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Mastery Motivation in Infancy and Early Childhood: The Consistency and Variation of Its Stability and Predictability of General Competence

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Abstract

Infant mastery motivation has been regarded as an important developmental precursor for later achievement and adaptability. This longitudinal study examined the cross-wave stablility of mastery motivation and its association with general competence in different periods of infancy and early childhood. Fifty-three 10-month-old infants and their mothers participated in this study. Children's mastery motivation and general competence were rated by mothers using the Dimensions of Mastery Questionnaire at each wave of testing at 10, 21, 26, 37, and 53 months. The cross-wave analyses of stability and predictability were conducted on three sets of 16-month intervals (i.e., 10 to 26 mo., 21 to 37 mo., and 37 to 53 mo.) and from 10 to 53 months of age. Results indicated that children's task persistence, especially in the cognitive and physical domains, remained stable throughout infancy and early childhood. The domain of negative reactions to failure showed consistent stability in all three sets of 16-month intervals while mastery pleasure was only stable when children were younger than two years of age. In terms of the predictability of mastery motivation, task persistence remained a significant predictor of competence across different periods in infancy and early childhood even after controlling for participants' demographic backgrounds and prior competence.

Keywords: competence, infants, longitudinal studies, mastery motivation, preschool children, stability

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Introduction

Mastery motivation is rooted in the desire to effectively interact with environment (i.e., effectance motivation; White, 1959) and acts as a propeller for children to master problem-solving tasks. Previous studies have indicated that individual differences in mastery motivation are already manifested in early childhood (e.g., Kelley, Brownell, & Campbell, 2000; Smiley & Dweck, 1994; Yarrow, McQuiston, MacTurk, McCarthy, & Vietze, 1983). Different researchers have documented the presence of early individual differences in mastery motivation and its stability across time as well as its predictability of later competence in mastering the environment. Although the above studies emphasized different aspects of competence (Messer, McCarthy, MacTurk, Yarrow, & Vietze, 1986; Yarrow et al., 1983; Niccols, Atkison, & Pepler, 2003), they seem to converge in regarding competence as an organism's capacity to interact effectively with the environment. In this vein, Morgan, Busch-Rossnagel, Barrett, and Wang (2009) postulated that the concept of "general competence" was indicated by children's ability to master their environment. Similarly, various studies have used different methods to investigate mastery motivation. Jennings, Harmon, Morgan, Gaiter, and Yarrow (1979) used free play; Yarrow et al. (1983) used age-appropriate structured tasks; Morgan, Busch-Rossnagel, Maslin-Cole, and Harmon (1992) used individualized moderately challenging tasks; Morgan et al. (2009) used adult ratings of the child's motivation and competence; and Huang, Lay, and Chen (2009) used q-sort observation of the child's problem solving behaviors.

Aside from mastery motivation and competence being defined and measured differently in different research, the realization of the stability and the predictability of early mastery motivation may depend on how empirical data are collected. For example, the age of the subjects, the interval of the across-time assessments, the task domain (e.g., cognitive vs. social domains) applied to assess mastery, the compatibility of the measurements used at different ages, and the informant of data collection (e.g., experimenter vs. caregiver) may all be factors that lead to different empirical results.

This study used mothers as the informant of children's mastery motivation and competence from infancy to the preschool period. With the ultimate goal of understanding whether individuals maintain their order of mastery motivation relative to other individuals at different points in early childhood and whether mastery motivation assessed at different ages early in life remains an essential precursor of later competence, the aim of this study was twofold. The first was to demonstrate the stability of mastery motivation in different periods of infancy and early childhood. The second is to examine the consistency and variation of the predictability of early assessments of mastery motivation to later development, by using "general competence" reported by mothers as the target outcome.

Definition and Assessment of Mastery Motivation

Mastery motivation activates and maintains children's endeavors in regard to skill learning and problem solving, which are important contributors to children's adaptation and the development of competence. The manifestation of mastery motivation can include both instrumental and expressive aspects (Morgan et al., 2009; Morgan, Józsa, & Liao, 2017). The instrumental aspect includes indicators such as staying focused on and persistent in tasks. The expressive aspect includes indicators such as mastery pleasure and frustration while facing failure (Barrett & Morgan, 1995). Moreover, mastery motivation may also comprise different domains from early in life, such as object/cognitive, social, and physical domains (Wachs & Combs, 1995). Empirical research has not only shown individual differences across different domains but also indicated that children with different developmental problems react differently in different domains of mastery tasks (Morgan et al., 2017; Morgan, Wang, Liao, & Xu, 2013).

Children's mastery motivation can be assessed either through observation in the contexts of free play (e.g., Jennings, Connors, & Stegman, 1988) and structured challenging tasks (e.g., Barrett, Józsa, & Morgan, 2017; Józsa, Barrett, Józsa, Kis, & Morgan, 2017; Morgan et al., 1992; Wang, Liao, & Morgan, 2017) or through rating scales by parent, teacher (Hwang et al., 2017; Józsa, & Molnár, 2013; Morgan et al., 2017), or students' self-ratings (Józsa & Morgan, 2014, 2017; Józsa, Wang, Barrett, & Morgan, 2014). Among them, the rating scale method has the advantage of ease of data collection without lengthy behavioral assessment and thus makes it possible to apply repetitive assessments, which is necessary in longitudinal designs. The Dimensions of Mastery Questionnaire (DMQ; Morgan et al., 2009) assesses six domains of adults' perceptions of children's mastery related behaviors; among them, four domains assess the instrumental aspects, namely, cognitive/object-oriented persistence, gross motor persistence, and social persistence with adults and also with children. The other two domains, mastery pleasure and negative reactions to failure in mastery situations, are for assessing the expressive aspects of mastery motivation. The DMQ also provides another scale for assessing children's ability (in contrast to motivation) to master tasks (i.e., general competence).

Aside from the ease of data collection, another advantage of the DMQ is that, with the same conceptual framework, this measurement system includes different versions to assess individuals at different ages as early as infancy. Hence, children's mastery motivation at different ages can be measured and compared based on the same theoretical construct. On the same landscape, the DMQ can also be used to investigate cross-age correlations and provide domain-specific stability of mastery motivation.

Stability of Mastery Motivation in Infancy and Early Childhood

Barrett and Morgan (1995) have divided the development of mastery motivation into three age ranges: birth to 9 months, 9 to 24 months, and 24 to 36 months. They found the characteristics of instrumental and expressive mastery behavior across the different age ranges transform rapidly as children grow. Moreover, individual differences in mastery motivation have been documented as early as during the first year of life (Yarrow et al., 1983). Toddlers and preschoolers are also different in the way they face challenge and novelty; some rise to the challenge while others avoid challenge (Kelley & Jennings, 2003; Smiley & Dweck, 1994).

Although early individual differences of mastery motivation in infancy and early childhood have been well documented, there are theoretical and empirical issues yet to be resolved in understanding the stability of individual differences of mastery motivation. For example, Shiner (2000) suggested that mastery motivation is a personality trait and therefore is generally stable. By contrast, other researchers have emphasized the effect of environmental stimulation and the interaction between child's characteristics and experience, which, in turn, make the development of mastery motivation somewhat malleable and flexible (Busch-Rossnagel, Knauf-Jensen, & DesRosiers, 1995; Deci & Ryan, 1985).

Prior empirical findings could not reject either side of the above notions. For example, although different tasks across the two assessment points were used to measure mastery motivation, significant but modest stability was found from six to twelve months (Yarrow et al., 1983) and from six to fourteen months (Banerjee & Tamis-LeMonda, 2007). Moderate stability of children's persistence in structured tasks was also found from one year to 3.5 years of age (Jennings, Yarrow, & Martin, 1984). Both high and low stability of mastery motivation across one year were shown in Jennings et al. (1988) depending on whether it was assessed through structured tasks or free play sessions, respectively. Similarly, although task persistence was stable across six years for girls but not boys, maternal report from the DMQ was not stable over the same period (Gilmore, Cuskelly, & Purdie, 2003). Conversely, other studies documented moderate stability using the DMQ to measure different aspects of mastery motivation over a period of one year from two to three years of age (Wang, Hwang, Liao, Chen, & Hsieh, 2011) and a period of 21 months from 1.5 years to 3.25 years of age (Wang, Morgan, & Biringen, 2014).

It should be noted that the stability of mastery may be domain specific. As shown in Wang et al. (2011), the DMQ stabilities of total persistence (i.e., the aggregated score of the four domains in the instrumental aspect) and persistence in object-oriented tasks and in gross-motor tasks were higher than that of social persistence and of indicators in the expressive aspect of mastery motivation. Maslin-Cole, Bretherton and Morgan (1993) conducted a longitudinal study of 18-, 24-, and 39-month-old children and also found domain specific stability of the DMQ; specifically, although all of the DMQ

subscales had cross-time stability, persistence in object-oriented tasks and mastery pleasure demonstrated higher stability than persistence in gross motor tasks and social persistence.

In summary, prior research has provided fruitful results about the stability of mastery motivation during infancy and early childhood. However, the consistency of stability of mastery motivation across different periods in early childhood can only be speculated about based on different studies that have used different measurements and different subjects with different ages, and were measured at different intervals. No empirical study has yet systematically compared the stability of mastery motivation in different periods of infancy and early childhood using the same group of children at different ages and with the same length of time between measurements.

The Association between Mastery Motivation and Competence

The connection of mastery motivation and later competence has been suggested in different research. For example, White (1959) suggested that mastery motivation provides children with the psychological force to improve competence and self-efficacy. Yarrow et al. (1983) proposed that motivation and competence are interrelated, especially in early life. However, the empirical correlation between mastery motivation and competence may be affected by how the two variables are measured. In terms of the measurements for competence, one option is to use standardized developmental or intelligence tests (Messer et al., 1986; Yarrow et al., 1983). Alternatively, competence has been conceptualized as adaptation in daily life (Niccols et al., 2003). Another option for competence measurement is to ask caregivers to rate their child's ability in daily activities, which is the indicator of general competence in the DMQ (Morgan et al., 2009). In terms of measurements of mastery motivation, various studies (Gilmore & Cuskelly, 2009; Yarrow et al., 1983) indicated that persistence has a more direct impact on competence than does the expressive aspect of mastery motivation.

Another factor that may affect the empirical correlation between mastery motivation and competence is the age when children's mastery motivation is assessed. In general, the relation between mastery motivation and cognitive functioning seems to weaken as infants get older (Morgan, MacTurk, & Hrncir, 1995). For example, persistence in mastering tasks shown by six-month-olds was significantly correlated with cognitive level assessed by the Bayley Mental Development Index at 12 months of age (Yarrow et al., 1983). Moreover, persistence, one of the common indicators of mastery motivation, assessed at 6 months of age was significantly correlated with children's cognitive level at 14 months (Banerjee & Tamis-LeMonda, 2007). However, mastery motivation measured beyond infancy seemed to be not as strongly correlated with later cognitive competence; for example, Redding, Morgan and Harmon (1988) indicated mastery motivation assessed at 24 and 36 months was not significantly correlated with concurrent cognitive ability.

Furthermore, the empirical correlation between mastery motivation and later competence may also depend on the time interval between the two variables that are measured. Prior studies mostly examined the relation between mastery motivation and competence by means of short-term longitudinal design, which involved two waves of data collection with mastery motivation measured at the first wave and competence at the second wave. For example, both Messer et al. (1986) and Yarrow et al. (1983) assessed children ranging in age from infants at six months to toddlerhood. Gilmore and Cuskelly (2009) tested children with Down syndrome from early childhood to early adolescence. The above results are not easily comparable since the time intervals were different. Moreover, even when the measurement tool and the time intervals are similar, results from different groups of children may not be comparable so it will be hard to interpret the variation of the predictability of mastery motivation assessed at different ages during infancy and early childhood.

Goal of This Study

The present study applied a longitudinal design to examine both the stability of mastery motivation and how well mastery motivation predicts competence in early life. Goal-directed activities emerge around nine to ten months of age correspondent with infants entering the cognitive stage of coordination of secondary circular reaction (Piaget, 1962), which makes it easier for caregivers to detect infant intention to master the environment. Therefore, this study collected mothers' rating on the DMQ starting when children were ten months of age. When infants enter toddlerhood, the manifestation of mastery motivation may transform due to both maturation and environmental influences, which may affect the stability and the power of the predictability of mastery motivation. Thus, the period from infancy to preschool provides an important window for understanding variation in the stability of mastery motivation and its association with competence. Consequently, this study collected five waves of maternal report of children's mastery motivation and general competence at 10 months, 21 months, 26 months, 37 months, and 53 months of age. Three sets of age ranges with the same interval of 16 months were selected for analyses; specifically, the age ranges of 10 to 26 months, 21 to 37 months, and 37 to 53 months. The stability and predictability from the first measurement to the last (i.e., from 10 to 53 months) were also analyzed.

For the analysis of stability, cross-wave correlations of each of the six domains in the DMQ and general competence were examined. Based on Barrett and Morgan's (1995) age range of the three early phases of mastery motivation, this study hypothesized that the age range of 21 months to 37 months may reveal the lowest stability among the three 16-month intervals, since the first and second assessment was conducted at the beginning of the second and beyond the third phase. On the other hand, each of the other two 16-month intervals was located at adjacent phases proposed by Barrett and Morgan. Furthermore, based on findings from Wang et al. (2011) and Maslin-Cole et al. (1993), this study expected that stability of mastery motivation would most likely be revealed in the domain of object-oriented persistence.

For the analysis of predictability, three DMQ indicators of total persistence, mastery pleasure and negative reactions to failure served as the predictors while general competence from the DMQ served as the outcome variable. Based on Morgan et al. (1995) and the other studies reviewed above, we anticipated that the predictability shown in the youngest 16-month interval (i.e., from 10 months to 26 months) would be stronger than the predictability shown in the analysis for the older intervals. Additionally, according to Gilmore and Cuskelly (2009) and Yarrow et al. (1983), we expected that, although the predictive effect would decline across domains when the subjects got older, persistence would show higher predictability to general competence than the expressive aspects of mastery motivation.

Method

Participants

A total of 53 children and their mothers residing in the Taipei area participated in this study. All of the recruited children were born full term, showed normal developmental milestones, and had no diagnosed medical conditions. The mothers filled out the age-appropriate version of DMQ when her child was at 10 months, 21 months, 26 months, 37 months, and 53 months of age. Due to sample attrition, the number of participants included in each set of 16-month intervals and the interval from 10 to 53 months was different. The specific sample size (range of n = 40 to 53) for each set of intervals as well as the demographic backgrounds of the participants are shown in Table 1.

Measures

Dimensions of Mastery Questionnaire (DMQ-C 17 Chinese infant version)

The DMQ-C infant version (Morgan, 1997; Morgan et al., 2009) was used to assess infant mastery motivation and general competence at wave 1. This version has 45 items across seven subscales, six of them assess different domains of mastery motivation, including four indicators for the instrumental aspect (object-oriented persistence, gross motor persistence, social persistence with adults, and social persistence with children), and two indicators for the expressive aspect (mastery pleasure, and negative reactions to failure). The seventh subscale measures general competence. In addition to the above seven indicators, total persistence was derived from the average of the four instrumental indicators. The scores were based on mothers' ratings on a five-point Likert scale from one (not at all typical) to five (very typical).

Dimensions of Mastery Questionnaire (DMQ-C 17 Chinese preschool-age version)

The DMC-C preschool-age version was designed to assess children between 18 and 60 months of age. The subscales and the number of items in each subscale are similar to the infant version with several items being different in content to reflect the distinctive characteristics and mastery activity of preschoolers. In addition, five items, instead of

three items in the infant version, were included to assess preschoolers' negative reactions to failure. In this study, the preschool version DMQ was given to mothers to report their child's mastery motivation and general competence when their child was 21 months to 53 months of age.

Procedure

Informed consent was obtained from all mothers in advance. When the children were 10 months of age, child-mother dyads visited the laboratory where the children participated in a series of structured tasks and the mothers filled out the DMQ-C infant version. When the children were 21, 26, and 37 months of age, the DMQ-C preschool-age version was post-mailed to the mothers. When the children were 53 months of age, the mothers again filled out DMQ-C when the child-mothers dyads visited the laboratory to complete a series of structured tasks. The task data are not reported in this paper, but were in Huang et al. (2009).

Results

Descriptive statistics regarding the studied variables are presented in Table 1. There were no significant differences in maternal educational levels or the sex ratio of children among different sets of 16-month intervals and from 10 to 53 months of age. Aside from girls displaying higher general competence than boys at age 53 months ($t(39) = -3.22$, $p = .003$), no other statistically significant gender difference was found on the DMQ subscales.

Stability of Mastery Motivation

The cross-wave correlation coefficients (i.e., stability) of each indicator of mastery motivation in each set of 16-month intervals (i.e., 10 to 26 months, 21 to 37 months, and 37 to 53 months) as well as in the interval from 10 to 53 months of age are presented in Table 2. Across more than 3.5 years from 10 to 53 months of age, except for negative reactions to failure ($r = .25$, *ns*), cross-wave correlations of the other domains were all significant ($rs = .32\sim.61$, $ps < .05$).

Significant correlations were found in total persistence ($rs = .57\sim.69$, $ps < .001$), object-oriented persistence ($rs = .52\sim.66$, $ps < .01$), and gross motor persistence ($rs = .44\sim.58$, $ps < .001$) in all three sets of 16-month intervals. Cross-wave correlations of social persistence with both adults and children were significant from 10 to 26 months ($rs = .48, .50$, $ps < .001$) and from 21 to 37 months ($rs = .40, .53$, $ps < .01$), respectively, but only significant at $ps < .06$ from 37 to 53 months ($rs = .30, .31$, $ps = .059, .055$).

Table 1. Means and Standard Deviations (in parenthesis) of Central Variables in Each Set of Analyses

Variables	Age range of cross-wave analysis							
	10 to 26 months (*n* = 53)		21 to 37 months (*n* = 43)		37 to 53 months (*n* = 40)		10 to 53 months (*n* = 40)	
	10 months	26 months	21 months	37 months	37 months	53 months	10 months	53 months
Child gender (boy/girl)	28/25		25/18		25/15		22/18	
Child's age (months)	9.53 (0.64)	26.00 (1.57)	20.77 (0.95)	37.02 (1.50)	37.16 (1.24)	52.50 (2.46)	9.53 (0.62)	52.70 (1.41)
Mother's educational level (year)	15.26 (1.71)		15.98 (1.75)		15.97 (1.89)		15.65 (1.56)	
General competence	3.45 (0.56)	3.73 (0.53)	3.77 (0.57)	4.01 (0.61)	4.02 (0.58)	3.64 (0.50)	3.51 (0.56)	3.59 (0.46)
Total persistence	3.74 (0.51)	3.70 (0.51)	3.73 (0.46)	3.80 (0.39)	3.82 (0.39)	3.79 (0.39)	3.83 (0.48)	3.79 (0.39)
Instrumental aspects: Object-oriented persistence	3.37 (0.53)	3.42 (0.57)	3.48 (0.48)	3.59 (0.64)	3.74 (0.58)	3.59 (0.53)	3.45 (0.51)	3.45 (0.49)
Gross motor persistence	3.67 (0.59)	3.71 (0.59)	3.80 (0.54)	3.82 (0.46)	3.79 (0.46)	3.53 (0.65)	3.75 (0.58)	3.64 (0.58)
Social persistence (with adults)	4.03 (0.60)	4.06 (0.60)	3.96 (.65)	4.19 (0.41)	4.18 (0.45)	4.23 (0.42)	4.10 (0.60)	4.11 (0.45)
Social persistence (with children)	3.90 (0.75)	3.62 (0.78)	3.68 (0.77)	3.58 (0.41)	3.58 (0.40)	3.83 (0.66)	4.03 (0.73)	3.96 (0.68)
Expressive aspects: Mastery pleasure	3.97 (0.66)	4.36 (0.56)	4.41 (0.59)	3.39 (0.44)	3.43 (0.44)	4.62 (0.38)	4.09 (0.66)	4.55 (0.43)
Negative reactions to failure	2.58 (0.72)	2.69 (0.56)	2.63 (0.52)	2.96 (0.57)	2.92 (0.51)	2.99 (0.63)	2.59 (0.72)	2.99 (0.53)

Regarding the indicators for the expressive aspects of mastery motivation, significant cross-wave correlations were found in negative reactions to failure in all three sets of 16-month intervals (*r*s = .39 to .48, *p*s < .05). While significant cross-wave correlation was found for mastery pleasure from 10 to 26 months (*r* = .29, *p* = .036), this was not the case from 21 to 37 months nor from 37 to 53 months (*r*s = .28, .21, *ns*).

Table 2.Cross-Wave Correlation Coefficients for DMQ Scales

Indicators of mastery motivation	10 to 26 months (N = 53)	21 to 37 months (N = 43)	37 to 53 months (N = 40)	10 to 53 months (N = 40)
Total persistence	.69***	.61***	.57***	.61***
Object-oriented persistence	.66***	.63***	.52**	.47**
Gross motor persistence	.44***	.58***	.56***	.41**
Social persistence with adults	.48***	.53***	.30†	.36*
Social persistence with children	.50***	.40**	.31†	.35*
Mastery pleasure	.29*	.28	.21	.32*
Negative reactions to failure	.39**	.48**	.40*	.25

Note. The p value of all the Fisher's z tests comparing sets of 16-month intervals were > .05
*†p < .06. *p < .05. **p < .01. ***p < .001.*

The above results indicated that almost all indicators assessed by the DMQ were stable up to age three. However, beyond 37 months of age, children's social persistence and mastery pleasure were not stable, at least for the repeated measurements that were conducted 16 months apart but they were stable from 10 to 53 months. It should be noted that, none of the cross-wave correlations of the indicators from DMQ were

significantly different across different sets of 16-month intervals, as indicated by Fisher's z tests.

Bivariate Correlations between Predictor and Outcome Variables

Zero-order correlation coefficients of five predictor variables, namely, mother's education, general competence, total persistence, mastery pleasure, and negative reactions to failure at Time 1 with the outcome variable of general competence at Time 2 in each set of intervals are presented in Table 3. Prior total persistence positively correlated with general competence 16 months later in all three sets of 16-month intervals (rs = .48∼.64, ps < .01) while total persistence at 10 months was correlated at p < .06 with general competence at 53 months of age (r = .31, p = .056). Neither mastery pleasure nor negative reactions to failure correlated with later general competence in any set of intervals. The control variable of maternal educational level also did not correlate with general competence in any set of intervals. Prior general competence was significantly correlated with later general competence in all three sets of 16-month intervals (rs = .38∼.56, ps < .05); however, there was no significant association of general competence between age 10 months and age 53 months (r = .27, p = .097).

Table 3. Correlation Coefficients between Predictor Variables (PV) and General Competence (GC)

Predictor Variables	PV → GC 10 to 26 months	PV → GC 21 to 37 months	PV → GC 37 to 53 months	PV → GC 10 to 53 months
Mother's Educational Level	.24	.06	-.10	.10
General Competence	.53***	.38*	.56***	.27
Total Persistence	.64***	.48**	.60***	.31†
Mastery Pleasure	.08	.26	.25	-.18
Negative Reactions to Failure	-.15	-.26	-.21	-.02

*Note. †p < .06. *p < .05. **p < .01. ***p < .001.*

Regression Analyses on Children's General Competence

Hierarchical regression analysis was conducted to examine the contribution of the three indicators of mastery motivation to later general competence. Four separate regression models for the three sets of 16-month intervals and for the interval from 10 to 53 months were examined. Child's gender, mother's educational level, and general competence assessed at the first wave in the particular interval were entered in the first step as control variables. In the second step, the three indicators of mastery motivation assessed at the first wave in that interval entered the model simultaneously. General competence at the second wave in that interval was the outcome variable.

The control variables accounted for 33% (F(3, 49) = 8.06, p < .001), 16% (F(3, 39) = 2.52, p = .072), 33% (F(3, 36) = 6.04, p = .002), and 24% (F(3, 36) = 3.77, p = .019) of later general competence in the three sets of 16-month intervals and from 10 to 53 months, respectively. As shown in Table 4, none of the main effects of gender or maternal educational level were significant in any of the three sets of 16-month intervals. However, girls' general competence was higher than that of boys at 53 months

(β = 0.41, *t*(39) = 2.73, *p* = .01). Similar to the results of the correlation analyses, prior general competence significantly predicted later general competence in all three sets of 16-month intervals (10 to 26 months: β = 0.50, *t*(42) = 4.26, *p* < .001; 21 to 37 months : β = 0.38, *t*(42) = 2.62, *p* = .013; 37 to 53 months: β = 0.57, *t*(39) = 4.15, *p* < .001). However, general competence at 10 months did not predict that at 53 months (β = 0.15, *t*(39) = .10, *ns*).

When the three prior mastery motivation variables were added at step 2, the increase in the variance of later competence accounted for was 22% (*F*(3, 46) = 7.35, *p* < .001), 9% (*F*(3, 36) = 1.58, *p* = .22), 9% (*F*(3, 33) = 1.76, *p* = .17), and 17% (*F*(3, 33) = 3.18, *p* = .037) in each of the 16-month intervals and from 10 to 53 months, respectively. Specifically, in combination with the other five variables entered at step 2, prior total persistence added positively to the prediction of later general competence in all three sets of 16-month intervals (β = 0.63, *t*(52) = 6.33, *p* < .001; β = 0.43, *t*(42) = 2.14, *p* = .039 ; β = 0.54, *t*(39) = 2.12, *p* = .042). The predictability of total persistence at 10 months to later general competence at 53 months was significant only at *p* = .07 (β = 0.35, *t*(39) = 1.91, *p* = .07). Mastery pleasure at 10 months in combination with other predictor variables negatively predicted general competence both at 26 months and 53 months (β = -0.33, *t*(52) = -2.83, *p* = .007; β = -0.42, *t*(39) = -2.74, *p* = .01). There was no significant predictive power for negative reactions to failure to later general competence at any age.

Table 4. Hierarchical Regression Analyses on General Competence

Predictors	10 to 26 months (N = 53)		21 to 37 months (N = 43)		37 to 53 months (N = 40)		10 to 53 months (N = 40)	
	β	ΔR²	β	ΔR²	β	ΔR²	β	ΔR²
Step 1		.33***		.16†		.33**		.24*
Child's gender	0.12		0.09		0.00		0.41*	
Mother's educational level	0.16		0.11		-0.14		0.07	
General competence	0.50***		0.38*		0.57***		0.15	
Step 2		.22***		.09		.09		.17*
Child's gender	0.13		0.06		0.00		0.43**	
Mother's educational level	0.13		0.11		-0.20		0.10	
General competence	0.23		0.14		0.24		0.09	
Total persistence	0.63***		0.43*		0.54*		0.35†	
Mastery pleasure	-0.33**		-0.07		-0.19		-0.42*	
Negative reactions to failure	0.04		-0.02		0.01		0.14	

Note. For the categorical predictor variable of gender, male was 1 and female was coded as 2.
*†p < .08. *p < .05. **p < .01. ***p < .001.*

Discussion

The present study investigated the stability of mastery motivation early in life and its association with general competence. By using a multiple-wave longitudinal design with the same range of age intervals, this study extended the findings from previous studies to demonstrate the variation of stability and predictability of multiple domains of mastery motivation in different periods of infancy and early childhood.

The present analysis of stability partially concurred with prior research (Maslin-Cole et al., 1993; Wang et al., 2011). That is, especially compared with the social domains and the expressive aspects of mastery motivation, persistence in object-oriented and gross motor domains were stable in early childhood. Specifically, throughout the five waves of assessment, moderate to high stability and moderate stability were found in the persistence of the cognitive/object-oriented domain and in the physical/gross-motor domain, respectively. In contrast, the domains of social persistence showed moderate stability up to age three but low stability beyond 3 years of age. Age 3 is the end point of the third age range of the development of mastery motivation suggested by Barrett and Morgan (1995). It is also about the time for most young children to start going to preschool, meeting new teachers and peers, and facing all kinds of novelty in new environments. Consequently, it seems not surprising that children's motivation to manage social interaction with adults and peers changes, which may, in turn, affect individuals' ranking of social persistence compared to other individuals.

For the findings of stability in the expressive aspect, contrary to Maslin-Cole et al. (1993) where mastery pleasure demonstrated higher stability than negative reactions to failure, in this study, the domain of negative reactions to failure remained mildly to moderately stable throughout the three sets of 16-month intervals. Negative reactions to failure can be attributed to child temperament (e.g., the subscale of frustration in the Early Childhood Behavior Questionnaire; Putnam, Gartstein, & Rothbart, 2006) as well as parental standards, both of which may not be easily changeable in a short period of time and lead to the stability of this expressive domain.

Modest or no stability in mastery pleasure across the three 16-month intervals found in this study is in conflict with Wang et al. (2011) where mastery pleasure was significantly stable between 24 to 36 months of age. On the contrary, the long-term stability of mastery pleasure was surprisingly significant from age 10 months to 53 months in this study. The last half of the second year has been suggested as a turning point of mastery pleasure (Kagan, 1992). The fact that the cross-wave (e.g., 10 and 26 months; 21 and 37 months) correlations of mastery pleasure cutting across the age suggested by Kagan were low may indicate that the construct of mastery pleasure is heterotypic with development. Subsequently, the expression of mastery pleasure during early childhood may need to be captured by a more sensitive assessment tool with enough breadth of descriptions including both pure expression of happiness from accomplishment to sense of pride and superiority (Lewis, Alessandri, & Sullivan, 1992).

Curiously, all of the indicators for task persistence and task pleasure, which may be the two most commonly referred markers of mastery motivation, demonstrated long-term stability from age 10 months to 53 months. The 3.5 years between the first and the final wave of the assessment not only stretch over the three early phases of mastery motivation (Barrett & Morgan, 1995) but also comprise major transformations in physical, cognitive, emotional, and social development. Despite sporadic findings of low or non-significant stabilities at some of the 16-month intervals of analysis, the existence

of long-term stability points to the value of assessing domain-specific mastery motivation before one year of age and the contribution of early behavioral patterns in the development of mastery motivation (Shiner, 2000).

Regarding the association between mastery motivation and general competence, concordant with prior research (Gilmore & Cuskelly, 2009; Yarrow et al., 1983), this study indicated task persistence had a stronger connection with later competence than did the expressive aspects of mastery motivation. When considered as a group, the three mastery motivation indexes increased the predictability of competence only in the 10 to 26 and 10 to 53 month intervals. However, persistence significantly contributed to the prediction of general competence even after controlling for participants' demographic backgrounds, the expressive variables, and earlier competence. The present results once again imply that tenacious attempts to master the environment lead to proficiency and competence, at least across each of the 16-month intervals.

Although domains in the expressive aspect did not correlate with later general competence, mastery pleasure negatively predicted later general competence in two of the four sets of regression analysis. This novel result may be attributed to the collinearity between total persistence and mastery pleasure (same-wave correlations between mastery pleasure and total persistence: *r*s = .36 to .59). Alternatively, maybe young children who are easily satisfied with and delighted by current accomplishment would be less ambitious in striving for further success in more advanced and difficult tasks, which is essential for competence improvement.

In terms of the cross-interval consistency and variation of the predictability of mastery motivation, total persistence remained a strong predictor of general competence across different periods in early childhood even when controlling for early competence and the other mastery motivation indexes. Additionally, total persistence assessed before one year of age still marginally predicted a child's competence at age four and a half years when all the other predictor variables were accounted for. Thus, this study seemed not in concert with the conclusion from prior studies with infants and preschool children (e.g., Morgan et al., 1995; Redding et al., 1988) that indicated the association between mastery motivation and cognitive functioning is lower as these children get older. Consistent with the current study, Józsa and Molnár (2013) and Morgan et al. (2009) found quite high correlations between persistence and competence measures on the DMQ for school age children.

Finally, although the only significant sex difference found in this study was that girls' general competence at 53 months was higher than that of boys, the mean score of girls' general competence measured in every wave was somewhat higher than that of boys. These results, on the one hand, implied that there may be a general relation between gender and competence across ages in early childhood of parent's perceptions that favors girls. The findings of the current study were concordant with prior studies (Józsa et al., 2014; Morgan et al., 2013) that indicated both Chinese and English speaking

parents rated girls higher on DMQ general competence than boys, even though the effect sizes of the significant sex differences were generally small.

In summary, by using an across-wave, longitudinal design with the same time interval in each set of analyses, the present study was able to compare the stabilities/predictabilities of mastery motivation across the same length of time but at different ages in early childhood. The present results demonstrated that parental perceptions of children's mastery motivation, especially of object and gross motor persistence, appeared to be stable throughout infancy and early childhood. Furthermore, in the domains of negative reactions to failure and mastery pleasure, short-term stability did not guarantee long-term stability and lack of short-term stability did not necessarily lead to long-term instability, indicating further research is needed to understand the development of the expressive (emotional) aspects of mastery motivation. In terms of the association between mastery motivation and later competence, the present study found that, throughout the assessment period, task persistence is an important predictor of later competence. The negative predictive effect of mastery pleasure on competence should be further investigated in future research.

Conclusion

An important message for parents and educators is that the results of this study revealed that early competence in infancy was not a valuable predictor of preschooler's capability. In contrast, tenacious attempts to master the environment in early childhood, from infancy to the preschool years, contributed to the development of general competence and probably to school readiness. Young children's negative reactions to failure, although they may exasperate parents and teachers when they work with the child, was not an important factor leading to the development of competence.

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