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Chapter 1

Overview of Mastery Motivation, Assessment, and This Book

George A. Morgan, Krisztián Józsa and Hua-Fang Liao

Introduction

This chapter provides a broad overview of the current research about the concept of mastery motivation, which is shown most clearly by a child's instrumental behaviors, especially persistent attempts to master skills, solve problems, and by expressive or affective behaviors, especially pleasure when solving problems (Barrett & Morgan, 2018; Morgan et al., 2017a). The chapter begins with an introduction on mastery motivation and its importance for children's development and competence. Then the chapter describes several methods for assessing mastery motivation, including some newer methods, and covers a broad age span from infants to young adults. Next, the chapter describes the historical development of the current Dimensions of Mastery Questionnaire, namely DMQ 18. Finally, the chapter includes an overview of each chapter in the book, as well as a conclusion. The book includes research and co-authors from six continents (Africa, Asia and the Middle East, Europe, North and South America, and Oceania/Australia) and covers a wide range of topics related to the Dimensions of Mastery Questionnaire, which is the focus of the book.

The U.S. National Academy of Science report *From Neurons to Neighborhoods* (Shonkoff & Phillips, 2000) identified mastery motivation as a key developmental concept, which should be included as part of a child's assessment. Thus, mastery motivation is an important topic, in part because there is evidence that better mastery motivation at an early age leads to better competence and achievement later. That is, children become more competent because of their early persistence at tasks, even if early on they are not highly competent. This tenant of mastery motivation traces back to the early research by Yarrow et al. (1975), who reported that cognitive-motivational behaviors in infancy, such as reaching for and manipulating novel objects, predicted preschool children's Stanford-Binet intelligence quotient (IQ); whereas, the whole Bayley Mental Developmental Index did not. Similarly, Józsa and Molnár (2013) found that the DMQ was more predictive of school grades than IQ and tests of basic skills. More recently, Józsa and Barrett (2018) found that mastery motivation in preschool children predicted school success in grades 1 and 2. Huang and Lay (2017) reported that DMQ total persistence predicted competence across three different 16-month periods in infancy and early childhood, even after controlling for earlier competence. Thus, measuring mastery motivation has implications for education and for early childhood intervention.

Definition of Mastery Motivation and Key Measures

Morgan et al. (1990) proposed that mastery motivation stimulates a child to attempt to master a skill or task that is at least moderately challenging for him or her. Mastery motivation has two major aspects: instrumental and expressive (Barrett & Morgan, 1995). The *instrumental aspect* motivates a child to attempt, in a focused and persistent manner, to solve a problem or master a skill or task. The *expressive aspect* of mastery motivation produces affective reactions while the child is working at such a task or just after completing it. This affect may or may not be overtly expressed and may assume different forms in different children as they develop.

There are three main types of measures for assessing mastery motivation. Busch-Rossnagel and Morgan (2013) described the strengths and weaknesses of these measurement techniques: free play measures, behavioral mastery motivation tasks, and the Dimensions of Mastery Questionnaires (DMQ). Early versions of these three types of measures were discussed in several of the chapters in two important edited books about mastery motivation: Messer (1993) and MacTurk and Morgan (1995).

Free Play Measures

Over the years, there have been many studies that have observed children's play in preschool, home, and laboratory play room settings, but most have not been focused on the child's persistence at trying to solve problems; i.e. mastery motivation as we've defined it. During the first Yarrow study of mastery motivation, Jennings et al. (1979) examined the relationship between one-year-old typically developing children's free play and their behavior in structured mastery tasks. They also reported on environmental antecedents of children's free play. Their measures of continuity of play and amount of appropriately mature play were somewhat similar to task directedness or persistence used in the behavioral mastery tasks. Continuity and amount of mature free play had more significant relationships with the child's persistence at mastery tasks than did measures of total exploration or the "production of effects." Thus, they seemed to be better measures of mastery motivation than the sheer amount of play.

Morgan and Harmon (1984) conducted a small longitudinal study of 9-, 12-, and 24-month-old infants using measures of play similar to those used by Jennings et al. (1979). They found that the amount of mature free play was positively correlated with persistence at moderately challenging structured mastery tasks, while the amount of simple exploration during free play was negatively correlated with persistence at such tasks.

Belsky et al. (1984) developed what they considered to be a mastery motivation measure called "executive capacity," partially from free play. Hrncir et al. (1985) extended this method in their studies related to mastery motivation. However, their measure was highly correlated with the Bayley Scales of Infant Development and other measures of early cognitive competence. Thus, there was some question about whether this measure is really a measure of mastery motivation as we define it.

Maslin-Cole et al. (1993) used a measure of free play engrossment to study toddlers at 18 and 25 months. Unfortunately, this measure was not significantly related to the mastery task measures or the Dimensions of Mastery Questionnaire. McCall (1995) stated that the problem with free play measures is that it's difficult to know if they represent mastery motivation or some other characteristics, especially competence, in part because persistence in some free play situations was inversely correlated with subsequent measures of competence. McCall stated, "the construct validity of most measures derived from free play assessments as indices of mastery motivation, in my opinion, is ambiguous at best and in serious doubt at worst."

In free play situations, the child is free to express his or her motivation without implicit or explicit social demands from the tester and is able to choose an activity that he or she finds interesting and natural; thus, enhancing ecological validity or the naturalness of the situation. However, fewer mastery attempts and less persistence have been found in short-duration observations of free play with toddlers and preschool children (Busch-Rossnagel & Morgan, 2013). Although free play measures may have the greatest ecological validity, observing an adequate sample of mastery behaviors and interpreting results is problematic. Therefore, the types of free play measures mentioned above have not been used frequently in mastery motivation research in recent years. Undoubtedly, a number of environmental, family, and cultural factors influence the amount and type of play that would be shown.

Behavioral Mastery Motivation Tasks

In early mastery motivation research, the general procedure for administering behavioral mastery tasks was to begin the tasks with the tester demonstrating how to use a problem-posing toy. Then the toy, such as a puzzle, was given to the infant who had the opportunity to try to complete it with little encouragement and no help from the experimenter. The duration of task-directed behaviors, called persistence, was the primary measure of independent mastery motivation. In the Yarrow et al. studies (1982, 1983) all children of a certain age were given the same tasks or problems. These tasks were intended to be challenging for the average child, but due to individual differences in children's abilities, the same task could be very hard for some children and easy for others. This problem led to the development of the individualized moderately challenging task method.

Individualized Moderately Challenging Mastery Tasks

Morgan et al. (1992) described procedures that attempted to deal with the problem of controlling for cognitive differences among young children and also made longitudinal analysis more meaningful. This strategy involved the use of sets of similar tasks/toys, such as puzzles, which had several levels of difficulty. The child's motivation was assessed with one level of each set of tasks that was found to be moderately difficult for that individual child. Specifically, a task was selected because the child had successfully completed at least part of it, but had not finished all parts of the task too quickly. Thus, the level chosen for a given child was moderately challenging but not so hard that partial completion was not achieved. The child's persistence and emotional behaviors during those moderately difficult tasks were the main measures of mastery motivation. McCall (1995) called this individualized

approach, with its identification and use of moderately difficult tasks "one of the most important measurement advances" (p. 288), in part because it facilitates the separation of ability or competence from motivation. This individualized method has been used by a number of researchers and led to an increasing understanding of mastery motivation in young children developing typically and, especially, atypically (e.g., Gilmore & Cuskelly, 2011; Young & Hauser-Cram, 2006; Wang et al., 2013). Green and Morgan (2017) expanded the age range of the individualized tasks to be suitable for school-age children 7 to 10 years old. At least two studies have followed young children with disabilities into adulthood and have found significant relationships with adult measures related to mastery motivation. Hauser-Cram et al. (2014) found that early mastery motivation measured with the individualized tasks predicted executive function in young adults with developmental disabilities. Gilmore and Cuskelly (2017) found strong associations between child and adolescent mastery motivation in children with Down syndrome and their self-regulation as young adults.

Hashmi et al. (2017) used these individualized mastery tasks as the outcome variables to test the efficacy of their "I can" mastery motivation classroom program with young preschool children in Malaysia. They described and evaluated their intervention designed to enhance children's persistence and pleasure when trying to complete challenging tasks using a randomized pretest-posttest experimental design. They believed that the "I can" intervention program should lead to better school performance later.

Revised Individualized Moderately Challenging Tasks

Wang et al. (2016b) reported evidence for reliability and validity of this improved individualized task method. One improvement of these revised Individualized Moderately Challenging Tasks (IMoT) allowed for the possibility of identifying several moderately difficult tasks for a given child. Wang et al. (2016a) provided an example of how this revised individualized task procedure was used to assess one child with developmental delays. Wang et al. (2017) described this individualized challenging task method in detail for use with 15 to 48 month-old children, and they included information on reliability, validity, and descriptive statistics. Wang (2016) used these revised tasks to assess young preschool children who had global developmental delays and found that there were bidirectional relationships between mothers' interactive teaching behavior and the child's mastery motivation over a 6-month time period. More importantly, she found that mastery motivation mediated the relationship between mother's teaching behaviors and the child's later cognitive and also fine motor ability (Wang et al., 2019).

The FOCUS Computer Tablet Tasks

Barrett et al. (2017), Józsa et al. (2017a; 2017b), and Józsa et al. (2020) described in detail a new computer-tablet procedure for assessing pre-academic knowledge, mastery motivation, and executive functions in 3 to 8 year-old American and Hungarian children as a school readiness predictor. The FOCUS procedure described by Barrett et al. (2017) was designed to be an assessment that could become a complement to the nationally used Hungarian school-readiness test, DIFER, or, in English, the Diagnostic Assessment Systems for Development (Nagy et al., 2016). Józsa et al. (2017a) focused on the results from testing Hungarian children with the computer tablet mastery motivation tasks. Józsa et al. (2020) reported an evaluation of these tablet tasks based on a computed measure of persistence at tasks that were *actually* moderately challenging for each individual child. Future plans for the assessment are that it become available for parents and teachers who would receive feedback about their child's "approaches to learning" and suggestions for enhancing them.

All of these behavioral mastery task methods require the tester to provide very little feedback to the child other than basic instructions and some prompts. Thus, the child must work relatively independently on trying to solve the problem posed by the task. This lack of feedback undoubtedly effects the child's behavior, to some extent, and is a reason why the free play measures are said to have greater ecological validity. Researchers could study, but haven't so far, the effects of different kinds and amounts of feedback on the child's persistence and pleasure during the tasks.

Three Mastery Motivation Questionnaires

The Dimensions of Mastery Questionnaire (DMQ)

The DMQ assesses mastery motivation by having a parent or teacher rate their perceptions of the child's mastery motivation (and/or school-aged students rate their own behavior). The DMQ is the measure described in detail in this book. The development of the DMQ beginning in the early 1980s is described later in this chapter. The DMQ was the basis for two related questionnaires: the (School) Subject Specific Mastery Motivation Questionnaire (SSMMQ) and the Dimensions of Adult Mastery Motivation Questionnaire (DAMMQ), which will be discussed before turning to the historical development of the DMQ.

Subject Specific Mastery Motivation Questionnaire (SSMMQ)

Józsa (2014) developed a questionnaire, based on the DMQ, to examine age differences in student's motivation for school subjects in Hungary. This

(School) Subject Specific Mastery Motivation Questionnaire (SSMMQ) has subscales to assess the student's motivation to try hard and to express pleasure in school subjects such as reading, math, science, and English as a foreign language. Józsa used Likert-type items similar to those in the DMQ. A pilot study supported the validity and reliability of the scales for the Hungarian students studying English and German in school. The correlations of the mastery scales for foreign-language with overall language achievement varied from medium to strong. In addition, there were declines from middle to high school in the student's self-ratings of their mastery motivation in other school subjects, but not in English as a foreign language (Józsa, 2014).

Using DMQ 17, Józsa et al. (2014) had found that mastery motivation decreased from grade 2 to 10. Similarly, using the SSMMQ, Józsa et al. (2017c) found decreases in motivation for most school subjects in both Hungary and Taiwan from grades 4 to 8 using the SSMMQ. In general, Hungarian students rated themselves higher than did the students from Taiwan. However, there were fewer differences at grade 10 between the Hungarian students and the Taiwanese students. In both Hungary and Taiwan, the mastery motivation for English as a foreign language did not decline from grade 6 to grade 10, leading to speculation about why middle and high school students remained motivated to learn English. Implications for further research and school practices were discussed by Józsa et al. (2017c); school practices are discussed in more detail in **Chapter 6** of this book.

Dimensions of Adult Mastery Motivation Questionnaire (DAMMQ)

Doherty-Bigara and Gilmore (2015) used the DMQ as the basis for a new instrument, the Dimensions of Adult Mastery Motivation Questionnaire (DAMMQ), used to collect data from Australian adults aged 18-90. They found that the DAMMQ had acceptable psychometric properties and produced some interesting differences. Next, Gilmore et al. (2017) used the DAMMQ to compare university students in Hungary, Australia, Bangladesh, and Iran. Gilmore et al. (2017) translated the DAMMQ into Hungarian and Persian; the students in Australia and Bangladesh used the English version of the DAMMQ. This questionnaire measured levels of persistence, preference for challenge, task absorption, and task pleasure. Gilmore et al. (2017) examined the psychometric properties of the DAMMQ in the four cultures, which were acceptable to good for most of the scales. There were no differences in mastery motivation among the four countries, but significant gender differences were found. In each of the countries except Hungary, male students reported higher levels of mastery motivation. The DAMMQ seems to be a useful measure of mastery motivation for college students across diverse cultures. The findings provide some support for the universality of the theoretical construct of mastery motivation, and they suggest the potential need for universities to encourage female students'

strivings for mastery. Given the importance of university education for every country's prosperity, understanding the motivational factors that underlie academic success is key to informing policies and programs to increase student retention and wellbeing.

The Development of the Dimensions of Mastery Questionnaire

The MOMM: An Early Version of the DMQ

When development of the Mother's Observation of Mastery Motivation (MOMM) questionnaire began in the early 1980s, there were no parental report questionnaires designed to assess the motivation of infants and preschool children. Infant temperament questionnaires did assess perceptions of some aspects of persistence (e.g., Carey & McDevitt, 1978), but none of them provided adequate coverage of the *motivational* aspects of toddlers' or preschoolers' attempted problem solving and mastery play. Two questionnaires for school-aged children, Gottfried's (1986), Academic Intrinsic Motivation Inventory and Harter's (1981) Intrinsic versus Extrinsic Orientation in the Classroom Scale, came closer conceptually to measuring the aspects of behavior in which we were interested. However, these scales focused on intrinsic versus extrinsic motivation in school, which is only partially applicable to our definition of mastery motivation. In developing items for the MOMM questionnaire, we drew upon several of Harter's scales and some themes from the persistence scales of infant temperament measures.

In its initial form, the MOMM was intended for 1- to 5-year old children. Items were written to fit seven a priori conceptual scales. The first four scales were intended to assess high versus low mastery motivation as it had been measured behaviorally in early mastery motivation studies (e.g., Jennings et al., 1979; Jennings et al., 1984; Yarrow et al., 1982).

Pilot work led to a 36-item questionnaire which was completed by approximately 140 mothers of children developing typically and 60 mothers of children who were at-risk or developing atypically aged 9 months to 5 years, some of whom participated in intervention programs. These data were collected as part of several different studies; e.g., Butterfield and Miller (1984); Harmon et al. (1984); and Jennings et al. (1985). Morgan et al. (1983) compiled the data about the use of the MOMM.

Principal components analyses of the mothers' ratings were done for the several samples studied with the MOMM. The first two factors, general mastery motivation and dependence in mastery situations, were used as the basis for two scales in the first version of the Dimensions of Mastery Questionnaire – General Scales (DMQ-G).

Support for the validity of the MOMM questionnaire was obtained in part through comparisons of mothers' perceptions of children developing typically versus children at risk (see Morgan et al., 1983). Another method used to assess the validity of the MOMM questionnaire was based in part of the effects of an intervention program on maternal perceptions of mastery motivation. Butterfield and Miller's (1984) intervention raised the children's mastery motivation on the behavioral tasks and raised the mothers' perceptions of their children's mastery motivation as measured by the MOMM (see Harmon et al., 1984).

Another method used to provide evidence for the validity of the MOMM was to correlate individual differences in maternal ratings on the questionnaire with behavioral mastery scores. As predicted, the MOMM general mastery motivation score was significantly correlated with infants' actual persistence at tasks (Morgan et al., 1983). In another study, preschool teachers rated the usual behavior of 18 children who had also been tested with the mastery tasks. There was a significant correlation between teacher ratings of the child's persistence and independently obtained tester ratings of the child's task orientation or persistence (Morgan et al., 1983).

These results supported the usefulness of the MOMM questionnaire, but it was felt that the psychometric properties and age appropriateness of the questionnaire could be improved without losing the strengths just described. Thus, a major revision was undertaken. Some items were dropped because they implied abilities that children under three or four years do not appear to have. Other questions about intrinsic versus extrinsic motivation were deleted because they did not seem to be as appropriate for our definition of mastery motivation or for young children as for school-aged children.

The Dimensions of Mastery Questionnaire – General Scales (DMQ-G)

The DMQ-G included 21 items written to be age-appropriate for toddlers and preschool children. The questions were written in descriptive, behavioral language similar to that used by mothers. The DMQ-G was designed to tap four dimensions of child behaviors that we had observed during the mastery tasks. These dimensions were: 1) General Persistence at Tasks, 2) Mastery Pleasure, 3) Independent Mastery Attempts, and 4) General Competence for one's age.

The first and third dimensions were based on the first two factors from the MOMM. The second and fourth dimensions were added to represent two important aspects of the young child's behavior in mastery situations that had not been included in the MOMM. The general persistence scale was intended to correspond to the typical instrumental mastery motivation measure, which was persistence at behavioral mastery tasks.

The second dimension, mastery pleasure, was added because Harmon and Morgan (i.e., Harmon et al., 1984) realized its importance to a conceptually complete view of mastery motivation in early childhood. Mastery pleasure is defined as smiling, laughing or other behavioral indicators of positive affect *during* task-directed behavior or immediately following the solution of a task. It is viewed as a measure of the expressive aspect of mastery motivation.

The fourth dimension, competence, is not considered to be a measure of mastery motivation, but it is an important aspect of mastery-related behavior. Furthermore, there was an analogous score derived from the mastery tasks, and competence is of general interest to investigators of young children's behavior. The competence items provide an index of a rater's perceptions of the child's abilities, relative to other children the same age, which may be similar to those assessed by the Bayley Scales of Infant Development (Bayley, 1969).

The DMQ-G was used by over 300 mothers of children developing typically and those with developmental delays. The DMQ-G items, with minor modifications, have continued to be used with the more recent versions of the DMQ. Thus, findings from the general persistence, mastery pleasure, and competence scales of the DMQ-G were relevant to the validity of DMQ 17 and are discussed in **Chapter 5** of this book.

The Expanded Dimensions of Mastery Questionnaire (DMQ-E)

Research with the infant mastery tasks made it clear that persistence is quite specific to the type of task (Yarrow et al., 1982, 1983). For example, even relatively similar mastery tasks such as those using puzzle-like tasks and those using cause and effect toys did not have very highly correlated persistence scores. In addition, mastery motivation researchers had shown in the early 1980's a growing interest in the expression of persistence during social and symbolic play of toddlers (Maslin-Cole et al., 1993) and in social behavior during tasks (e.g. Combs & Wachs, 1993; MacTurk et al., 1985; Morgan et al., 1991). Thus, there seemed to be clear value in developing ways to assess the instrumental or persistence aspects of mastery motivation that were not tapped by the scales of DMQ-G.

In response to these results and concerns, the DMQ was expanded. Five new scales, of three items each, were added to the general items of the DMQ-G. These scales measured persistence during five specific types of task or play: gross motor, combinatorial, means-end, social, and symbolic. This DMQ-E was used with over 20 samples to rate over 1500 1- to 5-year-old children who were mostly singletons or twins developing typically, but included substantial numbers of developmentally delayed and other at-risk children.

The DMQ-G items also were modified, mostly in minor ways, to make the DMQ easier to answer. The equivalence of the initial general scale scores with this revised and expanded DMQ-E was tested by asking mothers of 35 children, 29- to 59-months old, to answer both versions about three weeks apart (Morgan et al., 2018). Half answered the revised version first, and half answered it second. These correlations (General Persistence at Tasks, .85; overall Mastery Pleasure, .70; Independent Mastery Attempts, .83; and General Competence, .58) indicated that the scale scores of the two versions were quite highly related. For Persistence at Tasks and Independent Mastery Attempts the correlations indicated good alternate forms reliability. As expected, the correlation was somewhat lower for General Competence because several items had been changed to improve the psychometric properties of the scale and to try to differentiate competence more clearly from persistence. The overall Mastery Pleasure scale correlation was somewhat lower because we attempted to differentiate two related but somewhat distinct concepts: pleasure during the process of goal-directed behavior and pleasure at causing something to happen.

The Rescored, Five-factor DMQ-E

In the early 1990's, for both psychometric and conceptual reasons, we deleted 5 of the 36 items and reanalyzed the DMQ-E data. This resulted in five scales which were conceptually meaningful and psychometrically stronger than previous formulations. This revised conceptualization included one expressive facet or component of mastery motivation, mastery pleasure, and three instrumental components of mastery motivation, which were: persistence during object play, persistence in social/symbolic play, and persistence in gross motor play of young children. These instrumental components roughly paralleled Harter's (1982) three aspects of perceived competence (academic, social, and athletic) in school-aged children. This new conceptualization also included the overall perceived General Competence factor, which was of interest, but not viewed as an aspect of mastery motivation.

Thus, the rescored DMQ-E for toddlers and preschoolers had five scales: 1) Object-oriented Persistence, 2) Social/Symbolic Persistence, 3) Gross Motor Persistence, 4) Mastery Pleasure, and 5) General Competence. As the conceptualization of mastery motivation evolved, we made minor modifications in items to improve the internal consistency of the scales and the readability and translatability of the items (see Busch-Rossnagel et al., 1993).

The DMQ scales of Object-oriented Persistence (earlier called General Persistence at Tasks), Mastery Pleasure, and General Competence were considered to be essentially equivalent across all the earlier versions of the DMQ and DMQ 17 because item wording and content differed at most moderately and because parallel forms reliability was adequately high.

In summary, as our conceptualization of mastery motivation evolved, the MOMM became the DMQ-G, which provided measures of both the expressive and instrumental aspects of mastery motivation. The DMQ-E was a further expansion to include other potential domains (e.g., social and gross motor) of an instrumental aspect (i.e., persistence) of mastery motivation. The Rescored, Five-factor DMQ-E produced a conceptually and psychometrically stronger questionnaire for toddlers and preschoolers. The evolution of the DMQ up to DMQ-E and a summary of findings about reliability, validity, and correlates of mastery motivation, as measured by the DMQ, were presented in review chapters by Morgan et al. (1993) and MacTurk et al. (1995).

The DMQ with Expanded Social Scales (DMQ-ES)

In 1995 and 1996 the DMQ social persistence (i.e., social mastery motivation) items were revised, expanded and split into two scales: Social Persistence with Children and Social Persistence with Adults. In addition, a second expressive aspect of mastery motivation, Negative Reactions to Failure, was added. Other items and scales remained essentially the same as in the DMQ-E.

The new social scales were intended to assess the young child's attempt at social mastery of the peer environment and of interactions with adults. Social interactions are critical to social and cognitive development, so the motivation to interact with other human beings is a critical component of current notions of mastery motivation (Busch-Rossnagel, 1997; Combs & Wachs, 1993; MacTurk et al, 1985). Research has shown that social mastery (designed to begin, continue and shape social interactions) is distinguished from social interactions initiated and maintained by distress (Wachs & Combs, 1995). Likewise social mastery motivation is distinct from the temperamental dimension of sociability (Combs & Wachs, 1993; Dichter-Blancher, 1999). The DMQ also distinguishes between social interactions of individuals of unequal status (children with adults) and of individuals of equal status (interactions among peers).

Negative reactions to failure was added in view of the literature indicating that even toddlers can have negative reactions when they fail at a mastery task. These negative reactions seemed important to be included in the DMQ because both classic and more recent theory suggested that such negative reactions to failure, especially if severe or frequent, could undermine individuals' motivation to master new tasks. Such a variable might make a separate contribution to the overall degree to which children are motivated to master tasks with which they are faced.

In addition to a preschool version, which had been the predominant age range for the DMQ-G and DMQ-E, new versions of the DMQ were developed and pilot tested for infants, elementary school children, and teens. The ele-

mentary school-aged and teen versions had forms for children to rate themselves and a form for adults (parent or teacher) to rate the child. All the age versions of the DMQ had common items that were thought to be appropriate across ages. The remaining items varied somewhat by age version but roughly paralleled the items in the preschool version. For the DMQ-ES, more than 400 children from 6 months to 19 years (including children experiencing abuse, those with Down syndrome, children whose mothers had clinical depression, and those from low-income families) were rated by mothers, teachers, or by the teens themselves.

Thus, there were many refinements to the mastery motivation questionnaire from the MOMM to DMQ 17, which we describe briefly in the next section. However, from the beginning (i.e., the MOMM), persistence at difficult or challenging tasks has been a central measure of this mastery motivation questionnaire. Many of the changes, especially since the DMQ-G, have been refinements of items, expansion of the dimensions covered, and expansion of the ages included.

DMQ 17

In January 1997, the DMQ 17 version was finalized based on examining the data obtained from the DMQ-ES. This penultimate version of the questionnaire was called DMQ 17. It was used for almost two decades to assess the mastery motivation of many children in Hungary and in English- and Chinese-speaking countries (Józsa & Molnár, 2013; Morgan et al, 2013). The scales and most of the items remained the same, so the DMQ-ES and DMQ 17 are essentially equivalent. However, the wording of some items was simplified to make them easier for young school-age children to rate themselves and lower reading-level adults to understand. As much as possible, we used words with reading levels in the primary school grades (1-3). Several negatively worded (reversed) items were eliminated or reworded because they seemed to have been miscoded by a number of raters who either did not read them carefully or were confused by the wording. These items had lowered the alphas in several previous samples.

DMQ 18

Both statistical and conceptual reasons were used for modifying or deleting a number of DMQ 17 items. The scales and many items remained the same, except that the Negative Reactions to Challenge scale was intended to have two subscales: Negative Reactions Anger/Frustration and Negative Reactions Sadness/Shame; however, as mentioned in **Chapter 3**, the internal consistency reliability of these scales, especially Negative Reactions Sadness/Shame, were sometimes unacceptable. Thus, in this book, we have seldom referred to these intended subscales.

In addition to English, Hungarian, and Chinese versions of DMQ 18, there are now translations into several other languages, including Spanish; these language versions have been used to assess children from at least Iran, Turkey, Bangladesh, Indonesia, Israel, Kenya, and Moldova. The book describes and discusses research related to the use of DMQ 18 in these several countries, as well as DMQ 17 and 18 research in the US, Hungary, China, and Taiwan.

Overview of Each Chapter and Its Focus

Chapter 2 provides empirical and conceptual evidence used to revise and strengthen the DMQ. The measurement invariance of DMQ 17 was assessed for parent ratings of preschool children (Hwang et al., 2017) and separately for ratings of school-age students themselves (Wang et al., 2014). These analyses of Hungarian, Chinese, and English speakers' data were conducted in order to find out which items did and did not work well in all three cultures. These two studies are summarized in **Chapter 2** and lead to the development of DMQ 18.

Chapter 3 describes the seven scales for the four age versions of DMQ 18 and shows how the items are similar or different across the age versions. In addition, the chapter includes an overview of the current studies on DMQ 18 and provides tables listing the main characteristics of the DMQ 18 samples for each country. One such study using this version of the DMQ is Morgan, et al. (2017b). They used DMQ 18 to describe and compare five samples of infants, toddlers, and preschool children with and without risks or delays from Hungary, Taiwan, and the US. Based on available data from 11 languages and 10 countries, this chapter provides preliminary norms for typically developing children. There are norms for the preschool and school age versions rated separately by parents, teachers, and by school-age children themselves.

Chapter 4 describes evidence for the measurement reliability of DMQ data. The chapter summarizes evidence for reliability of DMQ 17 and then presents tables and text summarizing the evidence for internal consistency, test-retest, interrater, and parallel-forms reliability of DMQ 18. There is evidence for reliability from 12 languages and 33 samples of preschool and school-age children, both children developing typically and atypically.

Chapter 5 describes evidence for the measurement validity of DMQ data. The chapter discusses content, criterion, convergent, response processes, factorial, and discriminant evidence for validity from both DMQ 18 and DMQ 17 of various countries and languages around the world, and includes evidence for the validity of the DMQ for children developing typically and also children developing atypically.

Chapter 6 compares DMQ ratings from several countries and also discusses age and cultural differences in the DMQ. Using the DMQ, Józsa et al. (2014) found age-related cross-sectional declines in several aspects of mastery motivation in Hungarian-, English-, and Chinese-speaking school-age children and teens. These declines have been found in both cross-sectional and longitudinal studies, across several cultures, and in the ratings of parents and teachers as well as school children's self-ratings. This chapter discusses mastery motivation in preschools and schools and includes a discussion of the relationship between mastery motivation and the development of skills that are crucial to school success, including social and cognitive skills and school achievement.

Chapter 7 describes mastery motivation using the DMQ in children developing atypically or at risk and provides comparisons with children developing typically. In some DMQ research (e.g., Morgan et al., 2013), parent ratings of English-speaking children with and without various delays were compared; children with delays were rated lower on the DMQ persistence scales and on competence than children of similar mental ages developing typically. Child and family factors related to DMQ scales also are described. This chapter uses the preliminary norms from **Chapter 3** to produce tables showing what ranges of DMQ 18 scale scores are considered "atypical." We also show how to use tables of dichotomized DMQ and mastery task data to help clinicians make decisions about the use of DMQ ratings. These tables should be helpful to clinicians.

Chapter 8 describes using the DMQ in early interventions and for school-age children with special needs. Authors propose a 5-step model for enhancing mastery motivation in children with special needs. The 5-step model includes: problem identification of mastery motivation and assessment (step 1); problem-explanation with parent/child (step 2); goals selected by parent/child (step 3); motivation-enhancing strategies proposed and collaborative consultation with parent/child (step 4); and shared outcome evaluation (step 5). The steps may at times be bidirectional. DMQ 18 can be used for assessment, problem-explanation and outcome evaluation in a variety of applied settings and with clinical populations. **Chapter 8** also discusses the use of the minimum actually detectable change given the measurement error of the instrument and the use of DMQ 18 scores judged to be in the "typical" range to determine the effectiveness of interventions, which should prove useful to clinicians.

Chapter 9 discusses issues about translation, describing how the International Test Commission (ITC) guidelines for translating and adapting a questionnaire could be used as a model. We used these guidelines to provide a detailed hypothetical example of what we consider best current practices for translating and adapting DMQ 18 into a language and culture quite dif-

ferent from the original English version. This chapter also provides an example of how realistic but hypothetical data used confirmatory factor analysis to provide evidence for the goodness of model fit with mastery motivation theory related to the dimensions of mastery motivation and how to provide evidence for the reliability and validity of the translated and adapted DMQ.

Conclusion

This chapter provides evidence for the importance of the concept of mastery motivation and summarizes how it has been measured. The focus of the chapter and this book is on the Dimensions of Mastery Questionnaire (DMQ) including a detailed historical description of its development over the last four decades. Mastery motivation is a fundamental developmental construct that should be included as part of a comprehensive evaluation of children; the DMQ provides easily obtainable, reliable and valid information about mastery motivation. Researchers and clinicians have used the DMQ to rate the mastery motivation of children from 6 months to 19 years, both those developing typically and those developing atypically, in the home, in school, and in a variety of languages and cultures. These are major advantages.

The value of the DMQ for measuring mastery motivation in children at risk and those developing atypically is indicated by interest among special educators and clinicians (e.g., Blasco et al., 2020; Gilmore & Cuskelly, 2011; Hauser-Cram et al., 1997; Hines, 2018; Hwang et al., 2020; Majnemer et al., 2013; Miller et al., 2014; Pipp-Siegel et al., 2003; Salavati et al., 2018; Szenczi et al., 2018; Wang et al., 2013). Miller at al. (2014) conducted a systematic review of the properties of instruments designed to assess motivation in school-age children with a physical disability or motor delay; they concluded that the DMQ provides evidence of good clinical utility. Research with the DMQ provides important implications for clinical practice and early intervention as indicated **Chapter 7** and **8** in this book.

There are, of course some limitations of any questionnaire, including the Dimensions of Mastery Questionnaire. Ratings, especially when one person is asked to rate another (e.g., a mother rates her child) are based the rater's frame of reference and biases. Some raters may have difficulty understanding the items or making self-evaluations, which seems to be the problem for young (5-8 year old) school children rating their own mastery motivation.

When children with delays were tested with individualized, moderately challenging mastery tasks (that were not too hard for them personally), there were few significant differences in motivation between the children

with delays and typically developing children matched on mental age. However, in these studies, children with delays were rated significantly lower on the DMQ persistence scales than the matched children developing typically (Gilmore and Cuskelly, 2011; Wang et al. 2013). This indicates that the parents perceived their delayed children to be lower on mastery motivation than the children's behavior on the moderately challenging tasks would indicate. Józsa and Molnár (2013) reported that the combined DMQ ratings of teachers, parents, and children themselves provided more comprehensive measures and added value for research and clinical use.

The behavioral mastery motivation task measures are less filtered through the perception or bias of the rater, but they are more time consuming and expensive to obtain. We think that data from good individualized mastery tasks can complement the DMQ data, so we suggest that, when feasible, practitioners and investigators interested in mastery motivation should use individualized moderately challenging mastery tasks as well as the DMQ. This combination of methods should prove even more helpful in providing implications for education and clinical practice.

An additional advantage of the DMQ completed by parents, teachers, or the child/teen themselves is that it provides information that the usually short behavioral task measures of mastery motivation do not because DMQ raters have the opportunity to observe the child in other contexts for longer periods and over time. The evidence to support the validity of the DMQ measures presented in this book reinforces this advantage.

This book describes current research with DMQ 18, its reliability, validity and usefulness in examining children's mastery motivation in other cultures, in schools, and for predicting school success. We also describe how the DMQ has been used to examine the mastery motivation of children developing atypically, how it could be used in interventions, and how to interpret and apply the preliminary world-wide norms. We also provide guidelines for best practices about how to adapt and evaluate the reliability and validity of a translation. The next chapter discusses the transition from the DMQ 17 to the current DMQ 18 based on invariance analyses of DMQ 17 data from preschool children and school-aged students in Hungarian-, Chinese- and English-speaking countries.

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