Behavior of Low Birthweight Infants in Neonatal Period Using Orientation Items of the Brazelton Neonatal Behavioral Assessment Scale

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Abstract Mothers of low birthweight (LBW) infants often grow anxious as they compair the neonatal behavior of their infants with normal neonatal behavior. In this study, LBW infants were assessed concerning knowledge of a characteristic of neonatal behavior by using Brazelton's Neonatal Behavioral Assessment Scale (NBAS). The assessment was carried out a total of 316 times on 103 LBW infants. Six NBAS orientation items were chosen and were statistically analyzed by 1) difference in age at assessment (measured in terms of gestation), 2) difference in type of sensory stimulation, and 3) difference between inanimate and animate stimulation. Results were that: 1) the group aged at 45 weeks scored significantly higher on every item, 2) combination of visual and auditory stimulation evoked better reaction than other methods, 3) animate stimulation was better than inanimate stimulation in generating infant reaction to both visual and auditory stimulation.

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Key Words : low birthweight infants, neonatal period, behavior, NBAS, orientation items

Intoroduction

Given recent advances in perinatal medicine, low birthweight (LBW) infants can develop normally. However, these infants have high medical risks, and a relatively high percentage of them are later diagnosed with cerebral palsy, etc. There is much research on LBW infants from various standpoints, but most of these studies have investigated the developmental convalescence of LBW infants or compared them with normal birth infants. It is well recognized that the growth process of LBW infants is different from that of normal birth infants; LBW infants require several years to catch up. Nevertheless, anxiety in LBW infants' mothers is often exacerbated by making comparisons to normal birth infants. DeWitt et.al reported that the physical growth of LBW infants is influenced by maternal behavior[1)], and it would appear counterproductive to provide such mothers with information that tends to play on their fears. In addition, LBW infants are generally separated from their mothers for a comparatively long period of medical management. Mother-infant separation is a factor that inhibits the formation of a sense of motherhood, as this sense is acquired. Accordingly, it is necessary to the intervene in order to establish a healthy sense of motherhood and to facilitate better formation of mother-infant interaction. How the mother understands the infant's ability is an important element in the formation of positive mother-infant interaction, but there are few reports regarding the neonatal period of LBW infants. Orientation items of Brazelton's Neonatal Behavioral Assessment Scale (NBAS) are effective in assisking with the formation of mother-infant interaction. In this study, we report on NBAS orientations during the neonatal period of LBW infants.

Methods

Subjects

This study was conducted on 103 LBW infants (birthweight≦2,500g) from 25 to 39 weeks of gestation (mean=32 weeks). They were born between 1987 and 1994, and their mean birthweight was 1510g (min.=565g, max=2440g). They received medical care at the NICU of Nagasaki University Hospital, they were available for follow up, and did not have major medical conditions such as cerebral palsy or mental retardation.

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Data collection

Subjects were assessed a total of 316 times by means of the NBAS. For the purposes of this study, we examined "orientation inanimate visual" (OIV), "orientation inanimate auditory" (OIA), "orientation inanimate visual & auditory" (OIVA), "orientation animate visual" (OAV), "orientation animate auditory" (OAA), and "orientation animate visual & auditory" (OAVA). Orientation items assessed infants' reactions when they were stimulated using a red ball for OIV, a rattle for OIA, a red rattle for OIVA, the examiner's face for OAV, the examiner's voice for OAA, and the examiner's face and voice for OAVA. Infants' reactions were scored by means of the scale shown in Table 1[2].

Table 1 The scale of NBAS orientation items[2]

Orientation response (OIV,OIVA,OAV,and OAVA)
1 Does not focus on or follow stimulus.
2 Stills with stimulus and brightens.
3 Stills, focuses on stimulus when presented, little spontaneous interest, brief following.
4 Stills, focuses on stimulus, following for 30° arc, jerky movements.
5 Focuses and follows with eyes horizontally for at least a 30° arc. Smooth movement, loses stimulus but finds it again.
6 Follows for two 30° arcs with eyes and head. Eye movements are smooth.
7 Follows with eyes and head at least 60° horizontally, maybe briefly vertically, partly continuous movement, loses stimulus occasionally, head turns to follow.
8 Follows with eyes and head 60° horizontally and 30° vertically.
9 Focuses on stimulus and follows with smooth, continuous head movement horizontally, vertically, and follows in a circular path for a 180° arc.

Orientation response (OIA and OAA)
1 No reaction.
2 Respiratory change or blink only.
3 General quieting as well as blinking and respiratory changes.
4 Stills, brightens, no attempt to locate source.
5 Shifting of eyes to sound, stills and brightens.
6 Alerting and shifting of eyes and head turns to source.
7 Alerting, head turns to stimulus, and search with eyes.
8 Alerting prolonged, head and eyes turn to stimulus repeatedly (3 out of 4 times).
9 Turning and alerting to stimulus presented on both sides on every presentation of stimulus (4 out of 4 times).

Statistics

All statistical analyses were performed with Stat View software.

1. Differences in LBW infants' reactions by age at assessment (measured in terms of gestation).

   Scores of LBW infants were classified into three groups by age: prior to 37 weeks of gastation (U37), between 37 and 44 weeks of gastation inclusive (U45), and 45 weeks of gastation and after (O45). Each orientation item was compared among three groups using the Kruskal-Wallis rank test.

2. Differences in LBW infants' reactions by type of sensory stimulation.

   The Kruskal-Wallis rank test was also employed for studying the difference in reactions among visual, auditory, and combined visual and auditory stimulation. The same type of analysis was performed for the U37, U45, and O45 groups.

3. Differences in reactions between inanimate and animate stimulation.

   OIV and OAV, OIA and OAA, and OIVA and OAVA were compared using Mann-Whitney's U test, to compare reactions between inanimate and animate stimulation. The same type of analysis was performed for the U37, U45, and O45 groups.

Results

Histograms representing the scores for each orientation itemsare shown in Fig. 1. Each distribution is approximately regular. The percentage of the total of each group was used as the vertical axis, because the numbers of samples was different for each age group.

1. Differences in LBW infants' reactions by age at assessment (measured in terms of gestation).

   The results of the Kruskal-Wallis rank test are shown in Table 2. Significant differences by age were observed for every item. However, there was no significant difference between U37 and U45, with only O45 registering significantly higher. This confirms that the NBAS orientation items were influenced by time, especially remarkable after 44 weeks of gestation.

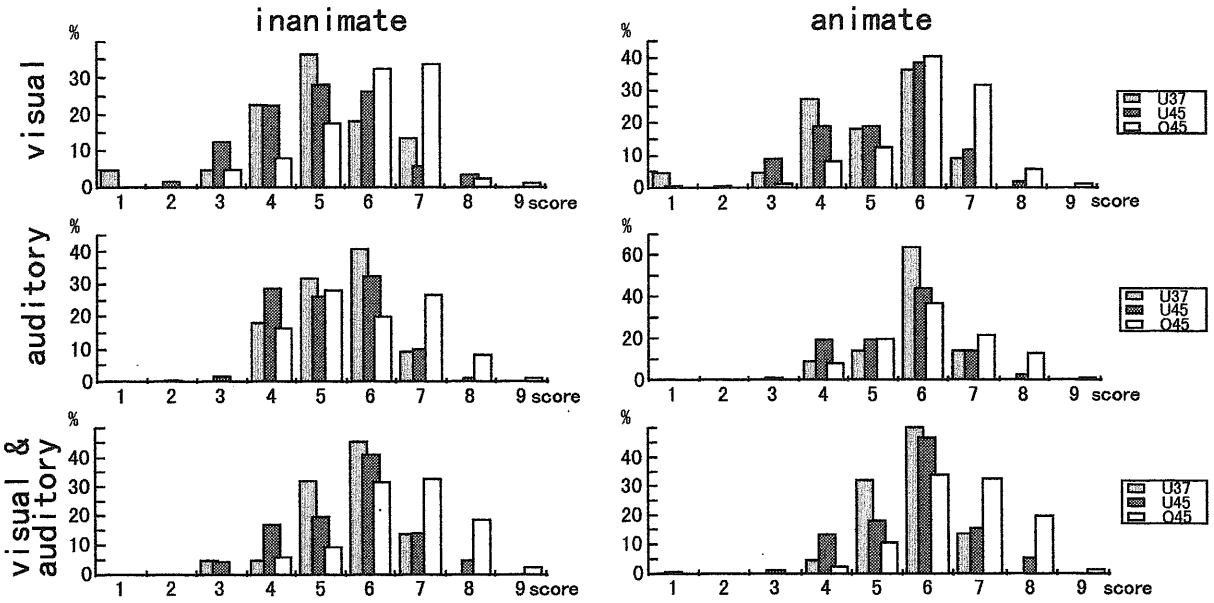

Fig. 1 Histograms of the scores for each orientation items

Table 2 Kruskal-Wallis rank test result of assessment opportunity

	tie corrected H	tie corrected p	mean rank		
			B36	B45	A45
O I V	35.072	<.0001	135.409	132.358	196.826
O I A	14.428	.0007	152.250	137.560	178.942
O I V A	39.324	<.0001	131.886	132.977	200.279
O A V	31.512	<.0001	122.977	137.649	195.775
O A A	13.553	.0011	159.477	140.334	179.897
O A V A	35.421	<.0001	127.182	134.887	197.151

2. Differences in LBW infants' reactions by type of sensory stimulation.

The results of the Kruskal-Wallis rank test are shown in Table 3. There were significant differences within both categories of inanimate stimulation and animate stimulation, when the subjects were treated as a single group. The stimulation that combined visual and auditory senses resulted in a higher score than auditory stimulation, and auditory stimulation resulted in a higher score than visual stimulation. When broken down by age, there was no significant difference by stimulation in the U36 group, and the order of visual & auditory, auditory, and visual in U45. Although the order of visual and auditory was reversed in O45, the difference was small, and infants clearly showed better reactions to combined visual and auditory stimulation.

Table 3 Kruskal-Wallis rank test result of sensory stimulation

	tie corrected H	tie corrected p	mean rank		
			visual	auditory	V & A
inanimate					
all	35.061	<.0001	415.559	436.881	531.524
B36	3.390	.1836	28.068	34.250	38.182
B45	24.571	<.0001	252.979	284.195	333.844
A45	15.593	.0004	120.424	113.715	154.360
animate					
all	19.228	<.0001	425.489	459.241	515.215
B36	5.544	.0625	26.364	38.409	35.727
B45	13.199	.0014	262.815	295.681	321.992
A45	9.559	.0084	122.916	120.684	151.326

3. Differences in reactions between inanimate and animate stimulation.

The result of the Mann-Whitney's U test is shown in Table 3. The score for animate stimulation was significantly higher in both visual stimulation and auditory stimulation when subjects were observed as a single group. There was no significant difference between inanimate and animate stimulation in combining visual and auditory stimulation. Broken down by age, there was no significant difference between U35 and O45, and only U45 exhibited significantly high scores for animate stimulation.

Table 4 Mann-Whitney's U test result

	tie corrected H	tie corrected p	mean rank	
			inanimate	animate
visual				
all	-2.650	.0081	291.336	328.365
B36	- .193	.8466	22.136	22.864
B45	-2.746	.0060	179.244	209.600
A45	- .920	.3575	84.576	91.309
auditory				
all	-3.720	.0002	283.074	334.510
B36	-1.650	.0989	19.568	25.432
B45	-3.258	.0011	176.549	212.084
A45	-1.509	.1314	81.378	92.557
V & A				
all	-1.310	.1902	300.482	318.518
B36	- .342	.7321	21.886	23.114
B45	-1.552	.1206	187.082	203.918
A45	- .145	.8847	85.971	87.029

Discussion

High scores on NBAS orientation items require that infants turn attention to stimulation and demonstrate smooth movement. The infant must have autonomic stability and maintain in awake state in order to tune attention to stimulation. The NBAS classifiee state into 6 stages, from deep sleep to crying, and the infant shows the best reaction to stimulation in state 4. The infant changes state to 1 or 6 from 4 in shutting out when he/she has overload stimulation. If the state adjustment of the infant is defective, his/her autonomic system is easily affected by stress.

It is necessary for the maturity of the central nervous system and motor system for smooth movement of the infant, and autonomic stability is needed to demonstrate this ability. The infant's energy for attention and adjustment of movement is limited due to the necessity of expending energy for autonomic stability, which is prioritized. NBAS orientation itemsoffer a clue to the maximum energy that is available for processes stimulation because it is carried out while supporting autonomic stability.

A significant difference was recognized between O45 and the other groups in the difference of LBW infants' reactions. Thus, it can be seen that O45 infants had greater capacity for stimulation processing due to progress in both environmental adaptation and autonomic stability.

In the intrauterine environment, fetuses show excellent performance due to the dependence of the autonomic system on the mother and the mother's limitation of stimulus. During normal birth, the infant's prebirth preparations for the extrauterine environment are activated and the autonomic system changes to extrauterine mode. But humans are assumed to be born in a physiologically immature condition, and normal birth neonates therefore acquire the ability to shut out stimulation in order to maintain autonomic stability in response to overload stress.

The subsequent child developmental process consists of child-environment interaction, i.e., learning. It is important for learning to be able to use energy for the adaptation to the extrauterine environment, especially in the early neonatal period.

There are many cases of LBW infants with stimulation processing problems. It is conceivable that normal birth infants are able to concentrate on the environmental adaptation while LBW infants must expend energy to complete a basis for adaptaton to the environment. This may become an element that inhibits learning. It is possible that the neonatal period of LBW infants has a very different meaning from that of normal neonates, since the LBW infant must complete its environmental adaptation abilities in the extrauterine environment. The apparent reactive deficiency of LBW infants may be due to the handicap imposed by a relative lack of energy. However, energy can be devoted to stimulation processing depending on the level of light /sound stimulation etc. It is necessary in evoking infant reaction for there to be proper conditioning of stimulation/environment as well as reactive reading ability.

The fact that combinatory and animate stimulations were suggest that LBW infants show satisfactory reaction to animate visual & auditory stimulation. This resembles to the normal approach that mothers carry out with their infants. The difference was in the level of stimulation, the environment, and infant handling. The environment for the NBAS assessment was set up so that the infant was in a quiet, semi-darkened room at a temperature of 22 to 27℃. Furthermore stimulation and handling were conducted softly in this study. However, this made it easy for mothers to overlook infant reactionsconsistingof eye movement and slight head movement.

The involvement of the mother is important for progress in every ability (not only physical growth), because child development is realized by child-environment interaction, and the most important environmental factor is the mother. However, mothers of LBW infants easily fall into child care anxiety when they overlook infant reactions. Mothers of LBW infants usually have the feeling that their infants are different from normal birth infants or that their infants are delayed. It is therefore undesirable to provede feedback to the mother that makes comparisons with normal birth infants.

One of the most important keys for therapists involved in aiding the development of LBW infants is to form positive mother-infant interaction. Intervention that reduces child care anxiety should be offered from a medical standpoint. Infant reaction can be made easily comprehensible to the mother through a demonstration of the NBAS orientation

items. It is also possible to show the mother environmental settings and effective stimulation for generating infant reaction. This may well result in conditions that are more suitable for learning.

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ブラゼルトン新生児行動評価の方位反応から見た低出生体重児の新生児行動

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要　旨　ＬＢＷ児の新生児行動を正常出生児を基準としてみることは母親の不安を増大させる可能性がある．ＬＢＷ児にはＬＢＷ児の新生児行動の特性があると考え，新生児行動評価（ＮＢＡＳ）を用いて検討した．103例のＬＢＷ児に対し，のべ316回のＮＢＡＳを行った．ＮＢＡＳの評価項目の中から方位反応に関する６項目を抽出し，1）評価時期による相違，2）刺激する感覚による相違，3）刺激の質（生命刺激か非生命刺激か）の相違について統計処理を行った．結果として，1）換算45週以降群は各項目の得点が有意に高かった，2）視覚と聴覚の組み合わせによる刺激への反応が高かった，3）視覚および聴覚への単独刺激において生命刺激への反応が高かった．

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