Letters

President's Intern Program

In 1971, Edward E. David, Jr., science adviser to the President, recognizing the problems that recent science graduates were having in finding employment, obtained from the Department of Labor about $4 million, which was made available on a matching basis in $7000 increments to universities and federal laboratories to employ recent graduates. The program was administered through the National Science Foundation. David reasoned that in time of temporary surplus it was to the nation's advantage to create a productive stockpile of this precious commodity.

As a result of the Administration's initiative, some 570 scientists and engineers have been employed where their training is of immediate benefit to themselves and to the nation. Many have been able during this period to broaden their experience so that they have become even more employable in the future to academic institutions, industry, and government.

Government expenditures in the spirit of the President's Intern Program should be encouraged. I hope that the scientific community appreciates what David has done in these programs and will contact the National Science Foundation and the Office of Science and Technology to urge continuation of President Nixon's Intern Program.

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Newborn Walking

In their report on the walking reflex in infants (21 Apr., p. 314) Zelazo, Zelazo, and Kolb quote the second edition of my book, *The Development of the Infant and Young Child*, published in 1963. If they had looked at the fourth or fifth edition (*1*), they would have noted that, long after the eighth week, babies show the walking reflex if the head is extended, that is, if a finger under the chin pushes the head back. Their observations, therefore, cannot be relied upon unless the posture of the child has been standardized with regard to the position of the head.

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Zelazo, Zelazo, and Kolb report results that suggest to them a critical period during which the early infantile walking response could be transformed from a reflexive to an instrumental action. This is accomplished by having parents support infants in a vertical, weight-bearing posture daily from the second through the eighth week of life, thus allowing active exercise of the walking and placing reflexes. They incorrectly assert that most infant intelligence tests are predicated on an invariant sequence of motor development. It is the motor rather than the mental scales or subscales that are so predicated (*1*). Their assumption that early walking is desirable and will produce primarily positive consequences can also be questioned. Early walking might prove on various grounds to be quite undesirable.

For example, at the naturally occurring mean age for solo walking (various norms place this from about 12 through 14 months), the average infant's posterior fontanel is closed and his anterior fontanel is closed or nearly closed (*2*). To accelerate the onset of walking would thus unnecessarily expose younger children, who have less complete fontanel closure, to possible central nervous system injury, particularly from penetration or incursion by sharp-edged or pointed objects. In New York City, for example, falls are the leading source of accidental infant mortality between the first and second years and are the second leading source between the second and third years (*3*). Accelerating the onset of walking might increase the incidence of falls by children under 1 year. The lesser protection afforded by the immature skull and other underdeveloped protective equipment of the younger child might contribute to an even higher mortality rate. Even now, children under 1 year more often die from accidents than do those of any other age group, and accidents lead all other causes of death in young children (*3*). It has been estimated that at least 100 crippling or disabling injuries are sustained for every accidental death (*3*). In absolute terms, more than 30 percent of children under 5 years are injured annually, and most of these injuries occur in the home (*4*).

Other potential injury sites are also probable. Leg girth, for instance, increases rapidly in boys up through about 1 year of age, after which the rate of growth declines (*5*). This is primarily due to a rapid increase in muscle mass, which would afford additional protection for the immature long bones. It is, in fact, infants with large leg-muscle masses (as determined radiographically) who become early walkers (*6*). Another complicating factor of risk for the "accelerated walker" is his underdeveloped inhibitory processes and immaturity in the recognition of danger.

Finally, accelerating walking may interfere with natural progressions of reflex development. Children who continue to exhibit certain early-appearing reflexes past the time of their normal disappearance often have associated developmental complications (*7*). One can wonder what happens to righting reflexes and equilibrium reactions in children who, as a consequence of "accelerated walking," spend less time than normal in crawling and so forth. The data required to answer such questions may not be available immediately; associated signs may not manifest themselves until the child is of school age—as appears to be the case with some specific learning disabilities. For this reason, such experimentation should be conducted only with long-term follow-up for possible deleterious after effects.

The work of Zelazo *et al.* might provide a model for therapeutic intervention in the case of some high-

risk infants who are known to have positive signs of motor dysfunction. Stimulating the walking and placing reflexes of some infants with cerebral palsy might improve their eventual mobility development, although this is only conjecture.

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Illingworth correctly notes that extending the infant's head backward produces walking movements at and beyond age 8 weeks. We controlled the posture of the head in both training and testing sessions; the infant's head was tilted slightly forward or held erect voluntarily, but never deliberately extended backward. Moreover, we explored this procedure with three 8-week-old control infants and found it difficult to elicit more than three or four steps in a 1-minute session. Infants in the active-exercise group elicited as many as 43 steps in the same period.

Gotts admonishes that it is the motor scale, not the mental scale, of infant development that is predicated on the assumption of an invariant motor sequence, but he overlooks the relation between the scales; they are not independent. Bayley herself reports ". . . a substantial positive correlation, usually of the order of .50 to .60, between the Mental and Motor Scales, in approximately the first twelve months of life . . ." (*1*). "Reaches for dangling ring at 3.1 months" is explicitly listed as a motor-related mental item, for example. The direction of the relation is also clear. Bayley explains that, "The development of manipulatory skills, which is seen most clearly in infancy, facilitates the development and employment of the various basic mental processes" (*1*). The assumption of an invariant motor sequence, therefore, also underlies a substantial portion of the mental scale.

The earlier walking established in our active-exercise group (mean of 10 months), although statistically significant, was within the range of normal development—about 9 to 18 months (*2*). Yet, Gotts expresses concern about the relation of early walking to accidental injury. We share his concern about childhood accidents but find much of his argument irrelevant to research on newborn walking. It is unreasonably fear-provoking and inaccurate to imply that walking in newborns is related to the ". . . more than 30 percent of children under 5 years" who "are injured annually. . . ." For example, he fails to differentiate the category of "falls" from that of "accidents" in general, which includes mortalities caused by motor vehicles (the most frequent agent nationally for children age 1 to 4), burns, drowning, poisons, and suffocation—the most frequent cause of death under age 1 (*3*). All falls are not the result of walking; this category also includes falls that occur when infants are crawling on stairs, porches, and furniture. Gotts overlooks one relevant study that specifically examined the role of early motor acquisition in accident- and nonaccident-prone children and found ". . . no gross differences . . ." between the groups (*3*). Accidents occur most often when children are unsupervised (*4*), and it seems more likely that the prevention of accidents will come with safer environments and closer supervision than from avoiding early walking.

We explicitly instructed parents to never *force* their infants to walk, on the belief that forcing any number of responses (eating or toilet training, for example) may be harmful. Infants are well equipped to express their displeasure, so it is noteworthy that, for the majority of experimental infants, standing and walking reliably inhibited, rather than caused, distress.

We tried to remove questions about infant walking from the realm of conjecture and include them in the domain of scientific inquiry. Not only is there no convincing evidence from our research or from other observations that deleterious consequences result from early exercise, but those cases that were followed reveal better-than-average motor performance. We emphasized that there

are many uncontrolled factors in follow-up observations, and the following cases do not demonstrate a causal relation.

Our initial pilot baby, who received active exercise of the walking reflex and opportunities for motor activity beyond the first 8 weeks, walked alone at 7½ months of age. He is now 6 years old and in excellent physical and intellectual condition. He has always showed good coordination—maneuvering a marble with a hockey stick at 14 months and riding a two-wheel bicycle with training wheels at 3½ years of age, for example. He combined as many as three words at 11 months and learned to read and write at 4 years of age. His thorough medical examinations have confirmed his sound physical and intellectual development.

Enough attention has not been given to McGraw's (*5*) pioneering research on Jimmy and Johnny, which included active exercise of the walking response during the newborn period and extensive training thereafter. She reported that Johnny performed more stepping actions as an infant than Jimmy or any of the other controls (*5*). Johnny did not walk sooner but showed ". . . greater agility and control . . ." as an infant (*5*, p. 86) and ". . . superior motor coordination . . ." at 6 years of age (*6*). X-rays of Johnny's legs showed that his skeletal growth at 32 months was normal (*5*). The boys were followed in the laboratory for 10 years, and no deleterious effects associated with early exercise were uncovered.

We have discovered some parents who on their own initiative have permitted their babies to walk and stand during the newborn period. One such parent reports that her three well-built babies walked alone at 7, 9, and 11 months. She described them as exceptionally independent infants, deliberate in their actions, intelligent, and rarely pesty. The children are now in their twenties and in sound health.

In general, Gotts's arguments are more conjectural than substantial, more alarming than accurate. For instance, he notes that children who exhibit reflexes ". . . past the time of their normal disappearance often have associated developmental complications. . . ." Our preliminary observations of active-exercise infants indicate that the Moro, grasp, and rooting reflexes disappear normally. Despite the evidence that walking in the active group at 8 weeks is a learned instrumental response, Gotts assumes that exercise preserves the walking reflex. It is unlikely that the newborn was equipped with reflexes simply to be tested in a neurological examination, although they serve that purpose well. It is possible that the Moro, grasping, walking, placing, and rooting reflexes are vestiges of our past and may have assisted the infant in survival—perhaps by helping him attain proximity to his mother (*7*).

Finally, we want to emphasize that it is not our desire to encourage all parents to walk their newborns, but to encourage more research on newborn walking.

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Graduate Education

Much credit is due Norman Hackerman (Editorial, 4 Feb., p. 475) for tackling some untested dogmas in American academia. It is high time that a serious examination was made of alternative models for graduate education.

Throughout the past two decades, while additions of graduate programs in the most unlikely places were made with the solemn intonation that graduate work and (even mediocre) research were needed to retain or produce the best undergraduate teachers, I asked deans and presidents for any study or evidence that this was true. I repeat my request in your columns. Dozens of small liberal arts colleges—the Wesleyans, Oberlins, Kenyons—managed to