performance and the responsiveness of individual children's pain reports to these clinical events can then be interpreted as direct evidence of the validity of the screening measures.

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References

Adesman AR, Walco GA. Validation of the Charleston Pediatric Pain Pictures in school-age children. J Clin Child Psychol 1992;21:10-13.

Belter RW, McIntosh JA, Finch A, Saylor CF. Preschoolers' ability to differentiate levels of pain: relative efficacy of three self-report measures. J Clin Child Psychol 1988;17:329-335.

Beyer JE. The OUCHER: a user's manual and technical report. Evanston, IL: The Hospital Play Equipment Company, 1984.

Beyer JE, Aradine CR. Content validity of an instrument to measure young children's perceptions of the intensity of their pain. J Pediatr Nurs 1986;1:386-395.

Beyer JE, Denyes MJ, Villarruel AM. The creation, validation, and continuing development of the Oucher: a measure of pain intensity in children. J Pediatr Nurs 1992;7:335-346.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=1479552

Beyer JE, Turner SB, Jones L, Young L, Onikul R, Bohaty B. The alternate forms reliability of the Oucher pain scale. Pain Manag Nurs 2005;6:10-17.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=15917740

Chambers CT, Johnston C. Developmental differences in children's use of rating scales. J Pediatr Psychol 2002;27:27-36.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=11726677

Craig KD, Badali MA. Introduction to the special series on pain deception and malingering. Clin J Pain 2004;20:377-382.

Denham SA. Social cognition, prosocial behavior and emotion in preschoolers: contextual validation. Child Dev 1986;57:194-201.

Fanurik D, Koh JL, Harrison RD, Conrad TM, Tomerlin C. Pain assessment in children with cognitive impairment. an exploration of self-report skills. Clin Nurs Res 1998;7:103-119; discussion 120-124.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=9633335

Goodenough B, Addicoat L, Champion GD, McInerney M, Young B, Juniper K, Ziegler, ZB. Pain in 4- to 6-year-old children receiving intramuscular injections: a comparison of the Faces Pain Scale with other self-report and behavioral measures. Clin J Pain 1997;13:60-73.
http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pub

med&cmd=Retrieve&dopt=AbstractPlus&list_uids=9084953

Hodgins M. Interpreting the meaning of pain severity scores. Pain Res Manag 2002;7:192-198.

Hunter M, McDowell L, Hennessy R, Cassey J. An evaluation of the Faces Pain Scale with young children. J Pain Symptom Manage 2000;20:122-129. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=10989250

Lander J, Fowler-Kerry S. TENS for children's procedural pain. Pain 1993;52:209-216. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=8455969

McGrath PA. Pain in children: nature, assessment and treatment. New York: Guilford, 1990.

McGrath PA, de Veber LL, Hearne MT. Multidimensional pain assessment in children. In: Field HL, editor. Advances in pain research and therapy, Vol. 9. New York: Raven, 1985, pp. 387-393.

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. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=8783307

McGrath PJ, Unruh AM, Finley GA. Pain measurement in children. Pain: clinical updates 1995;III(2):1-6. http://www.iasp-pain.org/AM/TemplateRedirect.cfm?template=/CM/ContentDisplay.cfm&ContentID=2549

Shields BJ, Cohen DM, Harbeck-Weber C, Powers JD, Smith GA. Pediatric pain measurement using a visual analogue scale: a comparison of two teaching methods. Clin Pediatr (Phila) 2003;42:227-234. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=12739921

Shields BJ, Palermo TM, Powers JD, Fernandez SA, Smith GA. The role of developmental and contextual factors in predicting children's use of a visual analogue scale. Child Health Care 2005;34:273-287. http://www.leaonline.com/doi/abs/10.1207/s15326888chc3404_3

Shih AR, von Baeyer CL. Preschool children's seriation of pain faces and happy faces in the Affective Facial Scale. Psychol Rep 1994;74:659-665. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=8197303

Siegler RS. Children's thinking (2nd ed.). Upper Saddle River, NJ: Prentice-Hall, 1991.

Spagrud LJ, Piira T, von Baeyer CL. Children's self-report of pain intensity. Am J Nurs 2003;103:62-64.

Stanford EA, Chambers CT, Craig KD. The role of developmental factors in predicting young children's use of a self-report scale for pain. Pain 2006;120:16-23. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=16359800

Stark J. Early language development and use. J Commun Disord 1969;2:48-56.

St-Laurent-Gagnon T, Bernard-Bonnin AC, Villeneuve E. Pain evaluation in preschool children and by their parents. Acta Paediatr 1999;88:422-427. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=10342542

Villarruel AM, Denyes MJ. Pain assessment in children: theoretical and empirical validity. ANS Adv Nurs Sci 1991;14:32-41. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=1759808

von Baeyer C, Forsyth S, Chambers CT. Evaluation of a brief screening tool to assess young children's ability to provide reports of pain intensity. Poster presented at 11th World Congress on Pain, Sydney, Australia. International Association for the Study of Pain, 2005.

Williams ACdC, Davies HT, Chadury Y. Simple pain rating scales hide complex idiosyncratic meanings. Pain 2000;85:457-463. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=10781919

Woolley ME, Bowen GL, Bowen NK. Cognitive pretesting and the developmental validity of child self-report instruments: theory and applications. Res Soc Work Pract 2004;14:191-200.

Yeh CH. Development and validation of the Asian version of the Oucher: a pain intensity scale for children. J Pain 2005;6:526-534. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=pubmed&cmd=Retrieve&dopt=AbstractPlus&list_uids=16084467