

**THE OUCHER: User's Manual and
Technical Report**

THE OUCHER

**User's Manual
and
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by**

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What is the Oucher?

The Oucher is a poster-like instrument designed to help children provide self-reports of the intensity of their pain. The Oucher consists of two scales: a 0-100 numerical scale for older children and a six-picture photographic scale for younger children. There are currently five versions of the Oucher: (1) White or Caucasian, (2) Black or African-American, (3) Hispanic, (4) First Nations (boy and girl), and Asian (boy and girl). Each version has been tested primarily with children in the ethnic group depicted in the photographs. All have been tested scientifically for content and construct validity, except for the First Nations Oucher which has been tested only for content validity. It is recommended that the children/parents should select the version of the Oucher they would like to use.

Who can use the Oucher?

The Oucher can be used by a variety of people who are interested in obtaining more information about children's experiences of pain. Parents can use it in the home. Nurses and counselors can use it at camp. Nurses and teachers can use the Oucher in schools. Physicians, dentists, nurses, psychologists and child life workers can use it in the office, clinic, or hospital.

When can the Oucher be used?

The Oucher can be used to assess pain intensity any time the child is awake and fully conscious. The child's dominant hand (arm) should not be restrained, if possible, during the use of the Oucher to allow him or her to point to a number or picture. If restraints are necessary, or if a child has an endotracheal tube, adults can question the amount of pain by pointing to pictures or numbers, and the children can answer by responding verbally, or by nodding their heads or closing their eyes.

The Oucher provides useful information about the pain associated with nursing, dental, and medical treatments and procedures as well as pain associated with injury and disease. It can also be used to assess the effectiveness of various pain relief measures.

The Oucher can be used with children ages 3-12 years. Although it has not been tested with children who have special needs, it seems reasonable to suggest that it can be used with any child who functions at a cognitive level between 3-12 years who can understand its use. Parents can help determine whether their child might be able to use the scale in a meaningful way.

Should the numerical or photographic scale be used?

The two scales on the Oucher are meant to be separate. A child should use either the numerical or the photographic scale. A series of cognitive tasks have been recommended to determine which scale each individual child should use. Children can use the numerical scale if:

1. They can count to 100 by ones or tens, and,
2. They can identify which of any two numbers is larger.

Children should use the photographic scale of the Oucher if:

1. They are unable to count to 100 by ones or tens, or,
2. They are unable to identify which of the two numbers is larger.
3. They indicate a preference for using the photographic scale.

In situations in which the school-aged child or adolescent shows a preference for using the photographic scale, he/she should be allowed to do so, as some children may prefer to use the more concrete scale.

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What is the seriation task used for?

The seriation task is recommended for use to determine if children are cognitively mature enough to rate their pain on the Oucher. Some 3-year olds or children with histories of developmental delays should be asked to complete a simple Piagetian seriation task by having them order same color forms of varying size, such as triangles, circles, or squares, from smallest to largest. This procedure was used as predictor of children's cognitive abilities to make meaningful judgments about the serial intensity of pain in photographs which comprise the African-American and Hispanic Ouchers (Villarruel and Denyes, 1991). The following procedure is, therefore, recommended when using any of the Ouchers in clinical practice:

1. Place six same-color but different size triangles, squares, or circles in random, circular format, on the floor or on a table in front of the children.
2. Ask them to select the "biggest" figure of the group and then you can place it at the top of the table.
3. Ask them to select the "smallest" figure of the group and then you can place it at the bottom of the table.
4. Ask them to select from the group of the remaining figures the one which is now the "biggest" and place it under the first figure selection.
5. Repeat step 4 until all figures are selected and you have them placed in a line in the order chosen by the child.

Successful completion of this task consists of the correct sequencing of figures from the largest to the smallest. If the child is not able to successfully complete this seriation task, that is, if the items are not in order by size, then he or she will be unable to use the Oucher. Again, parental input about the ability of their child to use the Oucher in a meaningful way should be considered.

How should the Oucher be introduced?

The Oucher should be introduced at an appropriate time and in an appropriate manner. If the child is not expected to have pain, the Oucher should not be introduced at all. If the child is expected to have pain, it is preferable to introduce the Oucher prior to the pain experience whenever possible. For a painful medical, dental, or nursing procedure, the child should be introduced to the Oucher while preparing him or her for the procedure. For surgery, the child can be introduced to the Oucher during or after the preoperative teaching session. The Oucher should not be shown or explained until the child has been alerted verbally to the possibility that he/she may experience hurt.

Children who already have pain will probably understand why people want to know how much hurt they have. However, the Oucher could frighten a child who does not have pain. Unless they are introduced in an appropriate manner, children could possibly think they would definitely have pain. To avoid misconceptions about the Oucher, children should first have some general information about what they will experience, including the possibility of pain. Health providers might say, "Sometimes when children have this operation (test) they have some hurt afterwards. Some children do and some children do not. When they do have hurts, some children have little ones and some have middle ones, and others have big hurts. We will want to know if you have any hurts, and if you do, how much hurt so that we can take better care of you." Researchers might say, "I know that your nurse (doctor, parent) has told you some things about your operation (test). I know she/he also told you that you might feel some hurt afterwards. Some children do and some children do not. I want to find out if you do have hurt after your operation (test) and if you do, just how much." Researchers (who are not part of the health team) should not introduce the Oucher to a child who has not been previously informed about the possibility of pain.

The following provides an example of how much to explain the Oucher to a younger child.

"Johnny, this is my poster called the Oucher. It helps children to tell me about their hurt. Do you know what I mean by 'hurt'?" [The child explains, "Okay, yes, this is a hurt."] The adult then explains the Oucher, "this picture (point to

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bottom picture) shows 'no hurt,' no hurt at all. This picture shows just a little bit of hurt (point to the second picture). This picture shows a little bit more hurt (point to the third picture). This picture shows even more hurt (point to the fourth picture). This picture shows pretty much [or a lot of] hurt (point to the fifth picture), and this picture shows the biggest hurt you could ever have" (point to the sixth picture).

When using the Oucher with an older child, the words can be modified, although it is still best to use the word "hurt" rather than "pain" (Eland & Anderson, 1977). They can be told that the pictures "are for the children who like to use pictures to tell us about their hurt." Once again, you would explain that the "0" means no hurt. "If your hurt is somewhere in here (point to the lower third of the scale between 0 and 3), it means you have a little hurts. If your hurt is somewhere in here (point to the middle third of the scale between 3 and 6), it means you have middle hurts. If your hurt is somewhere in here (point to the upper third of the scale between 7 and 9), it means you have big hurts. But if you point to 10, it means you have the biggest hurt you could ever have." The Ouchers with 0-100 scales can still be used: 0-29=little hurts, 30-69 =middle hurts, 70-99=big hurts, 100=the biggest hurt you could ever have.

How do you use the Oucher?

Practice using the Oucher

After introducing the Oucher to children, it is helpful to have them practice using it.

"Can you remember ever having a hurt?" Or, "Can you remember times when you have hurt yourself? [The child explains.] When you (fell off the swing, fell out of the tree, stubbed your toe, had an injection), how much hurt did you have?" Repeat your explanations about the meaning of the pictures or numbers of the Oucher. ("This is no hurt, this is just a little hurt, etc.). It is useful to try this several times to determine if the child seems to understand how to use the Oucher and if the scores seem to vary appropriately.

Obtain the pain score

Data can be obtained by saying the following:

"Johnny, do you remember the Oucher? Well, this is 'no hurt'..." (Point to each picture or sets of numbers and explain what each one means again). The question to ask to obtain a score for present pain intensity is: "How much hurt do you have right now?"

If children use the numerical 0 - 10 scale, the number named by the child represents his or her pain score.

If the children use the photographic scale, their selections should be converted to scores of even numbers from 0-10: the bottom picture = 0, the second picture = 2, the third picture = 4, the fourth picture = 6, the fifth picture = 8, and the sixth picture = 10. This scoring system is equivalent to a 0-5 scale.

The numerical score can be treated as interval-like data, but the photographic score should be treated as ordinal data. Again, the two scales are separate, and each child will provide a score for only one of them. For research purposes, the two scales may be analyzed separately, using parametric statistics for the numerical scale and non-parametric statistics for the photographic scale. However, the new scoring system allows researchers to put all scores on a 0-10 metric, which permits researchers to analyze all subjects as one group if they desire to maximize sample size.

Record the pain score

Accurate and systematic documentation of patient pain and pain relief improves the pain assessment/management process and the continuity of care. In addition, pain measures serve as critical variables for retrospective research studies. Documentation of the amount of pain should include a number score as well as a description of the scale

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used. In the case of the Oucher, scores from 0-10 would be recorded when using the numerical (left side) scale of the Oucher while only even number scores from 0-10 would be recorded when using the photographic (right side) scale. Documentation should not only include the child's report of the amount of pain experienced but also the pain relief methods used. Assessment and documentation of pain should occur every one to two hours. When attempting to reduce the pain intensity, as with medications, assessments and documentation may need to more frequent. In some hospitals, this information is recorded on flow sheets, while in other hospitals, scores are recorded on progress notes.

How should the pain scores be evaluated?

As mentioned above, self-reports are only part of patient assessment. Similarly, Oucher scores are only part of the assessment process and serve as an aid in drawing inferences about the intensity of children's pain. Health care providers need to examine other data about pain as well, such as parental impressions and children's behavioral, physiologic, and verbal/vocal responses, and medical-surgical circumstances. Additional information often examined with pain intensity is anxiety, fear, coping, distress and verbal/vocal and motor behaviors.

It is most useful to obtain Oucher scores often. Just like vital signs, Oucher assessments need to be repeated, as a single measurement may not be helpful. By obtaining Oucher scores at multiple points in time, trends and fluctuations can be readily observed. For example, we would expect pain intensity to be higher on the first than on the fifth postoperative day. We would not expect pain to occur after a local anesthetic is administered. We would also expect to see that pain would subside after analgesic administration. When Oucher scores do not reflect these expected trends, we need to take a closer look at the child and the pain relief measures utilized.

How should the Oucher NOT be used?

Children use the Oucher to communicate the intensity of their pain to adults. Therefore, adults should not suggest to children how much pain they "should" be feeling. Also, adults should not communicate verbal or nonverbal judgments to children about the Oucher scores they provide. Children easily pick up cues about what the adults want them to say or do, and then they generally try to comply. The result would be that their scores would reflect adult expectations rather than children's real experiences.

The Oucher has been tested as a self-report tool for children. It has not been tested as a tool to be used by adults. Further, the photographs should not be used by adults to compare the facial expressions of actual children and then be scored by the adults for pain. This would represent incorrect use of the Oucher.

The Oucher should not be used as the only way to assess pain in children. As with all human expressions, inaccuracies can and will occur. Some children may overestimate while others underestimate their pain intensity scores. Furthermore, other factors enter into estimations of pain intensity. As well as being a noxious sensory experience, pain has many socio-cultural, emotional, and psychological components. Fear, anxiety, separation, anger, and cultural background may well play a part in the amount of hurt the child feels and the type of reaction shown. In addition, other physiological states may influence the child's perception of pain intensity such as nausea, fatigue, bladder and bowel distention, and fever. It may not be possible to separate the influence of these factors from the physical sensation of pain. Thus, it is best to obtain data about pain from a variety of sources if possible.

Finally, Oucher scores themselves cannot be considered exact representations of the intensity of children's pain. There is currently no way to obtain exact ratings of pain intensity. The Oucher provides a way to obtain more precise information from children themselves without requiring detailed verbal statements from them. These ratings provide children's approximations of the amount of their hurt.

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What are the advantages of using the Oucher?

There are a variety of advantages to using the Oucher. For children, the Oucher provides an easy-to-use device for the estimation of the intensity of their pain. It helps them to communicate their experiences to adults more effectively. The Oucher is the only color photographic pain tool for children with a version for children of several different cultures. Although there are a variety of “faces scales,” they are all simple line drawings.

For health care professionals, the Oucher provides additional information about the child's experience which aids in both the assessment and management of pain. The Oucher eliminates the need to have children accurately verbalize the amount of their pain, and, therefore, eliminates the need for health care providers to try to interpret the meaning of their words. “It hurts like the blazes,” “it hurts a lot,” “it hurts some,” or “it’s awful” are all difficult to interpret. The Oucher also provides a consistent way of determining pain intensity in children when professional caregivers change. In addition, the Oucher can be used for most children between ages of 3 and 12; thus, this one instrument can be used across several developmental levels.

The Oucher should be used with body outlines, which allow children to indicate the location of their pain (Eland & Anderson, 1977; Savedra & Tesler, 1989). It should also be used with observations of verbal/vocal, behavioral, and physiological data and parental impressions. Pain management can become more systematic, comprehensive, and accurate when pain assessment incorporates all possible data sources. Even though pain intensity may not change over time, the location or body surface area of pain may change dramatically.

Background Research

The assessment of children’s pain is a major challenge for health care professionals. Pain is essentially a complex, subjective experience that defies direct measurement. Unlike the measurement of blood pressure or intracranial pressure, researchers have not yet discovered a way to determine levels of pain intensity with advanced technology. Traditionally, health care professionals have tried to estimate the intensity of the pain experience after observing patient responses to it (verbal/vocal, behavioral and physiologic data) and, after considering the child’s characteristics, background, and medical-surgical circumstances.

Assessment becomes more complicated when one considers the complexity of the phenomenon of pain. Wide acceptance is given to the fact that people have different pain thresholds and that they interpret and respond to pain differently. However, some children may think that they must be “big girls” and “big boys” and they may hide their feelings about and responses to pain (Schultz, 1971). Many young children perceive pain as punishment, and they may not be able to verbalize their experiences. Some children who have never experienced pain may not be able to know how to respond to it or how to describe it. Furthermore, some of the classic research on pain indicates the people ascribe different meanings to the experience and respond behaviorally to pain differently, according to their cultural backgrounds (Zborowski, 1952). Thus, the observation of behaviors may not be sufficient alone for accurate pain assessment.

There is no combination of physiological signs which would “diagnose” the presence or intensity of pain. Although health care providers need to observe patients for changes in pulse, blood pressure, and respiration, the presence or absence of these changes neither indicates nor rules out pain. Thus patients may be in pain without manifesting signs of autonomic arousal; similarly they may not be in pain and yet still manifest signs of autonomic arousal.

Before the Oucher was created, several instruments were developed to help adults explain the intensity of their pain. Commonly used examples of these include a visual analog scale (Huskisson, 1983) and the McGill Pain Questionnaire (Melzack, 1975). In adults, self-reports were considered the most “reliable indicators” of their pain

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(Hilgard, 1969; Jacox, 1979, Lasagna, 1960). Thus, the adult patient's own estimation of his/her pain provides more valid evidence of its nature and intensity than behavioral or physiologic signs and symptoms.

Several researchers had already developed instruments to obtain children's self-reports of pain intensity before the creation of the Oucher. A visual analog scale was used with 9-12 year olds (Abu-Saad & Holzemer, 1981). Eland (1974) had hospitalized children identify with cartoon pictures of dogs in various painful circumstances as a means of assessing the intensity of their pain. Eland (1981) also had children rank-order patches of color according to pain intensity prior to their pain experiences. She then had them select the color of their hurt after an injection. Hester (1979) developed the Poker-Chip Tool to examine children's assessments of the intensity of pain from injections. Subjects chose from zero (no hurt) to four white plastic chips (the most hurt) to represent the intensity of their pain. Later, red chips were substituted. Alyea (1978) used a "Four Face Tool" consisting of simple drawings of faces showing increases in pain expression. Molsberry (1979) used a "Hurt Thermometer" to measure pain intensity after minor surgery. It consisted of a cardboard thermometer and a piece of red elastic which children could manipulate to show the intensity of their pain from 0-4 "degrees." Although all of these devices showed promise, none had been thoroughly tested or widely used prior to the development of the Oucher.

During the process of developing the Oucher, a number of other self-reports of pain intensity for children were also developed, including faces scales (LeBaron & Zeltzer, 1984; McGrath, deVeber, & Hearn, 1985; Maunuksela, Olkkola, & Korpela, 1987, Wong & Baker, 1995), a ladder scale (Jeans, Hays, & O'Brien, 1988), a graphic rating scale (Savedra & Tesler, 1989), and a linear analogue scales with facial drawings (Broadman, Rice, & Hannallah, 1988; Varni, Thompson & Hanson, 1987).

Currently the Oucher consist of white posters, sheets, or cards with six photographs on the right side and a 0-10 scale on the left side. The photographs on the right side show one child - either Caucasian, African-American, Hispanic, or First Nation, or Asian-with the pictures arranged to show increasing levels of discomfort. Special procedures are used to determine whether the numerical or photographic scale should be used (see this [User's Manual](#), page 1 and Beyer, Denyes & Villarruel, 1992). An article in [MCN, The American Journal of Maternal/Child Nursing](#), marked the first publication of the first three versions of the Oucher in color (Knott, Beyer, Villarruel, Denyes, Erickson, & Willard, 1994).

Methodological Studies - Caucasian version

Preliminary Studies

The original (Caucasian) Oucher included a clear, hollow plastic cylinder with a removable plastic "slider" at the bottom. Children would drop from 0-100 red poker chips into the cylinder until it reached the level of pain they felt. The slider was then removed, the chips dropped out the bottom of the cylinder and they were counted for the pain score. The poker chips and the plastic cylinder, however, proved to be unwieldy, particularly when the child was young or when mobility was limited by surgery or medical equipment. To maximize the effective use of the Oucher, the poker chips and plastic cylinder were eliminated during the preliminary testing phase.

Preliminary studies were undertaken in order to test the usefulness and validity of the original Oucher. First, seventeen children between two and eight years used both the photographic scale and the poker chip cylinder to describe the intensity of pain from past painful experiences. Face validity seemed apparent since children were generally able to distinguish different intensities of pain. Those with more serious injuries and accidents provided higher Oucher scores; those with minor injuries and accidents provided lower pain scores. Children's scores on the photographic scale and poker chip cylinder were found to be significantly correlated for all subjects ($r = .823$, $p=.001$), and for all children except the 2, 3, and 4 year olds ($r = .804$, $p=.003$). Thus, correlations were not increased by the exclusion of the younger children.

Second, 8 children (ages 4.8 to 15.9) undergoing various surgical procedures reported pain each day postoperatively. The greatest amount of discomfort was reported on the first and second postoperative days (mean scores were 45 on both days). Pain decreased greatly by the third and fourth postoperative days (means were 16 and 28 respectively). By

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the fifth postoperative day, only one of four children still hospitalized reported any pain (score = 7). In addition, four children having spinal fusions and repairs of pectus excavatum reported much greater amounts of pain on the first postoperative day (mean = 63) than the children having minor surgery. Four children having tonsillectomies, hernia repairs, or rectal surgery showed a mean score of 5 on the first postoperative day. Thus, these data provide initial evidence of construct validity of the Oucher as one can expect more pain with major surgery.

Third, Hawley (1984) conducted a study examining both Oucher scores as well as scores for Hester's Poker Chip Tool (1979) for thirteen children aged 3-10 after plastic/reconstructive procedures or general surgery. Correlations between the two instruments was .92 ($p = .001$) for the first postoperative day and .87 ($p = .001$) for the second postoperative day. These data provided preliminary evidence of convergent validity.

Content Validity

Content validity of the original (Caucasian) Oucher was examined by Beyer and Aradine in 1986. After parental permission was obtained by mail, seventy-eight 3-7 year old Caucasian children (26 from each of three site groups: a hospital, a day care center, and presurgical orientation groups) were asked to sequence the six separate photographs of the Oucher. In order to do this, they were first asked to choose the picture that showed "no hurt." Then they were asked to choose the picture that showed the "biggest hurt you could ever have." Finally they chose the picture that showed the biggest hurt among the remaining photographs until all pictures had been chosen.

Findings revealed strong agreement within the sample of 78 children in the manner in which they sequenced the six photographs (Kendall's Coefficient of Concordance = .726, $p < .01$). Site, gender, and age subgroup coefficients varied between .526 and .986 ($p < .01$), with the lowest agreement among 3-year olds and the greatest agreement demonstrated among 7-year olds. The mean ranks for each photograph (generated from the Kendall's Coefficient of Concordance) for the entire sample and for the subgroup samples showed orderly increases in rank from the first through the sixth photographs.

Further evidence of consistency and understanding of the sequencing task was demonstrated by comparing the number of photographs placed in the same sequence as on the Oucher. Forty-one percent ($n = 32$) of the sample placed all six photographs in the Oucher sequence; thirty-six percent ($n = 28$) placed five photographs in the Oucher sequence; seventeen percent ($n = 13$) placed four in the Oucher sequence, and six percent ($n = 5$) placed three or fewer photographs in the Oucher sequence. In other words, 77% of the sample had either one or no photographs out of sequence with the original Oucher.

A separate study by Wischow-Jones (1992) provides additional evidence of the content validity of the Caucasian version of the Oucher. Using a qualitative approach in which children told stories about the Oucher photographs, children spontaneously provided evidence that they primarily saw pain, discomfort, and hurt in the photographs comprising the Oucher.

Construct Validity

An additional 112 three to twelve year-old, Caucasian, English-speaking subjects without histories of cognitive or developmental delays were involved in further methodological studies to test the construct validity of the Oucher (Aradine, Beyer, & Tompkins, 1987; Beyer & Aradine, 1987, 1988), using several subsamples. Hospitalized subjects were admitted for a variety of medical and surgical conditions. The study involved collecting pain intensity data from children after injury and before and after surgery, procedures, and analgesic administration. Three different pain intensity instruments were used: the Oucher, Hester's Poker Chip Tool (Hester, 1979), and a visual analogue scale. Fear was also examined concurrently with pain on a single occasion, using Melamed and Siegel's Hospital Fears Rating Scale (1975) and a single-item Scare Scale. Children were entered into the study consecutively, providing consent was given by a parent and assent was given by the child.

A subsample of seventy-four 3-12 year-old children provided complete data sets for the concurrent 5-instrument study of pain and fear. Of those, 19 (26%) subjects used the photographic scale and 54 (74%) used the numerical

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scale of the Oucher. Data were analyzed separately for each group. Gamma coefficients showed that scores on the three pain intensity instruments were strongly correlated (.695-.978). This supports the convergent validity of the Oucher. Gamma coefficients were also used to analyze the relationships among the scores on the Oucher and the two fear measures. Results showed little to no relationship between pain and fear. The correlations were as follows: photographic Oucher with Hospital Fears Rating Scale = .346; photographic Oucher with Scare Scale = .070; numerical Oucher with Hospital Fears Rating Scale = .003; numerical Oucher with the Scare Scale = .067. This lack of correlation supports the discriminant validity of the Oucher.

Out of 102 children providing presurgical or preprocedural pain scores, 90% indicated a score of zero. Of the ten children reporting pain at this time, all but one (a three year-old) had a diagnosed pre-existing painful condition or some observable cause for pain. Children having more extensive surgeries reported higher postoperative pain scores than children having less extensive surgeries. In a subsample of 18 children having major surgery, reported pain intensity demonstrated expected patterns over a 5-day postoperative observation period. That is, the means were close to 0 before surgery, were highest on the postoperative day and then gradually decreased over the 5-day observation period, almost returning to baseline. These data support the construct validity of the Oucher.

Finally, in a subsample of 25 children who were observed before and after analgesic administration, reported pain intensity again conformed to expected patterns. That is, pain scores were high immediately before analgesic administration and decreased after medication. Observations at 2, 3, and 4 hours after medication administration demonstrated expected patterns of increasing pain intensity as effects of the medication decreased. This finding supports the construct validity of the Oucher.

Reliability

Examining the reliability of the Oucher by using actual pain scores of children is problematic because the scale is not a traditional psychometric test. The methods used to statistically assess reliability are not appropriate for the Oucher (Beyer & Knapp, 1986). The Oucher is a single-item scale; therefore, measures of internal consistency cannot be used. The Oucher also measures a continuously varying phenomenon - pain. Therefore, measures of stability, such as test-retest procedures, cannot be used.

Belter, McIntosh, Finch, and Saylor (1988) found an indirect means of assessing the reliability of the Caucasian Oucher. Seventeen cartoon pictures depicting scenes in medical, play, and home situations were presented to fifty 3-6 year old children. They were asked to rate the intensity of pain shown in the pictures with the Oucher and two other pediatric pain intensity measures. The correlation coefficients for four separate subsets of cartoons (including pictures of no pain, low pain, moderate pain, and high pain) ranged between .539 and .722 ($p < .001$). Thus, moderate levels of test-retest reliability were obtained from these procedures. Assessing the reliability of single-item scales of varying phenomenon like pain will continue to be problematic.

Jordan-Marsh, Yoder, Hall, and Watson (1994) examined the alternate forms reliability of the Caucasian version of the Oucher. This procedure was requested by Beyer since the investigators wanted permission to reduce the size of the Oucher for research at their facility. In this study, 58 older children (mean age = 9.4 years) used the numerical scale and 21 younger children (mean age = 5 years, range = 3.1 years to 10 years) used the photographic Oucher. The small and large Ouchers were presented to subjects in random order. The second Oucher was presented to the child immediately after he or she provided a score for pain on the first Oucher. Findings indicated that the match between the scores on the small and large Ouchers for the older children was 82%. For the 21 younger children, the match between the scores on the two sizes of Ouchers was 80%. Most of these scores ($n = 13$) were 0, thus indicating that most of the younger children were not in pain when pain was measured. This study shows initial alternate forms reliability for the reduced version; it was at 80% or above and thus considered adequate for the purposes of the Jordan-Marsh et al. study. However, it would be important and necessary to repeat this study with a larger group of younger children who experienced various levels of pain. The smaller versions used by this group of investigators were color copies of the original Oucher, with varying qualities of color and clarity.

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Huth (2002), as a part of an experimental study on the effects of imagery on pain intensity after removal of tonsils and adenoids on 73 7-12 year old children, examined test-retest reliability of the Oucher. Oucher scores were obtained twice between 1 and 4 hours after surgery and between 22-27 hours after surgery. Only 10-20 minutes separated the test and the retest. Test-retest reliability ($n=69$) $r = .96$, $p = .01$ for the first measure and $r = .99$, $p = .01$ for the retest. Of the 73 children in the study, 63 were Caucasian, 5 were Hispanic, and 5 were African American. Each subject used the ethnic-appropriate version of the Oucher. More extensive studies would be needed to separate out the reliabilities of the three different ethnic versions of the Oucher.

Additional information about alternate forms reliability of the Caucasian, African-American, and Hispanic versions of the Oucher will be provided in the next section.

Methodological Studies on the African-American and Hispanic versions

Preliminary Studies

Prior to beginning the research on content validity of the photographs of the African-American and Hispanic versions of the Oucher, a simple Piagetian seriation task, consisting of the ordering of six equal-sided triangles of varying sizes from smallest to largest, was identified as a skill suggestive of children's abilities to use the Oucher (Villarruel & Denyes, 1991). The a priori assumption made was that if children could not distinguish between larger and smaller triangles, they would have difficulty making more abstract judgments about more and less pain intensity as depicted in photographs of children's faces. The Piagetian seriation tasks provide information about the cognitive maturity of the child.

In a study in which the content validity of all three versions of the Oucher (Denyes & Villarruel, unpublished data; Villarruel & Denyes, 1991) was examined, levels of agreement on the order of photographs for each new version of the Oucher were lower among children who did not correctly sequence the triangles (Kendall's coefficient = .16 - .32, $p < .001$) than for children who successfully completed the seriation task (Kendall's coefficient = .60 - .68). Based on these studies, it was hypothesized that the child's ability with the seriation task could be a useful indicator of his/her ability to use the Oucher in a meaningful way in clinical settings.

Content Validity

In order to ensure cultural relevance of the photographs used in the African-American and Hispanic versions of the Oucher, parents and children in each ethnic group were included in the research designed to examine the content validity of the next two versions of the Oucher (Marshall, 1998; Villarruel & Denyes, 1991). Parents and nurses in each ethnic group selected same-ethnicity photographs to determine which depicted "pain" and "no pain" expressions. Levels of agreement among judges resulted in the selection of two sets of 18 different photographs of the African-American and Hispanic child-models. Twenty-five each of African-American and Hispanic 3 - 7 year- old subjects completed a Piagetian seriation task (see above) to determine that they were cognitively able to seriate the photographs of the Oucher. They were then instructed to place three of the 18 photographs of the child in their own ethnic group into a pile to represent faces showing "no hurt" and three photographs to represent faces showing the "biggest hurt of all." From the 12 remaining photographs, the subjects selected three pictures showing "the most hurt of all" until all 18 pictures had been sorted into six piles of three each. The final selection of six photographs for each new ethnic scale of the Oucher was made by identifying the photograph chosen by the highest frequency of subjects in each of the six scale positions. After these photographs were identified, new groups of Hispanic ($n = 112$) and African-American ($n = 143$) children were asked to sequence the six photographs, using instructions similar to those developed in previous content validity studies (Beyer & Aradine, 1986). Findings showed significant agreement within samples of African-American and Hispanic children in the manner in which the photographs were ordered. (Kendall's coefficient of concordance was: 0.65 for Hispanic subjects, $p < .0001$ and 0.67 for African-American subjects, $p < .0001$).

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Content validity of all three versions of the Oucher was further examined in a study in which each photograph of each scale was analyzed for affective facial actions, using the Maximally Discriminative Facial Coding System (MAX) of Izard (1973) and the Facial Action Coding System (FACS) of Ekman and Freisen (1978). After examining each photograph for anatomical muscle actions and affect, it was found that pain was identified in most facial photographs on the respective Ouchers. Others emotions, such as sadness and fear, which are consistent with emotions usually accompanying pain, also were found. These results provide additional support for the content validity for the first three versions of the Oucher (Neuman, Denyes, Stettner, & Villarruel, 1990).

Construct Validity

Construct validity of the African-American and Hispanic versions of the Oucher was examined by Beyer and Knott (1995). One hundred four 3-12 year-old children participated in this study, and quota sampling was used to obtain subjects with particular characteristics. Twenty-six subjects fell into each of the following groups: African-American children using the photographic scale, African-American children using the numerical scale, Hispanic children using the photographic scale, and Hispanic children using the numerical scale.

Data were obtained from children who were scheduled for day surgery at one of two hospitals. They were randomly assigned to one of two groups: data would be collected before surgery or data would be collected after surgery. Scores were obtained at these times from four instruments administered in random order. A pain score was obtained from the appropriate scale and version of the Oucher. Pain scores were also obtained from the Analogue Chromatic Continuous Scale (ACCS) (Grossi, Borghi, Cerchiari, Della Puppa & Francucci, 1983; Grossi, Borghi, & Montanari, 1985), and the McNeil Color Visual Analogue Scale. The latter scale was produced by the McNeil Company, and no research identifying its psychometric properties had been found prior to this investigation. Two pain scores were used so as to examine the convergent validity of the African-American and Hispanic versions of the Oucher. In addition, the Child Medical Fear Scale (Broome, 1986; Broome & Hellier, 1987; Broome, Hellier, Wilson, Dale & Glanville, 1988) was also used to examine the discriminant validity of the Oucher.

Findings revealed strong positive relationships among the three pain measures: the Oucher, ACCS, and McNeil scale. The Spearman rho for these correlations ranged between .92 to .96 for African-American and Hispanic children using the photographic scales of the Oucher. Similarly, the Pearson r for these correlations ranged between .88 and .97 for African-American and Hispanic children using the numerical scales of the Oucher. These findings strongly support the convergent validity of both scales of both these versions of the Oucher.

Data also revealed weak to nonexistent relationships between the Oucher pain scores and the Child Medical Fears Scale. Spearman rho for African-Americans subjects using the photographic scale was .26 ($p > .05$). Similarly, the Pearson r for African-American subjects using the numerical scale was .21 ($p > .05$). This provided solid evidence of the discriminant validity of the African-American version of the Oucher, both numerical and photographic scales.

Statistics also showed that pain scores were higher before than after analgesic administration, thus supporting further the construct validity of two new versions of the Oucher. Only a few subjects received pain medication because pain management practices in the operating room and recovery room were quite effective. Out of the 104 subjects, only 11 Hispanic subjects using the numerical Oucher received analgesics. The difference between pre- and post- analgesic scores was significant: $t = -5.51$, $p = .000$. Because so few children using the photographic scales received analgesics, significant differences were not obtained when the Wilcoxin Signed Rank tests were performed separately. Only four African-American children received analgesics and only seven Hispanic children received analgesics of the group of young children using the photographic scales. Apparently, power was not adequate with a separate analysis. When the two groups were collapsed into one, the difference between pre- and post-analgesics scores was significant: $t = -2.37$, $p = .02$.

An unexpected finding was that discriminant validity was evident although "borderline" for children using the photographic scale of the Hispanic version, Spearman rho = .33 ($p = .10$). Further there was no evidence of discriminant validity found in the Pearson r for children using the numerical scale of the Hispanic version of the Oucher: $r = .51$ ($p = .007$). Instead of a low, non-significant correlation, it was moderate and significant. Because there

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was other evidence of convergent and construct validity supporting the validity of the numerical scale of the Hispanic Oucher, this was thought to be a chance finding. Additional discriminate validity studies need to be undertaken on the numerical scale of the Oucher.

Reliability

Beyer and colleagues (2005) conducted a separate study of 137 3-12 year old children (mean=7.1 years, S.D. = 2.3) in a Same Day surgery and dental clinics in a children's hospital. The sample consisted of 49 Caucasians (35.8%), 39 Hispanics (28.4%) and 49 African-Americans (35.8%). Of the total sample, 54.7% were boys and 45.3% were girls. After having adequately emerged from anesthesia, the children were asked to rate their pain of the surgical or dental procedure using a randomly selected small or large Oucher. Immediately thereafter, they rated their pain on the other (either large or small) ethically-appropriate Oucher. The alternate forms were a small Oucher, approximately 10" X 3" and a large Oucher, approximately 4: X 11".

Findings revealed strong positive correlations between the scores on the two sizes of the Ouchers, thus demonstrating evidence of adequate alternate forms reliability of the Caucasian Ouchers (photographic scales=.875, $p=.000$; numerical scales=.998, $p=.000$), African-American Ouchers (photographic scales=.909, $p=.000$; numerical scales=.906, $p=.000$), and Hispanic Ouchers (photographic scales=.912, $p=.000$; numerical scales=.984, $p=.000$).

Methodological Studies-Canadian First Nation Ouchers

Content Validity

Videotapes of Canadian First Nation (formerly called aboriginal) children were taken before and after immunization injections. From these videotaped images, two sets (one of a male and one of a female) of twelve photographs each were selected by a panel of Canadian First Nation adults. Eighty-one children then were asked to complete a seriation task in which they had to successfully demonstrate their ability to correctly pick out tree branches from shortest to longest. Those who were successful were then randomly assigned to sequence the 12 photographs of the gender-appropriate male or female model child. The 12 photographs were sorted into six piles, from "no hurt" to the "biggest hurt possible." Subjects were asked to explain the reasons for their selections. Based on the level of agreement obtained for the order selected for the photographs, six final photographs were chosen for each of the two model children. Then a separate sample of Canadian First Nation children were asked to rate the six pictures according to degree of pain intensity.

Kendall's Coefficient of Concordance indicated strong agreement in the ratings for group of six photographs. Kendall's W for the male scale was 0.889; $p<0.0001$, while it was 0.922, $p<0.0001$ for the female scale. This finding suggests strong evidence of content validity for the two First Nation scales.

Construct Validity

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Construct validity estimates for the Canadian First Nation Ouchers have not yet been undertaken. Since construct validity helps one determine if the tool actually measures the construct it was designed to measure, this psychometric property is essential when developing an instrument. Content validity on the other hand only examines the adequacy of the content of the scales for adequacy according to expert judges. Because they have not been examined for content validity, use of the First Nations Ouchers in research and practice must be undertaken with caution, and interpretation of the scores obtained from them, by necessity, must be considered tentative.

Methodological Studies on the Asian Oucher

Content Validity

The Asian Oucher studies were spearheaded by Dr. Chao Yeh of Taiwan. The research team selected a boy and a girl to serve as their Oucher poster models, taking 185 pictures of their faces to ensure the availability of adequate numbers of facial expressions from which to choose. These photographs were sorted by the research team into 6 piles of three photographs each, ranging from “no hurt” to “the most hurt of all” for both the boy and girl models. The next step involved 25 boys and 28 girls 4 to 7 years of age who chose one picture out of each pile to represent each of the six scale positions for the same-gender photographs. Agreement levels on each photograph ranged between 60-100% by the children. The resulting six photographs for each scale were numbered by the research team as the “correct order” from 0-5, according to the scores from the groups of child research participants.

Another group of 220 Taiwanese children included 3-7 year old (111 boys and 109 girls) at a day care center (mean age was 4.9 years). Their task was to order six photographs of the same-gender Oucher. They were first screened to determine if they could pass the Piagetian seriation task. Only the data for the 106 children who successfully completed the seriation task were used in the study analysis.

Kendall's Coefficient of Concordance showed strong agreement in the ordering task, $W = .845$ for the girls and $.806$ for the boys. The mean ranks for each photograph for the sample were in the “correct order,” according to the original ordering of the photographs by the first group of 53 child participants. To determine the accuracy of the ordering, a “misplacement analysis” was done which showed that photographs 3 and 4 for the girl and the boy were the ones most often placed out of order. Further examination showed that children had been distracted by the ruddier complexion of the face on one photograph of the girl and also by the cartoon figure in the background of one of the pictures of the boy. Both these problems were eliminated from the photographs for the final Asian Ouchers to lessen the chance of inaccurate scoring by children using them.

Finally, the construct validity of the two versions of the Asian Oucher was examined. In this part of the investigation, 111 different Taiwanese children, aged 3-7 years having outpatient surgery, participated. Mean age was 5.2 years, 68 (61%) were boys and 43 (39%) were girls. Children were screened to determine if they were able to use the numerical or photographic scales of the gender-specific Asian Oucher. If they were able to count to 10 and indicate which of two

numbers was larger, they used the numerical scale. If they were not able to complete the numbers tasks, they used the photographic scale. Four pain tools and two fear scales were used in this part of the investigation. There were three

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pain self-reports, including the new Asian Ouchers, also a 10cm vertical visual analogue scale (VAS), and Hester's 4-red chip poker chip tool (PCT). A fourth pain tool, the FLACC (Merkel & Shayevitz, 1997), was also used by the nurses to rate pain *behaviors*. The fear scales included the 17-item Child Medical Fears Scale (CMFS) (Broome, Hellier, Wilson, Dale, & Glanville, 1988) and the single-item Scare Scale. The four pain scales were administered three times: preoperatively. The Scare Scale was administered these same three times. The CMFS was only administered twice: preoperatively and at 60 minutes after the first pain complaint. The research team did not believe it appropriate to administer a lengthy questionnaire during the first pain complaint after surgery.

Results showed that the Asian Oucher demonstrated clinical validity by producing expected scores for outpatient surgery: median = 0 before surgery (range 0-2), median = 4 (range 0-10) at first pain complaint, and median =2 (range 0-10) one hour later. The Asian Oucher also demonstrated convergent validity in that there was a strong correlation between the Oucher and the VAS and the Oucher and the PCT postoperatively (all $r_s \geq .70, p < .001$). The correlations between the Asian Ouchers and the FLACC were much lower, ranging between .28 and .73. Discriminant validity was supported by low correlations between the Ouchers and the fear scales (.05 - .44) for both children and parents. The lack of a correlation between the Ouchers and the FLACC is not an unusual finding. Similar results were also found by Beyer, McGrath, and Berde (1990). Discordance between self-report and behavioral pain measures presents an interesting substantive issue but because it is known that they do not correlate, the test is not useful for determining convergent validity, even if the both supposedly measure pain.

Summary

The series of methodological studies reported here provide strong support for the content validity of the Caucasian, African-American, Hispanic, First Nations, and Asian Ouchers. Support is also provided for convergent, discriminant, and construct validity and test-retest reliability of the Caucasian Oucher. More recent studies to examine the construct validity of the African-American and Asian versions also support clinical, convergent, and discriminate validity. The findings regarding the Hispanic version of the Oucher show clear evidence of convergent and construct validity. Discriminant validity, of the Hispanic version is not so apparent. It appears to be borderline for the photographic scale and nonexistent for the numerical scale. Finally, the Caucasian, African-American, and Hispanic Ouchers have been shown to have strong alternate forms reliability. Research efforts will continue to examine the various psychometric properties of the five ethnic versions of the Oucher. Additional research needs to be conducted to examine further the discriminant validity of the two scales of the Hispanic version of the Oucher and all forms of construct validity for the two gender scales of the First Nations version. The Caucasian, African-American, Hispanic and Asian versions are sufficiently tested to be used with confidence in research and practice.

Postscript

During the 1980s when the testing of the Caucasian Oucher was in full force, many questions were raised about the cultural sensitivity of the Oucher. Beyer had originally thought that one Oucher "would do" for all children who needed to rate their pain. Drs. Villarruel was and Denyes were so concerned about the issue that they were willing to develop African-American and Hispanic versions of the Oucher in order to be able to use the tool at the Children's Hospital of Michigan. Similarly, Ms. Shapiro wanted to be able to use the Oucher with Canadian Indian (First Nations) children in her country. She however was not only concerned about the ethnicity of the original Oucher model but also the gender. She therefore created male and female versions of the First Nations Oucher. A three-year old boy had been chosen as the model for the original Caucasian Oucher, and he fortunately was androgynous in appearance. After the completion of the African-American and Hispanic versions of the Oucher, however, many questions were raised about the gender of the model children since the photographs were of older children, five year olds, who clearly were boys. Yeh similarly

was concerned about the lack of ethnic and gender Ouchers for use in her native country of Taiwan. She therefore developed a male and female version of the Asian Oucher. Many people have wondered when the Oucher will stop.

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They say it gets too confusing when there are so many different versions. It is unlikely that there will be any more Ouchers.

No questions had been raised about the numerical scale of the Oucher or any other pediatric pain tool until 2000 when von Baeyer and Hicks recommended that the pediatric pain intensity scales consist of a common metric. They rightly argued that the meaning of individual pain scores was confusing because of the profusion of a wide variety of numerical scales. They identified nine different metrics used in numerical pain scales for children. At that point, all of the Ouchers were changed from 0-100 to 0-10 numerical scales.

Issues of access and cost also were raised about the Oucher. Pain Associates in Nursing, the developers of the Oucher, originally decided that in order to maintain the color and photographic quality of the tools, they needed to be professionally printed and then laminated for durability. Personal color printers in the 1990's were not very reliable and the quality of the output was less than desirable. Thus, the Ouchers had to be purchased. This too became more and more unwieldy. Also, the addition of the First Nations and the Asian Oucher, each with a male and female version made it impractical and financially impossible to maintain a stock of all Ouchers. Thus, in 2009, the website (www.oucher.org) was revised to permit the downloading of all the Ouchers, brief instructions (in English, Spanish, Dutch, and Chinese), and the User's Manual and Technical Report.

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