Pain and distress in children undergoing blood sampling: effectiveness of distraction with soap bubbles. 
A randomized controlled study

Abstract
Background: Venipuncture is a very painful and distressing experience for many children. The aim of this study is to investigate the effectiveness of using soap bubbles as a distraction technique to reduce children's pain and distress before, during and after blood sampling.

Methods: Thirty children, aged between 3 and 6, undergoing blood sampling were randomly assigned to the experimental group where they were distracted with soap bubbles, (n=30), or to the control group, where routine medical care was performed (n=30). In both cases parents accompanied their child in the procedure room. All children received local anaesthesia with EMLA cream. Distress experienced by children before, during and after venipuncture was measured with the Observation Scale of Behavioural Distress, while the children perceived pain has been assessed with the Wong Baker Scale. Parent’s interaction with their child was recorded too.

Results: Levels of distress and pain are lower in children assigned to the distraction group when compared to the control group, before, during and after blood sampling. Correlation between distress during blood sampling and children age (r=-0.571; p=0.001) and correlation between age and pain (r=-0.577; p=0.001) is significant. Parents of older children seemed to provide less support than parents of younger children.

Conclusions: Based on our study, distracting using soap bubbles seems to be an effective method to manage and decrease venipuncture pain and distress in children.

Simona Caprilli, Laura Vagnoli, Carolina Bastiani, Andrea Messeri
Pain and Palliative Care Service, Meyer Children Hospital, Florence, Italy
l.vagnoli@meyer.it

Introduction
In paediatric healthcare, the primary goal of pain management is to minimise suffering while facilitating the success of medical interventions (1). Venipuncture for routine blood sampling can be one of the most distressing and painful events during medical procedures (1, 2). In previous studies, higher levels of pain during venipuncture were associated with greater anxiety and distress in children (3).

To alleviate pain and distress from venipuncture, different non-pharmacological techniques, including distraction, have been used (4, 5). Indeed, several studies have found that using distraction with children during medical procedures is inversely related to their distress (1, 3, 6). Distraction is a cognitive technique that can be defined as diverting attention from a particular stimulus or experience to an alternative stimulus, interrupting the affective component of pain thereby diminishing distress intensity (7-9).

Previous studies have evaluated the role of distraction using animated cartoon (10-12) games (13), music (14), or humour and joking (17, 5) to reduce children distress from venipuncture and the use of clowns (16) to reduce their preoperative anxiety during the induction of anaesthesia. Distraction techniques used by therapists and parents should be appropriately selected on children’s age and must meet some requirements, such as novelty, variety, familiarity, a certain degree of difficulty and the ability to stimulate children curiosity, in order to make the pain less intense and hence less distressing (3).

The aim of this study is to investigate the effectiveness of using soap bubbles to reduce distress and pain in children undergoing blood sampling. Making soap bubbles is a common game for children and can be an easy, useful and practical intervention to help children coping with this common painful and distressing experience.

There are previous studies that have investigated the effectiveness of using soap bubbles as a technique of distraction to reduce distress and pain in children undergoing

Studio randomizzato controllato sull'efficacia della distrazione con bolle di sapone sullo stress e sul dolore nei bambini sottoposti a venipuntura

Background: la venipuntura è un'esperienza dolorosa e stressante per moltissimi bambini. Lo scopo di questo studio è stato quello di valutare l'efficacia dell'uso delle bolle di sapone come tecnica di distrazione per ridurre il dolore del bambino prima, durante e dopo il prelievo venoso.

Materiali e metodi: 60 bambini di età compresa tra 3 e 6 anni, sottoposti a prelievo ematico, sono stati assegnati in modo casuale al gruppo sperimentale, nel quale venivano distratti con bolle di sapone (n=30), o al gruppo di controllo, nel quale venivano sottoposti a procedure standard (n=30). In entrambi i gruppi i bambini venivano accompagnati da un genitore nella stanza dove si svolgeva il prelievo. Tutti i bambini hanno ricevuto anche la crema EMLA come anestetico locale. Lo stress dei bambini prima, durante e dopo la procedura è stato misurato con la Observation Scale of Behavioural Distress (OSBD), mentre il dolore da loro provato è stato valutato con la scala delle faccine di Wong. E' stata anche valutata l'interazione tra il bambino ed i genitori.

Risultati: i livelli di stress e dolore sono minori nei bambini assegnati al gruppo delle bolle di sapone rispetto al gruppo di controllo, sia prima, che durante che dopo la procedura. E' stata trovata una correlazione statisticamente significativa tra lo stress durante il prelievo e l'età dei bambini (r=-0,571; p=0,001) e tra età e dolore (r=-0,577; p=0,001). I genitori dei bambini più grandi sembravano dare ai loro figli un supporto minore rispetto ai genitori dei bambini più piccoli.

Conclusion: Secondo i nostri risultati, la distrazione con bolle di sapone sembra essere un metodo efficace per ridurre il dolore e lo stress da venipuntura nel bambino.

IdB - Giornale Italiano di Scienze Infermieristiche Pediatriche 2012; 4 (1)
blood sampling (17-19). Our study for the first time investigates the effectiveness of distraction using soap bubbles on children undergoing blood sample with a hospital procedure that eliminates physical pain. This was achieved by using a topical local anaesthetic (EMLA®). The soap bubbles were made by the medical staff (psychologist) during a venipuncture procedure on children and we evaluated the effectiveness of this distraction technique on levels of pain and distress.

Previous studies have found that children age is negatively correlated with distress during venipuncture, showing more apparent distress in younger children (20). To further investigate this finding, we evaluated the influence of children age on level of distress and pain. Finally, we studied how the relationship between parents and children can influence children behaviour during blood sampling.

**Methods**

Our sample was composed of 60 Italian children, aged between 3 and 6, ASA physical status I/II, undergoing routine venipuncture at Meyer Children’s Hospital in November 2004. The study protocol was approved by the hospital ethics committee and informed, written consent form was obtained from the parent of each subject. Children were randomly assigned to one of the two groups:

- **Experimental group:** composed of 30 children who received blood sampling procedure with soap bubbles.
- **Control group:** composed of 30 children who received standard blood sampling procedure without soap bubbles.

When parents and children arrived in the waiting room, they received age-appropriate information about the blood sampling procedure from a nurse and in both groups, parents accompanied their child into the procedure room and stayed with him/her before, during and after blood sampling. In the experimental group, parents were also involved in distraction using soap bubbles before, during and after blood sampling. The soap bubbles were made by the medical staff (psychologist) during a venipuncture procedure on children and we evaluated the effectiveness of this distraction technique on levels of pain and distress.

Hospital staff (nurses and auxiliary staff) received practical training from a psychologist about the use of soap bubbles as a distraction technique during venipuncture. All procedures for both groups have been carried out in the same room, with a nurse performing the blood sampling procedure and, in the experimental group a psychologist making soap bubbles to distract children before, during and after the procedure. In the study we used kit of soap bubbles correctly sealed and not previously opened; overall products have been previously tested to be not heavily contaminated with bacterial organisms prior to its use. (21).

Two independent observers recorded behavior and completed observation scales and demographic data obtained from the parent prior to the medical procedure (age, gender). Parents were present during blood sample and they did not receive any training, so their natural interaction with their child was observed.

All children received a topical anaesthetic (eutectic mixture of local anaesthesia or EMLA® cream) one hour before venipuncture; EMLA® cream essentially provides local anaesthesia for skin penetration that is composed of an oil-in-water emulsion of lidocaine and prilocaine. By far the most common use for EMLA® cream since its introduction into clinical medicine has been the alleviation of pain associated with venipuncture in children (22-25).

We used three tools to measure distress and pain in children and interaction with parents:

- **Amended Form of the Observation Scale of Behavioural Distress (OSBD-A).** OSBD-A is a validated scale used in previous studies (26) to measure behavioral distress by an external observer. The instrument is a four-point Likert scale scoring the frequency of behaviors as 0 (not at all), 1 (a little), 2 (rather a lot) and 3 (all the time) and presenting eleven operationally defined items. The OSBD-A evaluates the procedure in three distinct phases: before, during and after blood sampling. Phase 1 starts when the child enters the procedure room and ends when the site is disinfected; phase 2 starts with blood sampling and ends when needle is extracted; phase 3 starts when cotton is placed on the arm to prevent bleeding and ends with the exit from the procedure room. The behaviors recorded in the OSBD-A are the following: crying, screaming, physical restraint, verbal resistance, requesting of emotional support, muscular rigidity, verbal fear, verbal pain, thrashing, nervous behavior and information seeking. For the purposes of our study the coding method has been translated from English to Italian and also reversely to double check its accuracy. During the medical procedure the OSBD-A observation scale was assessed by two independent observers who recorded the intensity of the different behaviors during each phase. The scores for each observer were complied and the agreement between the two observers was calculated.

- **Wong- Baker scale or faces scale,** is used to measure children self-reported pain, immediately after the procedure. Children have to indicate one out of six faces in this scale showing faces with increasing distress from neutral to a crying face. Face 0 is happy because it does not hurt at all. Face 1 hurts just a little bit. Face 2 hurts a little more. Face 3 hurts even more. Face 4 hurts a lot. Face 5 hurts as much as you can imagine, although you do not have to cry to feel this bad. This scale can be used only for children older than 4 years (27).

- **Observation of interaction.** A psychologist observed parents’ interaction with children during the procedure and recorded such interaction with an observation scale. This scale was previously prepared by a multi-disciplinary team composed of a doctor, two nurses and two psychologists from our hospital that observed interactions between parents and children during blood sampling. This instrument was composed of 3 questions: 1- Was the parent involved with any distraction technique for its child? (no; a little; yes); 2- Did the parent say anything to its child? (yes, with suitable interventions; yes, without suitable interventions;
the blood sampling, as shown in

Levels of distress measured with OSBD-A were significantly (OSBD-A in phase 2), pain measured with Wong-Baker scale separately using the Independent-Samples t Test. Pearson’s correlation coefficient was used to verify relation between measures obtained and to control relations between distress, pain and age of children and descriptive statistics were used to compare the two groups.

Results

Demographic characteristics: characteristics for both groups of children are shown in table 1. Statistical analysis was performed after a reconciliation of scores between the two observers coding the data of OSBD-A and using the Cohen-Kappa; there was 95% agreement between the two OSBD-A observers.

Levels of distress measured with OSBD-A were significantly reduced in the experimental group, before, during and after the blood sampling, as shown in table 2. The Pearson's correlation between OSBD-A (during phase 2) and Wong-Baker Scale was significant (r = 0.782, p = 0.001).

The correlation between distress during blood sampling (OSBD-A in phase 2), pain measured with Wong-Baker scale and age is significant and is showed in table 3. Parents of older children seemed to provide less support than parents of younger children, as indicated by the negative correlation between the emotional involvement of parents and the age of children (r = -0.586; p = 0.001). A qualitative analysis also shows that parents from the experimental group gave less support than parents from the control group. Table 4 shows parents interactions with the children in the two groups, as observed with the tool described in the Methods section.

Discussion

Venipuncture for routine blood sampling is a very painful and distressing experience for a considerable number of children and previous studies showed that children perceive it as one of the most frightening hospital procedure (1, 2). Children tend to control pain and distress during blood sampling in different ways according to their coping styles (28): the concept of coping styles tries to capture the number of ways that individuals use to cope and solve personal and interpersonal problems while seeking to master, minimise, reduce or tolerate stress or conflict. To this extent, it is possible to modify routine medical procedures by incorporating effective psychological techniques that reduce unnecessary distress, before and during medical procedure, and promote effective coping strategies (1, 3).

Results obtained from this study seemed to confirm the effectiveness of using soap bubbles as a distraction technique in order to reduce distress and fear of children before, during and after a venipuncture (17-19). Pain can be described as an aggregate of physical and psychological feelings but with use of EMLA®, it is possible that children do not perceive any pain (22). In this particular condition, using soap bubbles does influence children psychological response to perceived or imagined pain. Therefore, we measured the effectiveness of using soap bubbles on the psychological state of children as the local use of anaesthetic cream presumably eliminated most, if not all, somatic pain. It is clear that children’s distress and discomfort were mostly due to psychological stress. It is essential to utilize psychological techniques (distraction, imagery, hypnosis, breathing and relaxation techniques) to decrease anxiety and distress related to procedural pain in children (29).

### Table 1: Characteristics of the study groups

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Experimental group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Mean age (years ± SD)</td>
<td>4.20 ± 1.37</td>
<td>4.10 ± 1.30</td>
</tr>
<tr>
<td>Gender (% male/% female)</td>
<td>53/47</td>
<td>50/50</td>
</tr>
<tr>
<td>Parent present during procedure (% mother/%father)</td>
<td>70/30</td>
<td>70/30</td>
</tr>
<tr>
<td>Blood sampling at first attempt (n)</td>
<td>28</td>
<td>28</td>
</tr>
</tbody>
</table>

### Table 2: Mean scores of distress and pain in the two study groups

<table>
<thead>
<tr>
<th></th>
<th>Control group</th>
<th>Experimental group</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSBD-A before</td>
<td>4.80</td>
<td>5.50</td>
<td>0.005</td>
</tr>
<tr>
<td>(sd 4.73)</td>
<td>(sd 4.09)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSBD-A during</td>
<td>10.17</td>
<td>3.80</td>
<td>0.001</td>
</tr>
<tr>
<td>(sd 6.64)</td>
<td>(sd 5.40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSBD-A after</td>
<td>3.83</td>
<td>0.83</td>
<td>0.001</td>
</tr>
<tr>
<td>(sd 4.07)</td>
<td>(sd 1.51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wong-Baker Scale</td>
<td>5.93</td>
<td>3.37</td>
<td>0.007</td>
</tr>
<tr>
<td>(sd 3.60)</td>
<td>(sd 3.48)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3: Correlation between distress during blood sampling (OSBD-A), Wong Baker scale pain scores, and age

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distress during blood sampling (OSBD score)</td>
<td>r = -0.553</td>
<td>p = 0.001</td>
</tr>
<tr>
<td>Pain (Wong Baker scale score)</td>
<td>r = -0.569</td>
<td>p = 0.001</td>
</tr>
</tbody>
</table>

### Table 4: Parents’ interaction with children

<table>
<thead>
<tr>
<th>Was the parent involved with distraction technique for the child?</th>
<th>Control group</th>
<th>Experim. group</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>11 (37%)</td>
<td>13 (43%)</td>
</tr>
<tr>
<td>a little</td>
<td>1 (3%)</td>
<td>3 (10%)</td>
</tr>
<tr>
<td>yes</td>
<td>18 (60%)</td>
<td>14 (47%)</td>
</tr>
<tr>
<td>yes, partially</td>
<td>4 (13%)</td>
<td>4 (13%)</td>
</tr>
<tr>
<td>no</td>
<td>8 (27%)</td>
<td>12 (40%)</td>
</tr>
<tr>
<td>Did the parent give support to child?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no</td>
<td>15 (50%)</td>
<td>14 (47%)</td>
</tr>
<tr>
<td>yes</td>
<td>3 (10%)</td>
<td>4 (13%)</td>
</tr>
<tr>
<td>yes, in inappropriate way</td>
<td>12 (40%)</td>
<td>12 (40%)</td>
</tr>
</tbody>
</table>

IdB - Giornale Italiano di Scienze Infermieristiche Pediatriche 2012; 4 (1)
Cure atraumatiche

since in many instances overestimation of pain is only related to anxiety (30).

The parents’ role during children’s perceived pain is crucial and we observed that parents of children in the experimental group were less involved in distraction (47% in experimental group vs 60% in control group) and gave less affective support to their children than those of the control group (47% in experimental group vs 60% in control group). This can be explained as children distracted by soap bubbles were already quiet and did not need parents’ support or parents’ distraction. On the contrary, children that were not distracted by soap bubbles seemed more nervous and needed parents’ support. We have previously demonstrated that the presence of parents with active roles during a procedure, is beneficial for children (3, 31,32); once prepared, parents should be encouraged to use distraction and comforting techniques during venipuncture and they should be invited to sit with their child on their lap, so parents can see, encourage and touch the child (18). It has to be noted though that excessive parental reassurance, criticism, or apology seems to increase distress, whereas humour and distraction tend to decrease such distress (33).

In this study we observed also the influence of other variables such as age and gender on pain and distress of children during venipuncture. In a previous study both age and gender differences are assumed to be mainly the function of pain reporting variables, rather than reflecting fundamentals of age or gender based on variance in nociceptive processing (34). Therefore we evaluated the influences of age and gender on distress and pain during venipuncture. The age of children is a fundamental variable to understand how children react to a painful medical procedure like venipuncture (29) and in this study, younger children showed higher levels of distress and pain than older children. On the contrary, gender was not related to distress and pain.

Conclusion

Finally, even in the absence of perceived pain, children may be anxious or distressed during medical procedures as they believe that pain will occur. To alleviate this it is required to use pharmacological, physiologic and psychological interventions (35-37). Our study demonstrates the effectiveness of distraction by using soap bubbles, before, during and after blood sampling, to reduce children’s overt behavioural expressions of distress and pain. Using soap bubbles is a cheap, easy and practical intervention to help children coping with this common painful and distressing experience. There is scope to verify if using soap bubbles can be an effective distraction technique during more invasive medical procedures such as lumbar puncture.

References


IdB - Giornale Italiano di Scienze Infermieristiche Pediatriche 2012; 4 (1)