



THE THERAPEUTIC EFFECTS OF A MOTHER'S VOICE SHOULD SELECTED ASPECTS OF FAMILY-CENTERED CARE BE MOVED FROM THE MARGINS TO THE CENTER?

*Who ran to help me when I fell,
And would some pretty story tell,
Or kiss the place to make it well?
My mother.*

Ann Taylor (1782-1866)¹

Did you call your mom on Mother's Day? When you joined the millions of people all over the world who phone their mom on Mother's Day, you may have called to let mom know that you were thinking of her, to thank her for kind and selfless actions on your behalf, to express your love and respect for her role in your life, to inquire about her current health and wellbeing, or to update her on your immediate family events. Mother's Day continues to set the high watermark for the largest volume of telephone calls for any day in the year both within the United States^{2,3} and around the world. Among Americans whose mothers are still living, one survey⁴ found that 64% of adult children planned to visit their mom on Mother's Day and another 25% planned to call her that day. Internationally, South African expatriots telephone most on Mother's Day, increasing their call volume to 91% compared to any other day of the year, followed by Ghanians at 83%, then expatriots from China, Cameroon, New Zealand, Germany, Australia, Japan, Kenya, and Britain.⁵

Despite long-established global trends for families to be widely dispersed geographically, maintaining contact with our mother's voice has,

surprisingly, not only failed to follow those trends, but marched strikingly in the opposite direction. According to the Pew Research Center,⁶ in 1989 only 32% of adults reported that they saw or talked with one of their parents (usually their mother) every day, but in 2006, 42% reported doing so. These more frequent conversations between child and parent increased whether the child and parent lived in the same town or not. For the latter, whereas only 8% of adult children had daily telephone conversations with their parent in 1989, 22% reported doing so in 2006.

For all these parent-child telephone contacts, even when both parents are living, the child's conversations are most often with mom (61%) rather than with dad (18%) or equally between both parents (21%). What accounts for this overwhelming propensity to talk with our mothers? What is it about conversations with mom that matters to this extent? Why is it that adult children maintain such enduring vocal ties to their mother? Does mom need to hear from her children? Or do her children, even those long past their childhood, need to hear from mom? Have you ever entertained the possibility that all these conversations with mom may originate from our needs to hear her voice rather than from her needs to hear ours?

At least 3 lines of research appear to converge on the notion that hearing our mother's voice may confer more than just familiar, pleasing sounds to our ears. One line of research supports the long recognized preference that human infants display for their mother's voice. Another notes the soothing effects that a mother's voice has on

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preadolescent girls. A third line of study extends directly into critical care by considering whether the familiar voice of our mother may be capable of penetrating the neurologic impasse of unresponsiveness associated with severe traumatic brain injury (TBI).

Preference and Recognition for Our Mother's Voice

A newborn's recognition and preference for their mother's voice occurs early in life, very likely during fetal development, and can be demonstrated in neonates 1 to 3 days old⁷ as well as in newborns younger than 2 hours old.⁸ In summarizing these classic studies, Smith et al⁹ relate that this preference for the mother's voice derives from a unique prenatal priming that transpires during fetal intrauterine existence. Additional evidence¹⁰ reveals that at least as early as 4 months of age, infants process auditory stimuli from their mother's voice at a higher amplitude than they process auditory input from female strangers, suggesting that maternal voice stimuli undergo a unique form of cerebral processing that lends support for the existence of neurophysiologic mechanisms that reflect a child's preference for his/her mother's voice.

Smith et al⁹ further contributed to this body of research via a randomized, nonblinded, clinical study of 24 healthy volunteers, 54% of whom were girls, aged 6 to 12 years old who were trained to complete a simulated self-rescue escape procedure upon hearing a smoke alarm. Each child's mother recorded a voice alarm message, "First name! First name! Wake up! Get out of bed! Leave the room!" During the first cycle of stage 4 sleep, each child was randomly selected to hear either the voice or standard tone smoke alarm; the alternate alarm was triggered during the second cycle of stage 4 sleep. Both the personalized parent voice smoke alarm and the conventional residential tone smoke alarm were sounded at 100 dB. The results were quite striking⁹:

- One half of the children received the parent voice alarm first and half received the tone alarm first, yet the order in which the alarms were presented had no effect on awakening or escaping.
- Ninety-six percent of the children awakened to the parent voice alarm compared with only 58% to the tone alarm. One child did not awaken to either alarm.
- Thirty-six percent awakened to their parent's voice, but not to the tone. No child awakened to only the tone and not the voice.

- Eighty-three percent of children in the parent voice alarm group completed the escape procedure correctly within 5 minutes of alarm onset compared with 38% in the tone alarm group.
- The median time to awaken was 20 seconds in the voice alarm group compared with 3 minutes in the tone alarm group.
- The median time to escape was 38 seconds in the voice alarm group compared with the maximum allowed 5 minutes for the tone alarm group.
- For children in the parent voice alarm group, there was no association between the child's age and awakening or escaping.
- For either alarm type, there was no association between the child's gender and awakening or escaping.

In a residential fire, it appears that a child's innate ability to rapidly hear, distinguish his/her mother's voice, and respond to its message correctly can be a life-saving capability.

Soothing Effects From Our Mother's Voice

A recent study confirmed what all mothers and all of us fortunate to have our mother throughout childhood already knew: the sound of our mother's voice has soothing effects on her children. In this study,¹¹ a biological anthropologist, a neuroendocrinologist, and a psychologist from the University of Wisconsin-Madison tested 61 girls age 7 to 12 years to determine whether the neurohormone oxytocin—popularly referred to as the "love hormone"¹² or the "cuddle hormone"¹³ and known to be associated with development of love, trust, and enhanced mother-child bonding as well as with suppression of the stress response in their young—would be released via the mother's voice or only with direct mother-child physical contact, as seems to be necessary in animal models. The daughter's salivary cortisol level (as a biological marker for stress) and urinary oxytocin levels (as a marker for increased bonding and decreased stress) were measured before, during, and after a pair of situational stressors was applied. The initial stressor was randomly assigned and consisted of being suddenly asked to either deliver an impromptu speech or to solve a series of difficult math problems, both to an audience of strangers. The mother-daughter dyads were divided into one of 3 groups following these stressors¹¹:

- Group 1 girls met immediately and in person with their mothers, who provided whatever hugs, words,

and other physical and tactile ministrations as they wished.

- Group 2 girls were handed a cell phone with their mother already on the line.
- Group 3 girls viewed a recently popularized film titled *March of the Penguins*, which was characterized as emotionally neutral.

The results were readily distinguished:

- Group 1 girls, who received the full complement of tactile, vocal, and behavioral maternal comforting in person, demonstrated the highest levels of oxytocin and the most rapid return of cortisol to normal baseline levels.
- Group 2 girls, who were comforted only via their mother's voice over the phone, demonstrated strikingly comparable responses to those in group 1, that is, their oxytocin levels rapidly escalated (though not as fast or as high as those in group 1) and their cortisol levels rapidly declined to normal, indicating that for these girls the physical contact required for oxytocin release in the animal model was not necessary.¹⁴
- Group 3 girls, who viewed the film and received neither form of maternal interaction, continued to demonstrate elevated cortisol levels and flat or diminished levels of oxytocin an hour after the stressor was removed.¹⁴

The researchers concluded that hearing the mother's voice may be as important as tactile contact with the mother for the neuroendocrine regulation of human mother-child bonding.¹¹

Stimulating/Awakening Effects From Our Mother's Voice

In addition to enabling these soothing and calming benefits, a mother's voice may also serve as a possible breakthrough intervention for penetrating the communicative abyss of a coma associated with TBI. In Chicago, researchers led by Theresa Pape designed a clinical trial to investigate whether repeated stimulation from familiar voices can help to repair the injured brain and facilitate recovery of TBI patients.¹⁵ Following a pilot study that demonstrated via magnetic resonance imaging (MRI) that patients in a vegetative state responded more to voices of family members than to other voices, Pape considered that those familiar voices might stimulate therapeutic changes that could enhance responsiveness

and facilitate improvement. She hypothesized that repeated exposure to familiar voices might help repair disrupted neural axons and assist in restoring the integrity and organization of neural networks. Her methodology in the current full trial divides patients with severe TBI into 3 groups, each of whom will wear head phones 4 times a day for 6 weeks under the following conditions¹⁵:

- Group A/"high dose": Patients will hear 10 minutes of stories recorded by familiar voices during each headphone session.
- Group B/"low dose": Patients will hear 5 minutes of stories told by familiar voices and then 35 minutes of silence per session.
- Group C/"sham group": Patients will wear head phones without any stories related.

After the initial double-blinded period of 6 weeks, all study participants will receive the "high dose" of stories told by familiar voices to ensure that if this approach is beneficial, all participants will have the opportunity to gain from it. Two major study outcome measures include¹⁵:

1. Examination of a functional MRI of the brain to determine whether the patient shows the normal response of temporal lobe activation (memory centers) and frontal lobe activation (recognition associated with one's name being called) with hearing familiar voices
2. Comparison of baseline brain MRI (completed at study enrollment) with postvoice imaging for evidence of functional improvement in organization and efficiency among neural axon network interconnections

This double-blinded study was initiated in 2009; researchers hope to enroll about 45 patients before the study ends in 2011. In the interim, rather than adopting a wait-and-see attitude regarding the eventual findings from this study, I suggest that we encourage immediate family members and (depending on age and existing relationships) significant others to speak to the patient naturally and directly at planned intervals. The basis for this recommendation is borne out by the anecdotal evidence that has already surfaced regarding one trial participant: Ryan Schroeder, a 21-year-old college student who incurred TBI in January 2009 following his ejection from a snowmobile into a tree after an ice storm. At the time Ryan was enrolled in Pape's study late in February 2009, he did not make purposeful movements, did not respond to verbal commands, and displayed no overt evidence of awareness of his surroundings. After 3 weeks in the "high dose" voice group (hearing recordings of his

mother's, father's and sister's voices) 4 times per day, however, Ryan began to demonstrate that he noticed the lights outside his hospital room window. Then he gradually started responding to commands to push a ball out of his hand. One year later, Ryan brushes his own teeth; walks with a walker or cane; text messages his friends; continues with occupational, speech, and physical therapies; and works in his family's paving business by entering computer data. Although he does not remember the accident or listening to the recordings, he continues to make progress in resuming his young life.¹⁵

Discussion

The findings from these studies suggest that the family, particularly the patient's mother, might warrant a more visible, central, and instrumental role in patient recovery from TBI than has been recognized to date. We do not know whether there are age limits to the effects observed, whether these effects persist into adulthood, whether they differ significantly by gender, or whether they vary in other important aspects. We also need to keep in mind that every mother-child relationship is not a warm and mutually nurturing one and that changes and complications in that relationship may arise over time and could readily modify or nullify these findings in those cases. In any event, encouraging close family members to provide direct physical and verbal comfort to the TBI patient would certainly seem worth a try to determine the effects, if any, that ensue. And rather than just allowing family members to passively remain with critically ill patients for protracted periods, we might clearly and emphatically direct them, particularly patients' mothers, to interact closely with their child, calling them by name, ministering physical comfort measures, and actively conversing with them to assuage their stress, maximize their comfort, and possibly raise their responsiveness toward recovery.

All of us who have worked in critical care for many years have personal experience working with patients who no one expected to survive, much less thrive in recovery, and who far surpassed all expectations for their prognosis, so we are hardly in a position to ascribe one young man's recovery to date to hearing recordings of his mother's, father's, and sister's voices. On the other hand, with even that small pile of accumulating evidence that the intonations of loved ones, especially a mother's voice, may resonate meaningful, comforting, and awakening

therapeutic effects throughout our sense of being and well-being, I think those conditions justify giving that approach a try, don't you? CCl



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