

Investigation by Questionnaire Regarding Fetal/Infant Memory in the Womb and/or at Birth

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Abstract: The purpose of this study is to clarify the possession rate of fetal/infant memory in the womb and/or at birth and to validate its characteristic. A total of 1620 answered questionnaires of the 3601 distributed were returned, giving an overall recovery rate of 45.0%. The possession rates of womb and birth memory were 33.0% and 20.7%, respectively. Parents, too, responded with regard to their own memory from birth, and 1.1% appeared possessing such memory. The possession rate is relevant to the mother's feeling and speaking to the fetus during pregnancy, and irrelevant to the irregularity in delivery. Most memories were positive.

Keywords: memory, womb, birth, fetus, infant, oxytocin, cortisol.

From the 1980s there has been an awareness of the existence of fetal/infant memory in the womb and/or at birth through investigations by a number of researchers, for example, Thomas R. Verny, M.D. (1981; 2002) and David B. Chamberlain, Ph.D. (1988; 1998). Dr. Chamberlain conducted research using hypnotherapy methods. However, detailed studies on the ratio of existing fetal/infant memory in full consciousness (vs. being under hypnosis) has not yet been conducted. The objective of this research is to investigate fetal/infant memory in full consciousness. This research was conceived when pregnant mothers attending my clinic with their child/children for antenatal care were asked whether their child/children carried some memory related to their birth. (Subsequently, this has been asked regularly since 1999.) It turned out that many children possessed such memory, though some mothers were hesitant in offering their children's story. At the time of the inquiry, the mother seemed to think that her child's memory was just funny talk. It was at this point that I thought it was imperative to investigate the fetal/infant memory more closely. How many children really possess such memory? As the possession ratio of fetal/infant memory had not yet been examined, I decided to set up an investigation, for the purpose of which, a clearly defined group of population would be examined. In this investigation, memory in the womb has been defined as the memory of the embryo/fetus while still being carried prenatally, and memory at birth as the memory of the fetus/neonate before, at, or after birth. A questionnaire was administered to mothers/fathers of 3,601 children at nursery schools in two different areas. The questionnaire focused on questions about fetal/infant memory possessed by children, and also included some questions about fetal/infant memory possessed by parents themselves with regard to their own birth.

Methods

This investigation by questionnaire consisted of two parts and was conducted in Japan. The first part was carried out at 17 nursery schools in Suwa-City (population approximately 52,000), and two other local kindergartens during the period of August and September 2002. The second part was carried out at 19 nursery schools in Shiojiri-City (population approximately 65,000) during December 2003. These two parts were combined and the results were used in this research.

Questionnaire Items

The questionnaire consisted of the following items: - The mother's age - The child's age - Whether the child had talked about a memory in the womb and/or at birth - The age at which the child talked about a memory for the first time - Sex of the child - If there was a memory, whether the child had talked about it after the mother's asking, or had volunteered - If there was no memory, whether the child simply had no

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recollection, or had refused to respond - Whether the mother tried to communicate with the fetus during pregnancy - If the mother tried to communicate, whether the child had a memory about it - Whether the mother had a stress-free, pleasant pregnancy - Whether, according to the mother, her delivery had been smooth or difficult - Whether the delivery was vaginal or via Caesarean section (with labor pain present or not) - Whether the delivery had been carried out using vacuum extraction or forceps extension - Whether uterotomica had been used - Whether there had been breech presentation - Whether there had been coiling of the cord - Whether the parents had a memory from their own birth Statistical analysis based on chi-square test was used to assess the results

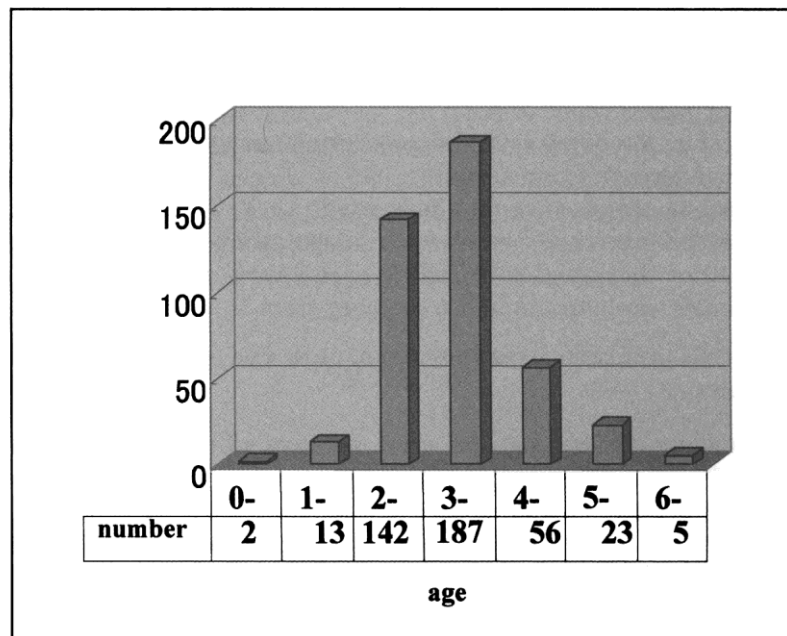
Results

Recovery Rate of the Questionnaire and Other Particulars

A questionnaire for the first investigation at Suwa-City was distributed to 1,773 parents, and a total of 838 answered questionnaires were returned, giving a response rate of 47.3%. The second questionnaire at Shiojiri-City was distributed to 1,828 parents, and 782 answered questionnaires were returned, giving a response rate of 42.8%. A total of 1620 questionnaires were answered of the 3601 questionnaires that were distributed, giving an overall return rate of 45.0%. The minimum number of children per nursery school was 16, and the maximum number was 210. The average number of children per nursery school was 93, in the total of 38 nursery schools. The mean average age of mothers who gave a response was 33.7 ± 4.4 (mean \pm S.D.) years, and that of the children was 4.0 ± 1.4 years. The age at which the majority of the children reported a fetal/infant memory was between 2 and 3 years. Two of the children demonstrated some fetal/infant memory by means of gesture, after being questioned by the parents, at the age of 10 months (Figure 1). As for the gender of children possessing fetal/infant memory, there was no significant difference, with womb memory being reported by 268 boys and 254 girls, and birth memory by 174 boys and 156 girls.

Figure 1

Child's age at which Fetal/Infant Memory was Recognized or Hinted at for the First Time



Possession Rate of Fetal /Infant Memory

The number of children who reported memory in the womb and at birth was 534 and 335 respectively, with corresponding memory possession ratios of 33.0% and 20.7%, of the total number of 1620 responses to the questionnaire (Table 1). Thirty-eight children of 534 who reported womb memory

(7.1%) had volunteered to talk about the memory, while 496 children responded after questioning (92.9%), which is equivalent to 2.3% and 30.5% respectively, of the total number of questionnaires answered. Twenty-two children of 335 who reported birth memory (6.6%), had volunteered to talk about the memory, while 313 children responded after questioning (93.4%), which is equivalent to 1.4% and 19.3%, respectively, of the total number of questionnaires answered (Table 2).

Table 1
Possession Rate of Womb Memory/Birth Memory

<i>Memory</i>	<i>Present</i>	<i>Not Present</i>	<i>Unclear</i>	<i>Total</i>
In the womb	534 (33.0%) 45.1%*	649 (40.1%) 54.9%*	437 (27.0%)	1620 (100%)
At birth	335 (20.7%) 30.9%*	748 (46.2%) 69.1%*	537 (33.1%)	1620 (100%)

Note. *The number indicates the ratio when excluding the "unclear" cases.

Table 2
Details of the Children Possessing Fetal/Infant Memory

<i>Memory</i>	<i>Volunteered Responses / 1620</i>	<i>Responses after Questioning / 1620</i>	<i>Combined Responses / 1620</i>
In the womb	38 (7.1%) 2.3%	496 (92.9%) 30.5%	534 (100%) 33.0%
At birth	22 (6.6%) 1.4%	313 (93.4%) 19.3%	335 (100%) 20.7%

Fetal/Infant Memory in Adults (Possession Rate)

The possession rate of memory in adults was examined through questions addressed to the parents (Table 3). Sixteen (1.1%) of the 1,407 parents (774 mothers, 633 fathers) responded with regard to their own memory, reporting fetal/infant memory. Among mothers, there was no one who reported simultaneously existing memory in the womb and at birth. Among fathers, two persons reported having both memories simultaneously.

Table 3
Parents Possessing Fetal/Infant Memory

<i>Memory</i>	<i>Present</i>	<i>Not Present</i>	<i>Total</i>
Mother			
In the womb	5 (0.6%)	769 (99.4%)	774 (100%)
At birth	5 (0.6%)	768 (99.4%)	773 (100%)
Father			
In the womb	3 (0.5%)	630 (99.5%)	633 (100%)
At birth	5 (0.8%)	625 (99.2%)	630 (100%)

Possession of Fetal /Infant Memory was Unconfirmed

There were three types of responses in the group where fetal/infant memory could not be confirmed. These were the "refused to answer," "child was not asked," and "child's response unclear." The details and conditions of "refuse to answer" were unclear. The number of cases where the child "refused to answer" was over 50% of the unconfirmed cases for both memory in the womb and at birth (Table 4). The ratios of "refused to answer" cases for memory in the womb and/or at birth based on the total number of responses (1620) were 15.4% and 16.8%, respectively. Many of the cases where the "child was not asked," were due to the fact the child was not able to talk yet.

Table 4
Possession of Fetal/Infant Memory Unconfirmed

<i>Memory</i>	<i>Refused to Answer / 1620</i>	<i>Child was Not Asked / 1620</i>	<i>Child's Response</i>	
			<i>Unclear / 1620</i>	<i>Total / 1620</i>
In the womb	249 (57.0%) 15.4%	178 (40.1%) 11.0%	10 (2.3%) 0.6%	437 (100%) 27.0%
At birth	272 (50.6%) 16.8%	242 (45.1%) 14.9%	23 (4.3%) 1.4%	537 (100%) 33.1%

Communicating with the Baby during Pregnancy "Committed" in Table 5 refers to the group of mothers who tried to communicate with the fetus during pregnancy actively, and "indifferent" refers to the group of mothers who rarely or never tried to communicate with the fetus during pregnancy. When mothers tried to communicate with the fetus during pregnancy, there appeared a tendency of existing fetal/infant memory. Similarly, commitment during pregnancy significantly affected response in the way of an increase of the "refused to answer" cases.

Table 5
Effect of Parents' Attitude with regard to Communicating with the Fetus during Pregnancy on the Possession of Womb/Birth Memory

<i>Communicating with the Fetus</i>	<i>Memory in the Womb</i>			<i>Memory at Birth</i>		
	<i>Present</i>	<i>Not Present</i>	<i>Refused to Answer</i>	<i>Present</i>	<i>Not Present</i>	<i>Refused to Answer</i>
Committed	290 (41.4%)	263 (37.6%)	147 (21.0%)	184 (27.5%)	317 (47.5%)	167 (25.0%)
Indifferent	207 (34.2%)	336 (55.4%)	63 (10.4%)	125 (21.9%)	382 (66.8%)	65 (11.4%)
	P < 0.00001			P < 0.00001		

Mother's Evaluation of a Smooth/Difficult Delivery

When a mother considered her delivery to have been a difficult one, memory in the womb tended not to be present ($p = 0.02589$). However, birth memory did not appear to be influenced by the mother's assessment of her delivery (Table 6). When the mother assessed her delivery as smooth, the child's memory in the womb and/or at birth tended to be positive, and conversely, it tended to be negative, when the mother assessed her delivery as difficult, but there was no significant difference (Table 7).

Table 6
Effect of Mother's Feeling with regard to Smooth/Difficult Delivery

<i>Delivery</i>	<i>Memory in the Womb</i>		<i>Memory at Birth</i>	
	<i>Present</i>	<i>Not Present</i>	<i>Present</i>	<i>Not Present</i>
Smooth	340 (44.0%)	433 (56.0%)	221 (31.2%)	488 (68.8%)
Difficult	111 (52.6%)	100 (47.4%)	71 (36.8%)	122 (63.2%)
	P = 0.02589		P = 0.13925	

Table 7
Assessment of Children's Memory with Respect to
Smooth/Difficult Delivery

<i>Delivery</i>	<i>Assessment of Memory in the Womb</i>		<i>Assessment of Memory at Birth</i>	
	<i>Positive</i>	<i>Negative</i>	<i>Positive</i>	<i>Negative</i>
Smooth	230 (95.8%)	10 (4.2%)	190 (96.4%)	7 (3.6%)
Difficult	72 (91.1%)	7 (8.9%)	59 (89.4%)	7 (10.6%)
	P = 0.18603 using Yates' correction		P = 0.05847 using Yates' correction	

Memory in cases with Irregularity in Delivery

The irregularity in delivery, such as, vacuum extraction, forceps extension, use of uterotomica, breech presentation, and/or coiling of the cord, did not appear to influence the possession of memory in comparison with normal vaginal delivery. The rate of the possession of memory in the cases of Caesarean section appeared to vary regardless of the existence of labor pain (Table 8). There was no actual correspondence between the mother's assessment of her delivery as difficult or smooth and the medically assessed irregularity of delivery.

Table 8
Possession of Memory in Cases with Caesarean Section

<i>Labor Pain</i>	<i>Memory in the Womb</i>		<i>Memory at Birth</i>	
	<i>Present</i>	<i>Not Present</i>	<i>Present</i>	<i>Not Present</i>
Present	14 (51.9%)	13 (48.1%)	8 (27.6%)	21 (72.4%)
Not present	40 (58.0%)	29 (42.0%)	19 (30.2%)	44 (69.8%)
	P = 0.586861		P = 0.995726 using Yates' correction	

Discussion

If newborn babies are capable of retaining memory in the womb and/ or at birth, we should reconsider our attitude with regard to childbearing management. Many studies have been done to submit evidence of fetal memory. However, it can be hardly said that obstetricians are convinced about the existence of fetal/infant memory still now. This study was not designed to prove the existence of fetal/infant memory. It is really difficult to prove fetus memory at this point, though, among others, David Chamberlain has also made reference to the possession of birth memory among the young and adults in his articles (Chamberlain, 1988/1998). This study was designed to confirm the possession rate of fetal/infant memory based on child response. After a search of related articles, I came to the conclusion that there must have been no survey previously conducted on the possession rate of fetal/infant memory.

The Possession Rate of Fetal /Infant Memory From the results of this study, the possession rate of womb memory was 33.0% and that of birth memory was 20.7% (Table 1). The results indicate that one-third of the children possessed memory in the womb and a quarter of the children possessed memory at birth. This research indicates the possession ratio in children up to six years old. The age at which the majority of the children began to talk about fetal memory was between two and three years, and at the age of six years the number decreased significantly (Figure 1). If research had been limited to the ages of two to three years, the possession ratio of memory might have been higher.

Why Don't We Notice Fetal/Infant Memory?

If many children possess fetal/infant memory, why don't we notice? It can be considered to be due to two possible reasons. One of the reasons is that few children (only 1-2%, Table 1) are likely to volunteer to talk about their early memory. Another is the disbelief with which ordinary parents tend to treat the

possibility that their child could possess such an early memory. As a result, it is unlikely that they will attempt to confirm such a memory in their child. The possession rate also decreases with age. This was demonstrated in another unpublished research study I conducted at elementary schools and junior high schools in Japan, according to which the possession rate of fetus memory was around 5-9% and 1-4%, respectively. In this research, it was moreover proved that 1.1% of the adults also possess early memory from their own birth (Table 3). Considering all various factors together, the fetal/infant memory does not always disappear on reaching a certain age, but it might be held up to even adult age, though, as naturally expected, it gradually diminishes.

The Factors that Contribute in Retaining Fetal I Infant Memory

The following hormones are known as factors affecting memory: oxytocin, cortisol, serotonin, corticotrophin releasing factor (CRF), cholecystokinin, adrenocorticotrophic hormone (ACTH), etc. Thomas Verny has shown that oxytocin is an important factor in extinguishing memory and also that the stress hormone cortisol is known to extinguish the recall of traumatic memories, thus playing a protective role during stress (Verny, 1981/2002). The stress hormone ACTH acts to carry on memories. Gulpinar and Yegen (2004) have reported that the peptides cholecystokinin, serotonin and CRF, play strategic roles in the modulation of memory processes under stressful conditions. Table 7 indicates fetal/infant memory, assessed as positive or negative. In most of the cases it is positive, regardless of the mother's assessment of her delivery as difficult or smooth, which suggests that unpleasant memories tend to be erased. However, when stress exceeds a certain level, secretion of the protective hormones may not be sufficient to provide protection, and as a result unpleasant memories may be retained. In the present research the trigger point of the stress level at which the protection system fails to resolve, has not been defined. Also the type of memory, positive or negative, was independent of the mother's assessment of a difficult or smooth delivery. It is difficult to justify why possession rates of memory in the womb and memory at birth, were different by about 10% because there may be many factors participating. One possible factor may be the length of the stimulation period. Memory in the womb may be relatively easy to be retained by repeated stimulation for periods as long as a pregnancy. On the other hand, memory at birth may be relatively hard to be retained because the duration of the event of childbirth is very short compared to a whole pregnancy period. The memory may be easier to retain with repeated stimulation.

Another possible influencing factor in the decreased possession rate in memory at birth may be the protection mechanism, which acts to extinguish agony experience at birth by secretion of oxytocin and other hormones. There is no significant difference in possession rates of memory in the womb and memory at birth between cases with labor pain present (increase levels of released oxytocin at birth) and cases without labor pain (reduced levels of released oxytocin at birth). Table 8 suggests that the lower levels of oxytocin is an influencing factor in the retaining of womb memory, as the memory possession ratio for cesarean section cases without labor pain is 58.0%, which is slightly higher than that of the cases with labor pain present. The attitude of the parent, who does not talk to the fetus during pregnancy, may be creating unpleasant conditions for the fetus, in which case the child tends to efface both memories in the womb and at birth (Table 5). The stressful condition experienced by the fetus during pregnancy may have a direct connection to the observed decrease in the rate of retained memory at birth due to secretion of oxytocin, cortisol and other hormones. In the laboratory it has been observed that oxytocin and cortisol efface memory. In Table 6, why does the possession rate of memory in the womb tend to increase in the difficult delivery group? Heinrichs and co-worker indicate that central oxytocin selectively influences memory performance depending on the kind of memory test used and the psychobiological relevance of stimuli (Heinrichs, Meinlschmidt, Wippich, Ehlert, & Hellhammer, 2004). Oxytocin may act to reduce unpleasant feelings, while pleasant feelings are less influenced. Since with breast-feeding oxytocin secretion is sustained, the puerperal woman may forget the labor pain she has experienced. How the "Refused to Answer" Group is Regarded About 15% of the children in this study who refused to answer were considered to be likely to have retained fetal/infant memory. The pattern did not show a consistent tendency with the mother's general feeling with regard to her pregnancy. It will be necessary to further investigate the background and the details of this group in a future study of fetal/infant memory. Is Fetal/Infant Memory Influenced by the Irregularity in Delivery? It is generally believed that there is a tendency to retain fetal/infant memory in difficult deliveries. In this study, the irregularity in delivery, such as, the use of vacuum extraction, forceps extension, or uterotomica, breech presentation or coiling of the cord, did not influence the memory possession rate in comparison with the cases of normal vaginal delivery. There was hardly any difference in memory possession rates of memory at birth between easy and difficult delivery cases, but there was a significant difference for memory in the womb (Table 6). Memory in the womb was retained when mother assessed her delivery as difficult.

Does Antenatal Training have an Influence on the Retaining of Fetal / Infant Memory?

The importance of antenatal training has been known since the ancient times. Mother talks to the fetus naturally. However, recent mothers in Japan tend to ignore their fetus and/or they are not inclined to talk to their fetus. This study shows that memory in the womb and at birth is retained when the mother talks to the fetus. There tends to be a higher possession rate of memory in the womb in the difficult delivery cases compared with the smooth delivery cases, but the fetal/infant memory is usually positive in most children. This indicates that the possession rate of fetal/infant memory is certainly directly related to the mother's feeling during the pregnancy period and at delivery. Therefore, it is important to take notice of the mother's feeling and to maintain a good mood during pregnancy and at birth. There is a strong suggestion that antenatal training can influence fetal/infant memory, in which case it is important that pregnant women remain conscious of such a fact and show their affection during pregnancy.

Conclusion

In this research, about 30% of the children less than 6-years-old possessed fetal/infant memory, and about 1% of the adults had their own fetal/infant memory, which leads to the naturally expected observation that the possession rate of fetal/infant memory decreases with age. The possession rate is undoubtedly influenced by the mother's feeling and speaking to the fetus during pregnancy and moreover, positive memory tends to be retained in children, more than negative memory. With these points in mind, it becomes evident and suggestive that we should politely handle childbirth based on the premise of existence of memory in the womb and/or memory at birth.

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