

Research Article

The Stability of Mastery Motivation and its Relationship with Motor Competence Influenced by Gender in Preschoolers

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Abstract

Mastery motivation (intrinsic drives to explore and master one's environment) is a key aspect of development in children. However, evidence about the stability of parental perceived mastery motivation and its relations with motor competence affected by gender was inconclusive. The aims of this study were to investigate the influence of gender on (1) The stability of mastery motivation; and (2) The associations between motor competence and parental perceived mastery motivation from 2-year to 5-year of ages in children developing typically. Data of 94 children developing typically from a birth cohort study at Northern Taiwan from 2- to 5-year old. Mastery motivation measured by four indicators (Object Persistence; Gross Motor Persistence; Mastery Pleasure; Negative Reaction) from the Dimensional Mastery Questionnaires at 2 and 5 years of age. Motor competences were measured by motor developmental quotients from the

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Comprehensive Developmental Inventory for Infants and Toddlers at 2 years of age. Pearson correlations were used to examine the two purposes ($\alpha=0.05$; two-tailed). There was moderate stability of mastery motivation from 2 years to 5 years of age ($r = .36 - .41, p < .05$) and girls' stability was higher than boys'. The 2-year motor competence could significantly predict 5-year Gross Motor Persistence for boys ($r = .33, p < .05$), but no predictive relationship for girls. It seemed that boys' early motor competence influence later parental perceived mastery motivation. Children's gender would influence the stability of the perceived mastery motivation and the relationships between motor competence and parental perceived mastery motivation. Such information could help clinicians in parental education for children with and without developmental delay.

Keywords: Child development; Gender; Mastery motivation; Motor competence

Introduction

Mastery motivation is defined as a multifaceted, psychological force to stimulate the child's attempt to master the tasks that are moderately challenging for him or her. Children's mastery motivation is also a force that energizes, directs and sustains goal-directed behavior [1,2]. Proposed the model of children's motivation, which demonstrated mastery motivation, provides a person a sense of satisfaction that promotes further development of competent functioning while acquiring challenging skills [2]. Therefore, understanding its relationships with developmental outcomes or influencing factors are important.

Construct of mastery motivation

Mastery motivation is manifested in various behaviors as the child develops. The construct of mastery motivation can be measured by two indicators in three domains. The two indicators are: (1) Instrumental mastery motivation which is represented by persistence, the duration of goal-directed behavior; and (2) Expressive mastery motivation which is referred to as pleasure or positive affect during or after goal-directed behavior [3]. The three domains are object (children's attempt to master toys), social (children's attempt to interact with others) and gross motor tasks (children's attempt to master physical skills).

Assessment tools of mastery motivation

Both individualized challenging structured tasks and the Dimensions of Mastery Questionnaire (DMQ) have been commonly used to measure children's mastery motivation [4]. The former one is to measure object (cognitive) mastery motivation by counting numbers of task-directed behaviors and positive affect for 4 minutes while observing the child's behavior in manipulating three types of tasks (puzzles, shape-sorters and cause-effect tasks) that are moderately challenging for that child [5]. The latter one is to have a parent rate his/her perceptions of the child's behavior in three domains of mastery motivation. Although behavioral assessment might be more objective than parental rating, it observes mastery motivation for only a small amount of time in a single setting. On the other hand, the advantages of the caregiver questionnaire are: it can measure more than one

domain of mastery motivation and it doesn't require much testing time or a special room. In addition, the DMQ is quicker and easier to use than the more complex behavioral assessment. Therefore, we used the DMQ to measure mastery motivation in the present study.

Gender difference in stability of mastery motivation

The stability of mastery motivation in early life is inconclusive from the results of previous studies. While two previous studies showed that mild stability of object persistence occurs from 6 to 12 or 14 months of age [6,7]. Another study found no significant correlation between 12- and 20-month-old on mastery motivation [8]. Furthermore, the stability of mastery motivation might be affected by gender, age, type of tests or tasks used to measure mastery motivation [9,10]. Showed moderate stability in persistence on a cause-effect task from 1 to 3 years of age in boys, but not girls. Previous research reported moderate stability on a shape-sorter task from 2 to 8 years of age in girls, but not boys [11,12], have also found moderate stability of perceived total persistence from 2 to 3 years and girls' stability was higher than boys'. Regarding stability of expressive mastery motivation, poor stability from 12 to 20 months of age was revealed [8]. However, recent study found moderate stability of perceived mastery pleasure and negative reaction to failure in typical-developing children aged from 2 to 3 years. The separate correlation coefficients between boys and girls were not significantly different [12]. These inconclusive results might be partially due to the natural features of the mastery motivation across different phases of development [13]. Proposed that explicit behavior characteristics of instrumental and expressive mastery motivation would change through the three phases, namely, birth to 9 months for the first phase, 10 to 22 months for the second phase and 23 to 36 months for the third phase. For example, the instrumental mastery motivation in the first phase is manifested by awareness of the contingency between action and response, preference for novelty and using familiar means to master the task. However, the instrumental mastery motivation in the third phase would be featured by persistence at moderately challenging tasks, planned attempts to master multistep tasks and preference for tasks anticipated to be solvable [13]. Therefore, stability of mastery motivation should be further investigated using the same test in the same developmental phase with separate gender groups to avoid possible confounders. Moreover, previous studies were limited to instrumental object mastery motivation: The single indicator of the specific domain in mastery motivation.

Gender difference on the relationships between motor competence and mastery motivation

Numbers of studies have been examined the relationship between cognitive competence (as measured by performance on a standardized test of intellectual functioning) and instrumental mastery motivation (as measures by persistence in goal-directed behaviors with structured tasks) in young children developing typically [6,7,14-16]. Investigators have confirmed that cognitive competence is significantly correlated with instrumental mastery motivation in children at 12 or 14 months of age [6,7,15,16,]. Furthermore, several studies showed that association between cognitive competence and object mastery motivation were influenced by two genders [9,10,15].

Regarding to association between motor competence and instrumental mastery motivation in young children developing typically, three previous studies indicated that there are no significant relationships between psychomotor development and mastery motivation (as measured with persistence at moderate challenging tasks) in children

developing typically (as measured by performance on a standardized test of psychomotor functioning) [7,15,16]. The possible reasons might be due to limitation of behavioral assessment of mastery motivation and standardized developmental test. In addition, most previous studies indicated the possibility of domain-specific pattern of relations between competence and mastery motivation. That's to say that cognitive competence is significantly associated with object mastery motivation. It might be also reasonable to assume that there is a significant relationship between gross motor mastery motivation and motor competence in young children. However, only one study showed positive association between physical activity and gross motor mastery motivation in 5-yr children.

Regarding to expressive mastery motivation, two studies indicated that there is no significantly related with cognitive or motor competence from 6 months to 12 to 14 months of age in infants and toddlers with typical development [7,16]. The possible interpretation is emotional expression might be not well-developed at infancy stage. However, showed that expressive mastery motivation measured with parental questionnaire was significantly correlated with physical activity in children aged 5-6 years old the inconsistent results might be due to children's ages, different measures of mastery motivation and different genders of association between mastery motivation and motor competence. As a result, it is necessary to investigate the mastery motivation and motor-skill competence in children from toddler age.

Toddler age is viewed as the time children are beginning to be more self-regulated in their production of outcomes and to perceive themselves as agents of action in behavioral-event contingencies [17]. Furthermore, most previous studies investigated children at infancy age. Few studies examined early competence and later mastery motivation in children aged over two years old.

The purposes of this study were to investigate the influence of gender on (1) The stability of mastery motivation; and (2) The associations between motor competence and parental perceived mastery motivation using the DMQ from 2-year to 5-year of ages in children developing typically. The DMQ has been designed to assess the two indicators and three domains of mastery motivation for children [18]. Specifically, we tested the following hypotheses:

- 1) We expected that the correlation coefficients between DMQs of 2- and 5-year-olds would be different between the two genders.
- 2) We expected that the correlation coefficients between 2-year motor competence and mastery motivation at 2 and 5 years would be different between two genders.

Methods

Participants

The study was part of a birth cohort study (Taipei Birth Panel Study). Informed consents, approved by the Human Subjects Review Committee at one medical center, were obtained from all the parents (N=335) who had arranged to give birth to a child at that medical center during the period between May 2004 and December 2006. Appropriate data of paren-child dyads were selected from the existing dataset to answer the two research questions: stability of DMQ and home environmental impact on DMQ. The inclusion criteria for the present study were: Full-term (gestational age 37-42 weeks), birth weight \geq 2500 g, no known perinatal or postnatal complications (Apgar score \geq 8 at 1 min and 5 min, no hospitalization since birth) and DMQ data

available at 3 years of age. Infants with preterm and known complications were excluded owing to these factors influencing the development of mastery motivation and rearing practice. The exclusion criteria were also defined as follows: Developmental Quotient (DQ) of the whole test of the Comprehensive Developmental Inventory for Infants and Toddlers (CDIIT) less than 85, congenital defects, chronic diseases, neurological disease, orthopedic disease, or vision and hearing problems found before 3 years of age. Finally, a total of 113 children met the selection criteria. Among the 113 infants, 17 cases did not complete DMQ at 2 and 5 years of age due to moving to other countries (N=2), parental refusal (N =5), loss of contact (N = 2), or other reasons (N = 8) and invalid DMQ scores at 2 years and 5 years. Therefore, only data of 94 infants were used for statistical analysis in the present study.

Measures

Dimension of Mastery Questionnaire-Chinese version (DMQ-C)

The DMQ-C is a Chinese-translated DMQ with the permission of the questionnaire developer, Professor GA. Morgan. The toddler version (aged 1.5-5 years) was used in this study [19]. The toddler version of DMQ-C requires a parent to rate her/his perceptions of the child's behavior in mastery contexts [19]. The DMQ-C contains 45 items and each item is a five-point Likert scale (1 = not typical at all; 3=similar to children with same age; 5=typical) [20]. The 45 items were clustered into seven subscales: four instrumental indicators (Object-Persistence, Gross-Motor-Persistence, Social-Persistence-Adult and Social-Persistence-Child), two expressive indicators (Mastery-Pleasure and Negative-Reaction to Failure) and one general competence subscale which is not considered an aspect of mastery motivation. The score of each subscale was obtained by averaging item scores in that subscale. Therefore, the range of scores of each subscale is between 1 and 5. The averaged score of the four instrumental indicators represented the Total Persistence Score (Total Persistence) and the averaged score of Social-Persistence-Adult and Social-Persistence-Child was the Total Social Persistence score (Social Persistence). Except for the Negative-Reaction subscale, the higher the score, the higher the motivation is [19]. DMQ has acceptable internal consistency (Cronbach alphas >.7). Its concurrent validity with structured tasks is moderate in children with Down's syndrome ($r=.42$) [1]. Validity of the DMQ was also demonstrated by distinct differences in mastery motivation between low- and high-risk infants [18].

The Comprehensive Developmental Inventory for Infants and Toddlers (CDIIT)

This inventory is a diagnostic developmental test. It was standardized on a norm sample of 3703 Taiwanese children, aged 3-72 months, randomly selected according to age, sex and geographic regions. It contained five developmental domains (cognition, language, motor, social and self-help). The CDIIT raw scores can be transformed into the Developmental Quotients (DQs). DQs of ≥ 85 mean development within normal range. Previous studies have shown that the CDIIT possesses acceptable reliability and validity [21-23].

Procedures

The health conditions (birth weight and gestational age) and sex of the enrolled newborn and the Social Economic Status (SES) of the parents were collected at birth. Around the 2nd birthday of the child,

the parents were asked to fill out the DMQ [19] and informed of arranging the follow-up with the CDIIT at the laboratory. Around the 5th birthday of the children, the data from the DMQ were collected again. Testers and coders at each of the ages were blind to the children's or families' information at the previous ages.

Analysis

The measurable variables were examined for normality and analyzed using the Statistical Package for Social Science version 13.0. The stability of mastery motivation was analyzed by Pearson correlation analysis because most of the variables were distributed normally. Fisher r-to-z transformation analysis was used to compare the correlation coefficients between genders [24]. Pearson correlation was used to examine the associations between motor competence and mastery motivation. The statistical significance was set at $\alpha = .05$ (two-tailed).

Results

Results are presented for the correlation analyses associated with our hypotheses [25].

Demographic and basic data of participants

Demographic and basic data of participants are shown in (Table 1). The means of the four instrumental indicators and Mastery Pleasure subscale of DMQ were all above 3, but Negative Reaction was less than 3. That means the parents perceived the motivation of this sample relatively higher compared to their children's peers on average. There were no significant differences in subscales of DMQ between genders ($p>.05$) except that girls had lower negative reaction to failure than boys. Among all the 94 selected families, 98 percent of them had annual income more than 400,000 NTD (approximately 13 thousands US dollars) and 50 % of them more than one million NTD. The distribution of SES levels were two (2%), twenty-nine (28 %), fifty-three (52%), eleven (11%) and one (1%) for level I to V respectively, with level I representing the highest SES. The SES of the remaining six (6%) families was not available [26].

Characteristics	Whole group (N=94)	Boys (N=41)	Girls (N=53)	P
Ages of children, months				
At 2 years of age	27.9 (2.1)	27.6 (2.2)	28.1 (2.1)	0.28
At 5 years of age	70.2 (3.3)	69.9 (3.2)	70.5 (3.3)	0.36
DQ at 2 years of age	102.1 (9.2)	99.8 (9.0)	104.0 (9.0)	0.03
DMQ at 2 years of age				
Total Persistence	3.76 (0.47)	3.68 (0.36)	3.83 (0.53)	0.12
Social Persistence	3.93 (0.53)	3.88 (0.49)	3.96 (0.56)	0.47
Mastery Pleasure	4.40 (0.50)	4.41 (0.50)	4.44 (0.51)	0.81
Negative Reaction	2.99 (0.63)	3.15 (0.53)	2.87 (0.69)	0.04
DMQ at 5 years of age				
Total Persistence	3.60(0.56)	3.55 (0.55)	3.64 (0.57)	0.43
Social Persistence	3.79 (0.63)	3.70(0.62)	3.85 (0.63)	0.27
Mastery Pleasure	4.06 (0.67)	4.02(0.69)	4.10 (0.66)	0.57
Negative Reaction	3.08 (0.57)	3.26 (0.59)	2.94 (0.52)	0.01
Maternal age, y	32.5 (3.9)	32.2 (3.8)	32.6 (3.9)	0.63

Table 1: Means and Standard Deviations (in Parentheses) for Characteristics of Children-Parent dyads in the Stability Part of the Study.

Note: DMQ= Dimensions of Mastery Questionnaire; DQ: Developmental Quotient.

Stability of mastery motivation

Correlation coefficients between 2 and 5 years on the same DMQ-C subscales for the whole group and for the two genders are presented in (Table 2). Total persistence, Gross motor persistence and mastery pleasure had significant stability in both genders. Furthermore, the stability coefficients were significantly higher for girls than for boys in social persistence and object persistence subscales. There was no significant correlation between 2 and 5 years on negative reaction to failure subscale in both boys and girls. Therefore, hypotheses 1 were partially supported by the results of the present study.

DMQ-C subscales	Whole group (N=94)	Boys (N= 41)	Girls (N= 53)	z ^a
Total Persistence	0.41**	0.23	0.51**	1.53
Social Persistence	0.36**	0.12	0.50**	1.99*
Object Persistence	0.38**	0.05	0.50**	2.32*
Gross Motor Persistence	0.40**	0.32*	0.45**	0.71
Social Persistence with Adult	0.33**	0.19	0.40**	1.07
Social Persistence with Children	0.36**	0.30	0.40**	0.53
Mastery Pleasure	0.40**	0.44**	0.36**	0.44
Negative Reaction	0.17	0.01	0.20	0.90

Table 2: Correlation Coefficients between the Same Subscales of the DMQ-Cat 2 and 5 Years of Age for the Whole Group and for Both Genders Individually.

Note: DMQ-C, Dimension of Mastery Questionnaire-Chinese version; az score by Fisher %z transformation to compare correlation coefficients between boys and girls; **p* < .05, ***p* < .01, by Pearson correlation test.

Correlation between 2-year motor competence and 2-year and 5-year mastery motivation

The correlation coefficients between various indicators of 2-year DMQ-C and 5-year DMQ-C and 2-year motor developmental quotient are shown in (Table 3). While the 2-year motor developmental quotients were significantly correlated with the 5-year DMQ-C Gross Motor Persistence in boys, the 2-year motor developmental quotient did not significantly predict subscales of 5-year DMQ-C. 2-year motor developmental quotients were not significantly correlated with the DMQ-C object Persistence, Mastery Pleasure and Negative Reaction to Failure in boys and girls. Hypothesis 2 of this study was partially supported. Note that gender contributed significantly in the association between early motor competence and later mastery motivation.

Discussion

In this study, we examined the stability of mastery motivation and its relationship with motor competence in children developing typically. For stability of mastery motivation, moderate stability of instrumental mastery motivation was found from 2 to 5 years in both genders, except for no significant stability of Total Persistence, Social Persistence and Negative Reaction subscales in boys. Girls had higher stability of mastery motivation than boys. Regarding relationships between motor competence and mastery motivation, 2-year motor developmental quotient appeared to have a positive impact on 5-year Gross Motor Persistence in boys and no significant associations of motor competence and mastery motivation were found in girls. It seemed that boys' early motor competence influence later parental perceived mastery motivation.

Variables		Motor developmental quotient		
		Whole group (N=94)	Boys (N=41)	Girls (N=53)
Object Persistence	2-year	-.06	-.16	-.01
	5-year	-.02	.22	-.17
Gross Motor Persistence	2-year	.02	.05	.01
	5-year	.06	.32*	-.11
Mastery Pleasure	2-year	-.05	.05	-.11
	5-year	-.07	.14	-0.23
Negative Reaction	2-year	.04	.21	-.06
	5-year	.02	-.06	0.09

Table 3: Correlation Coefficients between the 2-year Motor competence and Mastery Motivation at 2 and 5 Years of Age for the Whole Group and for Both Genders Individually.

Note: Significant results are in bold type; **P* < .05, by Pearson correlation test (two- tailed). DMQ-C, Dimension of Mastery Questionnaire-Chinese version.

This is the first longitudinal study to follow up children from 2 years to 5 years to elucidate the stability question as well as the factors that influence mastery motivation influenced by genders. The results demonstrated that parental perception of girls' mastery motivation was generally more stable than boys during the toddler years and the factors that influenced mastery motivation were motor competence at specific ages. The DMQ measures parental perceptions of the young child's mastery motivation; it is not necessarily the child's actual motivation. However, parental perception of children's mastery motivation is important in itself because these perceptions would influence the adults' interactions with the child and even the child's behavior.

This study confirmed that the development of mastery motivation from 2 to 5 years of age was stable. This might be because these two ages all belong to the third phase of mastery motivation development [13]. This study also showed that the stability of mastery motivation was higher in girls than boys. This finding is partly in line with the study of Gilmore [11,12], but is contradictory to the results of [10]. Different age intervals, measures for testing stability between our study and the two other studies made the comparisons problematic. Possible explanations for higher stability in girls might be that girls are more compliant and consistent than boys in their approach to tasks by following adults' command [9].

Regarding the early factors correlated with children's mastery motivation at later ages, the results of two previous cohort studies showed that the cognitive or motor competence at 6 months of age had significant influences on object mastery motivation at 12-14 months [16,6]. However, the results of the present study demonstrated that the motor competence at 2 year seemed to have a positive impact on Gross Motor Persistence of DMQ at 5 years of age. This study also found gender difference in association between motor competence and mastery motivation [15], found that association between early MM and later motor competence was different in boys and girls and different ages. For boys and girls, 6-month mastery motivation could predict 30-month motor DQ. For girls, mastery motivation at 12 months could predict motor quotient at 30 months, but not boys. Some limitations of the present study are as follows. (1) Mastery motivation measured by DMQ-C might be affected by parental perception and not be specific to moderately challenging tasks. However, a

previous study showed its concurrent validity with structured tasks [10]. This sample may have been too homogenous, receiving a medium to high quality of home environment. Therefore, the results of this study might be unable to be generalized to high-risk families. (3) The small sample size made subgroup analysis difficult.

Conclusion

In conclusion, the stability of instrumental and expressive mastery motivation from 2 to 5 years of age was moderate and girls were more stable than boys. Children's gender would influence the stability of the perceived mastery motivation and the relationships between motor competence and parental perceived mastery motivation. Such information could help clinicians in parental education.

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Author's Contribution

Study concept and design: Wang, Liao and Hwang
Acquisition of data: Hwang, Liao.
Analysis and interpretation of data: Wang, Liao and Hwang.
Drafting of the manuscript: Wang and Liao.
Critical revision of the manuscript for important intellectual content: Liao, Wang, Hwang, Chen and Morgan.
Obtained funding: Wang.

Financial Disclosure

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