



# The Association between Skill Development and Task Specificity among University Students

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## Abstract

*The aim of this study is to examine the relationship between skill development and task specificity. One hundred and eighty three male and female undergraduate students between 18 and 52 years old were randomly selected to participate. Performance on motor skills of participants was tested using four motor tasks from the Movement Assessment Battery for Children test (Movement ABC) and two tasks from the Test of Motor competence (TMC). Pearson's correlation was used to analyse the data to examine the relationship between the Movement ABC and TMC. Interestingly, relatively low correlations were found between the six selected motor tasks of the Movement ABC and the TMC and relatively higher correlations were found among the unimanual co-ordinations. The findings suggest that learning of particular motor skills is task specific. Furthermore, motor skills that involve the use of two hands tend to be more task specific than those which employ only one hand at a time.*

**Keywords:** Movement ABC, skill development, task specificity, test of motor competence.

## Introduction

Over the years, developmental psychologist and other scholars have disagreed on issues regarding the relationship between skill development and task specificity. These disagreements emerge apparently because while some researchers believe skill development is innate (i.e. not task specific)<sup>1,2</sup>, others believe skill development is learned or experiential (i.e. task specific)<sup>3,4</sup>. This disagreement has led to the development of the general motor ability hypothesis and the specificity of motor abilities hypothesis<sup>5</sup>. As motor behaviour (e.g. motor skills) is considered as an essential component for effective functioning in an individual's life, it could serve as a good measure of determining the specificity of skill development<sup>6</sup>.

The relative influence of genes and experience in determining the specificity of tasks is rooted in what has become known as the nature-nurture debate or the maturation-learning controversy. The nature or maturation theories were very prominent in the nineteenth-century believing that human development (e.g. skill development) is basically inborn devoid of environmental influences<sup>1,2</sup>. The nurture or learning theories on the other hand gained prominence in the twentieth-century and propose that human development is basically learned with no genetic influence, referring to the human mind as a blank slate or "tabula rasa"<sup>3,4</sup>.

In spite of the entrenched positions taken by the nature-nurture theorists, the past few decades has seen many researchers opting for an 'interaction' rather than an 'either/or' position regarding the maturation-experience debate of human development. Many

modern scientists are unaligned to either the nineteenth-century thinking that humans are destined biologically or the twentieth-century thought that the human mind is a blank slate<sup>7</sup>. For instance, the theory of probabilistic epigenesis<sup>8,9</sup>, and the theory of neural group selection<sup>10</sup>, seem to recognize the relative influence and importance of both maturation and experience on individual development.

**Probabilistic Epigenesis:** By probabilistic epigenesis, Gottlieb<sup>8</sup> refers to the bidirectional relationship between genetic activity, neural activity, behaviour, and environmental factors i.e. physical, social, and culture in determining an individual's development. What this suggests is that an individual's development should not be attributed solely to a single factor, but should be attributed to the collective interplay or coactions all factors (i.e. genetic activity, neural activity, behaviour, and environmental factors). Any effect of genetic activity and environmental factors is mediated by the levels of order remaining between them i.e. behaviour and neural activity<sup>10</sup>.

**Neural Group Selection:** Neural Group Selection posits that learning or individual development start in the brain (neural system) and is selectionist in nature, not instructionist, in contrast to computers, which carry out explicit symbolic instructions<sup>10</sup>. Edelman<sup>11</sup> and Lerner<sup>12</sup> assert that connections between neurons and groups of neurons arise through use and that the excess of neurons and the possible connections between them inadvertently leads to specificity as a result of competition. Practice of a task reinforces the neural networks used in specific tasks<sup>13</sup>. Also, it has been reported that an effect similar to that experienced for special skills occurs due to constant practice<sup>14</sup>.

The dynamic systems approach incorporates both the probabilistic epigenesis theory and the theory of neural group selection in explaining motor development. Fogel<sup>15</sup> describes the dynamic system as a method that conceptualises the mutuality of individuals and their environment. In Fogel's<sup>15</sup> view, there are organized patterns of behaviour in dynamic system perspective and these emerge from the mutual relationship between constituents coming from the individual and the environment and are not the result of a previous maturational plan within the individual. The dynamic systems perspective does not make a distinction between constituents from the individual and from the environment because both sets of constituents are part of the same system and enter into the formation of attractor patterns<sup>16</sup>.

Drowatzky and Zuccato<sup>17</sup> investigated the interrelationships between six measures of static and dynamic balance and found that among the 15 correlations computed, only the correlation between sideward leap and bass stepping-stone test was found to be significant, but this was relatively low, suggesting very little transfer between skills that require static balance and skills that require dynamic balance. The effects of practice composition on acquisition and transfer of the underhand volleyball serve was investigated and the results showed partial support for specificity of learning and the contextual interference hypotheses<sup>18</sup>. Also, resistance exercises performed on unstable equipment, which require a high level of static balance, may not transfer to sports skills which require a high level of dynamic balance supporting the notion of the specific of tasks<sup>13</sup>. When leaning or experience is associated with motor skills there is a high likelihood of it being task specific<sup>19</sup>. Additionally, the effect of practice throwing was compared with specific weights i.e. specificity principle, or with variable weights i.e. variability of practice, for a short practice period and results showed that the increased workload i.e. practice is a more important factor than the type of practice (specific or variable) in enhancing performance<sup>20</sup>.

The purpose of this study was to examine the interrelationships among some selected measures of motor skills to ascertain if skill development is task specific. From the foregoing discussion it is pertinent to hypothesise that skill development is task specific. Therefore, it is hypothesised that relatively low associations is expected among the selected measures of motor skills.

## Methodology

**Participants:** A total of 183 right handed undergraduate students of the Norwegian University of Science and Technology participated. Ninety-four (51.4%) of them were females and eighty-nine (48.65%) were males with their ages ranging from 18 to 52 years (M = 23.05, SD = 4.66). In order to ensure consistency in lateralization, a simple random sampling technique was used to select the needed right-handed participants from the population by using the Handedness Inventory. The Handedness Inventory is a measurement scale used to assess the dominance of a person's right or left hand in everyday activities, sometime referred to as laterality<sup>21</sup>.

**Instruments and Procedure:** The Movement Assessment Battery for Children test (Movement ABC) and the Test of Motor Competence (TMC) were the main instruments used. The Movement ABC and TMC were designed as tools for identifying individuals with motor co-ordination problems. The Movement ABC<sup>22</sup> and TMC<sup>23</sup> both give a quantitative and a qualitative assessment of the motor competence in a child's daily life through a spectrum of motor skills, although the TMC also tests general motor competence in addition. The movement ABC subtasks used in this study were i. treading Beads (TB), ii. threading nuts on bolt (TNB), iii. posting coins right (PCR) and posting coins left (PCL), iv. placing pegs right (PPR) and placing pegs left (PPL). Also, two tasks of the TMC were used: placing bricks right (PBR) and placing bricks left (PBL) and Building Bricks (BB). On each item, a possible score range between 0 and 5, with higher scores indicating worse performance. Item scores are summed to obtain scores on subtests to produce the total score which ranges between 0 and 40. The number of seconds used to complete each task was the raw data of this study.

After the University had given ethical approval for the study to be conducted, participants were initially briefed about the purpose and significance of the study and were further told that participation is voluntary. Upon agreeing to participate, each subject was given the six tasks from the Movement ABC and the TMC to carry out in a quiet room. The guidelines and set-up procedure for administering the Movement ABC and TMC were followed accordingly<sup>22,23</sup>.

## Results and Discussion

**Results:** SPSS 16 was used to analyse the data. Pearson product-moment correlation analysis was conducted to examine the association between the six selected measures of the Movement ABC and TMC. The probability value of 0.05 was considered to indicate a statistically significant relationship. Table 1 below shows the descriptive statistics of the Movement ABC and TMC.

**Table-1**  
**Descriptive Statistics of the six subtasks of the Movement ABC and TMC**

	Minimum	Maximum	M	SD
Age	18	52	23.05	4.66
Posting coins Right	9.00	22.22	13.40	2.19
Posting coins Left	9.96	25.25	14.66	2.34
Placing Pegs Right	10.87	34.78	18.63	3.06
Placing Pegs Left	13.43	43.90	21.71	4.07
Placing Bricks Right	13.71	30.93	20.36	3.02
Placing Bricks Left	16.75	31.16	22.50	3.32
Threading Beads	12.15	47.00	28.24	4.44
Threading nuts on bolt	6.52	46.61	23.22	10.23
Building Bricks	8.30	22.00	12.63	2.53

**Table-2**  
**Correlation between the six subtasks of the Movement ABC and TMC (N =183)**

	PCL	PPR	PPL	PBR	PBL	TB	TNB	BB
PCR	.610**	.383**	.280**	.396**	.298**	.422**	-.197**	.192**
PCL	--	.369**	.261**	.228**	.361**	.272**	-.244**	.120
PPR	--	--	.452**	.298**	.214**	.373**	-.214**	.143
PPL	--	--	--	.210**	.299**	.277**	-.156*	.152*
PBR	--	--	--	--	.573**	.282**	.319**	.564**
PBL	--	--	--	--	--	.308**	.279**	.545**
TB	--	--	--	--	--	--	-.100	.253**
TNB	--	--	--	--	--	--	--	.400**

\*  $p < 0.05$ , \*\*  $p < 0.01$  (2-tailed).

PCR = Posting Coins Right; PCL = Posting Coins Left; PPR = Placing Pegs Right; PPL = Placing Pegs Left; PBR = Placing Bricks Right; PPL = Placing Bricks Left; TB = Threading Beads; TNB = Threading Nuts on Bolt and BB = Building Bricks.

From table 2 above, it can be observed that although there were some significant relationships between the Movement ABC and TMC subtasks, these correlations are relatively low. Also, it can also be observed that the highest correlation was between PCR and PCL and the lowest correlation was between TB and TNB. A very interesting finding is the relatively low correlation found between the bimanual co-ordinations; TB - TNB, TB - BB and TNB-BB as well as the relatively higher correlations found between the unimanual co-ordinations; PCR - PCL, PPR - PPL and PBR - PBL of the Movement ABC and TMC test. The relatively low correlations suggest that motor skills are somewhat task specific. The hypothesis of this study is therefore supported.

**Discussion:** The results of this present study provide evidence to support the proposition that skill development is task specific. Relatively low correlation coefficients were found between the selected measures of motor skills of the Movement ABC and TMC tests indicating that there is very little relationship between the motor skills assessed in this study. The results also indicate that skill development involving bimanual co-ordination tasks are more task specific than skill development involving unimanual co-ordination tasks. In other words, motor skills which involve the use of two hands tend to be more task specific than those which employ only one hand at a time.

The findings of this study are consistent with that of previous findings suggesting the specificity of skill development<sup>13, 17, 19</sup>. These previous studies discovered relatively low correlation coefficients, thus putting forward that skill development is not general, but specific to the type of task being learned or performed. This confirms Edelman's theory on neural Darwinism - that practice of a task reinforces the neural networks that are used for particular task such that the behaviour being practiced has a higher likelihood of reoccurring<sup>11</sup>.

Theoretically, the relatively low correlations between the six selected measures of motor skills imply that practicing each task reinforces the neural connections involved in that particular task which in turn makes it possible for this behaviour to reoccur in the future. As a consequence, it could be argued that task-specific training is necessary because the neuro-motor and perceptual-motor subsystems involved in that specific task needs to be activated<sup>24</sup>. What this could also imply is that because of training, each motor task has become specific due to the strengthened of neural connection in each specific task. As a result, each task has little or no relationship with the other motor tasks, hence leading to relatively low associations.

The specificity of skill development as this current study investigated is very important if we are to understand the dynamics involved in individual development. Consequently, it is plausible to say that no individual was born with predispositions not to do well in certain tasks. Practice or learning plays an important role in skill development<sup>8,25</sup>. For example, individuals or student were not born to do well in all aspects of mathematics (e.g. algebra, arithmetic etc.). An individual who does well in all aspects of mathematics may have practiced or become good in it through experience or simply, the passage of time. Under normal circumstances, an individual will be better in one aspect of mathematics than the other due to the specificity of various aspects of mathematics. As suggested by Haga<sup>13</sup> when embarking on the development of a set of skills for children, each skill should be treated as specific and as such we must decide what skills are necessary and important for children to learn and ignore the rest. What this also means is that skill development should not be seen in general terms (e.g. mathematics) but should be looked at from its specifics (e.g. algebra).

It can be concluded fairly from the foregoing discussion that skill development is task specific. The learning of any type of skill should be treated independently since other similar skills may have no direct relationship at all with it. This notwithstanding, as this was an experimental study coupled with the relatively small sample size used, these findings should not really be generalised to the whole population. However, some

inferences could be made to indicate the causal link between skill development and task specificity. It will be very interesting for future studies to go beyond motor skills and task specificity to examine the associations between cognitive skills (e.g. mathematics, reading, drawing etc.) or social skills (e.g. active listening, confident stance; standing up straight but not at attention, relaxed manner; not too tense, not falling asleep, remembers and uses names during conversation, etc.) and task specificity.

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