Infant Mullen Scales of Early Learning (IMSEL)

The Infant Mullen Scales of Early Learning (Mullen, 1989) is an individually administered, norm-referenced test intended to assess mental and motor ability in infants from birth to 36 months of age. Basal and ceiling rules are used. The 37 items in the IMSEL are arranged in the following five scales.

Subtests

Gross Motor Base (GMB)  Items in this test require muscle control, balance, and coordination of large muscle activities. Examples of items (at the oldest age in the level where the item is placed) include lifting and rotating head (4 months), standing unassisted (14 months), and hopping on either foot (39 months).

Visual Receptive Organization (VRO)  Items in this test require visual localization, tracking, and scanning. Examples of items include inspecting own hand (7 months), finding a partially hidden ring (11 months), and nesting cups (27 months).

Visual Expressive Organization (VEO)  Items in this test require fine-motor skill (primarily manipulation), hand patterns, and prewriting readiness. Examples of items include reaching and holding with palmar grasp (7 months), taking a Cheerio with a refined pincer grasp (15 months), and stringing three or more beads (39 months).

Language Receptive Organization (LRO)  Items in this test require auditory discrimination and auditory/oculomotor ability. Examples of items include looking at a
person who is speaking (4 months), following simple commands (20 months), and comprehending action words (39 months).

**Language Expressive Organization (LEO)** Items in this test assess overall verbal expressive abilities. Some examples are smiling and making happy sounds (4 months), using one word (15 months), and orally repeating spoken numbers (33 months).

**Scores**

Clear and specific scoring criteria are provided for each of the 37 items. Suggested starting points are also given in the manual. Because rules for establishing ceilings and basals are used, children are not required to complete all items. Each scale receives a score (age scores, developmental stages, and normalized $T$-scores). Test ages are calculated by adding the number of passed items above the basal to the number of items below the basal and finding, on the test protocol, the number of months that correspond to this sum. No data are presented in the test manual to indicate how ages were assigned to specific items. Working backward from $T$-scores to test ages indicates that ages are only approximately correct.

Developmental stages are determined by locating the developmental stage (one through eight) in which the test age is located. (The basis and meaning of "developmental stage" is unclear, and no references are provided in the manual to suggest the theory underlying those stages.) The number correct can also be converted to $T$-scores by using tables based on the child's age. $T$-scores of 35 or less, in the author's judgment, indicate significant delay and warrant early intervention.

**Norms**
No sampling plan was described in the IMSEL manual. The norms, which required eight years to develop, consist of 1,231 children from 100 different sites. Norm tables are available for the following 16 age groups:

1. 1 month
2. 2 months
3. 3 months (children 3 and 4 months old)
4. 4 months (children 4 and 5 months old)
5. 6 months (children 6 and 7 months old)
6. 8 months (children 8 and 9 months old)
7. 10 months (children 10 and 11 months old)
8. 12 months (children 12 and 13 months old)
9. 14 months (children 14 and 15 months old)
10. 16 months (children 16 to 18 months old)
11. 19 months (children 19 to 21 months old)
12. 22 months (children 22 to 24 months old)
13. 25 months (children 25 to 27 months old)
14. 28 months (children 28 to 30 months old)
15. 31 months (children 31 to 33 months old)
16. 36 months (children 34 to 39 months old)
However, sampling was based on only 11 age groups. Because only the number of children in each sampling group is reported, it is not possible to determine the number of children in several norm groups. However, it appears that as many as 9 of the 11 norm groups are based on fewer than 100 children, an inadequate number. For geographic region, the representativeness of the normative samples varies by age; at some ages, the norms closely approximate the U.S. population; at other ages, they do not. The norms appear representative for gender, race (European American, African American, and Asian American), and parent occupation.

Reliability

Three types of reliability information are presented in the IMSEL manual: internal consistency, test–retest, and interscorer. Internal consistency of each subtest was estimated by coefficient alpha for three age groups: At 1–12 months, alpha ranged from .90 to .91; at 14–25 months, alpha ranged from .89 to .91; and at 28–36 months, alpha ranged from .83 to .89. Because alphas are calculated over a large range of ages, they are probably inflated by the correlation of age and item and are likely to overestimate the reliability of the subscales. Thus, the internal consistency of the subtests is sufficiently high to use the IMSEL for screening purposes but insufficient for making important educational decisions about children.

Stability was assessed by retesting 68 children; the average test–retest interval was two weeks. Stabilities are reported for most subtests at four age ranges: 10 to 12 months \((N = 24; r_{xx} = .70–.99)\); 14 months \((N = .15; r_{xx} = .93–.98)\); 16–25 months \((N = 16; r_{xx} = .90–.99)\);
Interscorer reliability was estimated for each subtest for ten age groups. Except for GMB at 1–2 months (where $r_{xx} = .78$), all subtests had interscorer agreement exceeding .90. Thus, the IMSEL appears to have excellent interscorer reliability.

Validity

Although test items seem to represent the target domains, the author presents no specific information about how specific test items were selected. Therefore, test users must judge the IMSEL’s content for themselves. Information about the criterion-related validity of the IMSEL is incompletely reported. The VRO, VEO, LRO, and LEO subscales correlate moderately ($r_{xy} = .5–.6$) with the total score on the Bayley Scales of Infant Development, and the GMB correlates almost perfectly ($r_{xy} = .95$) with the Bayley Motor Scale. Some evidence is also presented to suggest that the IMSEL is useful in discriminating children with normal development from children with developmental delays and in discriminating subgroups of children with developmental delays.

Because the IMSEL consists of five independent subtests and because no total score is used, we would expect some evidence of factor independence of the subtests. No factor analyses were conducted; rather, subtest intercorrelations were examined. However, in our opinion, the correlations do not suggest subtest independence.
Summary

The IMSEL is an individually administered, norm-referenced test intended for use with children from birth to 36 months of age. The test has five subtests: Gross Motor Base, Visual Receptive Organization, Visual Expressive Organization, Language Receptive Organization, and Language Expressive Organization. The IMSEL is constructed as an age test, but test ages can be converted to normalized $T$-scores. The technical information that appears in the test manual is very incomplete. With that caveat, the IMSEL's norms appear to be generally representative. Interscorer reliability is excellent, but stability varies by age. Internal consistency is generally suitable only for screening purposes. The information about content validity presented in the IMSEL manual is inadequate, although our inspection of the items suggests content very similar to that of other developmental measures. The IMSEL appears to discriminate youngsters who are developmentally delayed from those who are not.