



Validation of the Teacher Questionnaire of Montessori Practice for Early Childhood in the Dutch Context

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Abstract: Montessori education has existed for more than 100 years and counts almost 16,000 schools worldwide (Debs et al., 2022). Still, little is known about the implementation and fidelity of Montessori principles. Measuring implementations holds significant importance as it provides insight into current Montessori practices and because it is assumed that implementation might influence its effectiveness. In the Netherlands, it is especially important to measure fidelity because of the country's history of flexible implementation of Montessori principles. No instruments currently exist that are specifically designed to measure Montessori implementation in the Dutch context. This study aims to validate a translated version of the Teacher Questionnaire for Montessori Practices, developed by Murray et al. (2019), within the Dutch early childhood education context. Additionally, it seeks to investigate the extent to which Montessori principles are implemented in Dutch early childhood schools. Data were collected from 131 early childhood Montessori teachers. Confirmatory factor analysis revealed that the Dutch dataset did not align with the factor structure proposed by Murray et al. (2019). Subsequent exploratory factor analysis led to the identification of a 3-factor solution, encompassing dimensions related to Children's Freedom, Teacher Guidance, and Curriculum, which shows some similarities with Murray et al.'s (2019) factors. Implementation levels in the Netherlands varied, with the highest level of implementation observed in Children's Freedom and the lowest in Curriculum.

Montessori education is a globally recognized pedagogical approach adopted across diverse cultural and educational contexts. With almost 16,000 schools in 154 countries, Montessori education is the largest educational reform movement in the world (Debs et al., 2022). Montessori education is a child-centered educational approach that considers children's individual abilities, needs, and interests. While Montessori schools adhere to this philosophy, it is widely recognized that there are implementation differences across Montessori schools (Demangeon et al., 2023; Lillard, 2019; Randolph et al., 2023). Literature on Montessori implementation identifies three possible explanations for implementation variation among others: Montessori teacher training, public or private funding, and national educational regulations (e.g. Debs, 2023; Gerker, 2023; Randolph et al., 2023). Discussions of Montessori implementation often revolve around the concept of fidelity, which refers to how well a program is implemented relative to the original model (Lillard, 2012). Greater fidelity in Montessori implementation would then be characterized by a strict implementation of Montessori's original principles and a close alignment with her original ideas (Lillard, 2012; Lillard et al., 2017). Some evidence suggests higher fidelity results in greater effectiveness (e.g. Lillard, 2019; Randolph et al., 2023). However, empirical evidence demonstrating the impact of implementation differences on Montessori effectiveness is still scarce. To better understand Montessori effectiveness, it is of critical importance to study Montessori implementation.

The Netherlands is a unique and interesting context for studying Montessori implementation variation. From the early 20th century, calls for school reforms resonated in the Dutch educational landscape. Conventional, traditional schools were criticized for their rigidity, authoritarianism, and narrow focus on cognitive development (Imelman & Meijer, 1986). In addition, until 1917, government funding was exclusively allocated to conventional public schools, leading to a clear divide between government funded public schools and privately funded schools, which included religious schools or schools based on alternative educational philosophies. Individuals with different social and religious opinions, as well as different ideas about the role of education, campaigned for public funding of all types of schools, which led to the so-called School Struggle (*schoolstrijd*), which started in 1889. This School Struggle was settled in 1917 with Article 23 of the Dutch constitution, often referred to as the Freedom of Education Act (Rietveld-van Wingerden et al., 2003). The Freedom

of Education Act stipulates that the government funds all types of schools, thereby eliminating the distinction between privately and publicly funded schools and thereby establishing parity within the Dutch educational system. In addition, the constitution stipulates that the government decides on the core educational objectives and supervises educational quality, but schools themselves are free to choose their educational methods and adapt the curriculum how they see fit, leading to moderate government regulations (Slaman, 2018). Consequently, in addition to religious schools, progressive education, such as Montessori, Dalton, and Jenaplan, was introduced into the Dutch educational system (Slaman, 2018). Throughout the 20th century, these schools remained part of the Dutch educational landscape and their numbers grew steadily. Currently, the Netherlands has great diversity in publicly funded schools with a range of pedagogical orientations: about 10% of all Dutch schools implement an alternative educational philosophy, such as Montessori, Dalton, Freinet, Jenaplan, or Waldorf (Sins & van der Zee, 2015).

Due to the government funding for Montessori schools and moderate government regulations, the Dutch context offers ample opportunities for Montessori schools to shape their own practices. From the founding of the Dutch Montessori Association in 1917, the implementation of Montessori education has been an ongoing debate in the Dutch Montessori movement. In their seminal review of progressive education in the Netherlands, Imelman and Meijer (1986) even argued that debating Montessori implementation has become an integral part of the Dutch Montessori movement over the years. Therefore, it is likely that there is considerable variation in Montessori implementation. If this variation in Montessori implementation can be measured, we can examine how specific ways of implementing Montessori education are related to differences in effectiveness. In addition, the Dutch Inspectorate of Education periodically assesses the quality of schools, particularly learning outcomes. Since 2018, this assessment has included the examination of the educational quality of 29 elementary Montessori schools. Among these, 18 Montessori schools received favorable ratings for their quality while the remaining 11 were deemed insufficient (Inspectorate of Education, n.d.). It is worth examining how these schools implemented Montessori principles and how this is related to the assessment conducted by the Dutch Inspectorate of Education. Considering these factors, the unique Dutch context creates an intriguing opportunity for studying Montessori implementation.

Early Dutch Montessori Implementation Debate

Even before the Dutch translation of Montessori's book *The Montessori Method* in 1916, Montessori schools were already emerging in the Netherlands. The first Montessori school started in The Hague in 1914, initially as a kindergarten (Joosten-Chatzen, 1937). However, from the start, there was hesitation about applying the Montessori principles (Hazenoort, 2010). For example, Montessori's emphasis on freedom presented practical challenges, including classroom disorder and children's lack of engagement and, therefore, teacher disillusionment in the Montessori Method (Philippi-Siewertsz van Reesema, 1924, 1954). Careful implementation of Montessori principles was complicated when World War I prevented direct contact with Montessori herself coupled with the limited availability of Montessori's books translated to Dutch. Consequently, a wide range of interpretations and experimental implementations of Montessori's principles emerged in the Netherlands. For example, such experimental implementations included the Montessori-Froebel combination, with morning classroom instruction and free Froebel play, followed by Montessori activities in the afternoon and a blending of Montessori and Decroly principles, and later combinations of Montessori and Dalton (Eyssen, 1919; Hoencamp et al., 2022; Philippi-Siewertsz van Reesema, 1954; Schwegman, 1999).

Initially, flexible and experimental Montessori implementations were part of the widespread dissemination of the Montessori Method in the Netherlands (Leenders, 1999). In 1920, however, Montessori herself endeavored to recapture a stricter implementation of her Method. During lectures in Amsterdam, she stated that learning materials may only be used in accordance with fixed instructions, and Montessori teacher training programs must be approved by Montessori herself (Leenders, 1999; Philippi-Siewertsz van Reesema, 1954). In addition, Montessori, among others, was involved in amending a Dutch education act in 1922, whereby the possibility of exemption from the fixed timetable was obtained—something that had been seen as an obstacle to a more strict implementation of Montessori education in the Netherlands (Joosten-Chatzen, 1937). Moreover, Montessori (1971) criticized the Dutch mixture of her Method with other pedagogies, arguing that such approaches would not yield the same results she had

achieved. Montessori (1989) stated that “her method also bears her name to distinguish her work of those others establishing new forms of education” (p. 3). This resulted into a series of articles in *Montessori Opvoeding* (Montessori Education), the journal of the Dutch Montessori Association, addressing numerous disagreements regarding the rigid adherence to exclusively using Montessori's materials (Philippi-Siewertsz van Reesema, 1954).

Despite initial implementation problems in the early 1930s, the Montessori movement thrived in the Netherlands due to the stable Dutch political climate, government funding, and moderate government regulations (Kramer, 1976). According to Kramer, “Of all the Montessori schools throughout the world, the Dutch had the most consistently best” (p. 323). Kramer describes how the Dutch Montessori schools gradually developed into demonstration schools, for example in Amsterdam, where foreign visitors could see the Method “in operation at its best” (p. 292). However, it is important to note that Kramer's focus was primarily on those Dutch schools strictly following Montessori principles, excluding other variations like Montessori-Froebel and Montessori-Decroly mixtures, which were also prevalent in the Netherlands. For example, Montessori herself visited a Dutch school that mixed Montessori's material with Froebel's and reportedly “utterly disapproved” (Philippi-Siewertsz van Reesema, 1954, p. 103).

Over time, diverse types of Montessori schools emerged within the Dutch Montessori movement, ranging from classic Montessori schools, closely following Montessori's guidelines, to more flexible, experimental Montessori schools that incorporated Froebel and Decroly principles alongside Montessori principles (Hazenoort, 2010; Leenders, 1999; Philippi-Siewertsz van Reesema, 1954). These types of Montessori schools also had their own teacher training programs. For instance, the Amsterdam training program, which started in 1919, adhered strictly to Montessori's directions, while the The Hague Montessori training course, which started in 1918, embraced a broader spectrum of pedagogies, including Decroly, Ligthart, Froebel, and Parkhurst (Hazenoort, 2010; Joosten-Chatzen, 1937; Leenders, 1999). The early adaptation of Montessori principles in the Netherlands, characterized by its varied implementations, suggests that the initial fidelity to Montessori's original principles was somewhat restrained. Montessori principles were integrated to enhance and complement existing

educational practices. On the other hand, however, Montessori called for a stricter implementation of her principles in the Netherlands. The tension between Montessori's call for a stricter adherence to her principles and the diverse interpretations and implementations of Montessori education in the Netherlands highlight the importance of understanding Montessori implementation to gain a better understanding of how practices align with Montessori's original principles and her original ideas.

Dutch Montessori Movement from the 1940s to Today

The internationally unique Dutch context has resulted in various implementations of Montessori education. The debate regarding the diversity of Montessori implementation, observed until the 1940s, endured within the Dutch Montessori movement even in the post-World War II era. For example, at the international Montessori conference in Amsterdam in 1950, Montessori again raised the issue that reforms she developed after 1940 were never implemented in the Netherlands (M. M. Montessori, 1961). On the other hand, Sixma (1956), a former Dutch Montessori teacher and principal who later became a professor of educational sciences, advocated for flexibility, asserting that there was no single "Montessori school" but a wide range of Montessori schools, each influenced by different interpretations of Montessori theory. Conversely, the Montessori Center, founded in Amsterdam in the mid-1960s, aimed for a stricter adherence to Montessori principles. This Montessori Center, which included Mario Montessori as its secretary, pursued an Association Montessori Internationale (AMI) certified training, but Dutch government restrictions complicated this endeavor (Imelman & Meijer, 1986).

In the 1970s, the Montessori Center collaborated with the Dutch Montessori Association to publish a book providing guidelines for the use of Montessori materials with the goal of improving the alignment of Montessori teacher training in the Netherlands. However, in the preface, Mario Montessori (M. M. Montessori, 1973) wrote that the book was born out of necessity, completely contrary to Maria Montessori's will, and emphasized that this initiative was solely Dutch as no equivalent standardized book exists anywhere else in the world. The book led to increased attention to teacher professional development, resulting in the introduction of a framework for Montessori teacher training in 1980s. The purpose of this framework was to promote consensus and

uniformity in teacher training, bringing more consistency to the way Montessori education was implemented (Dutch Montessori Association, 1983). However, despite the publication of this book on Montessori materials and an increased focus on teacher professional development, variation among Montessori schools remains. This more centralized and standardized approach, which the Dutch Montessori Association adopted, failed to achieve the intended results, and the debate on Montessori implementation persists. Nevertheless, the Dutch Montessori Association continues its efforts to standardize, which is also demonstrated by the establishment of the Dutch Montessori Association's own accreditation system in 1997. This accreditation system was intended to "determine whether member schools meet its standards and thus may call themselves a Montessori school" (Vos, 2007, p. 75). However, creating such an accreditation system has proven challenging due to diverse perspectives within the Dutch Montessori movement regarding implementation and a lack of consensus regarding these different views (Vos, 2007). On a national level, there appears to be some shared understanding among members of the Dutch Montessori Association, particularly regarding the importance of having trained teachers and supporting children's free choice (Vos, 2007). However, this consensus is limited and can only be comprehended in general terms as details are lacking, providing schools with little guidance on how to implement Montessori education. In addition, many Montessori schools cherish their autonomy to choose their educational methods and adapt the curriculum how they see fit, as they are entitled to do under the Freedom of Education Act. As a result of this lack of consensus on Montessori implementation on a national level and the autonomy of schools given by the law, practitioners started to introduce adaptations to Montessori education that affect its implementation. For example, some Montessori schools in the Netherlands have single-age classes or use supplementary materials in addition to Montessori materials. Two Dutch Montessori teacher trainers, Stefels (current trainer) and Rubinstein (former trainer), contended that lacking a sufficient central approach has led some schools to deviate from Montessori fidelity, questioning the choices being made by these schools (Vos, 2007). Throughout the final three decades of the last century, there was a consistent pattern of oscillation between straying from Montessori fidelity and reverting back to it.

To structure the enduring debate in the Netherlands, Berends and de Brouwer (2020) compiled a volume that delved into various perspectives on Montessori education in the Netherlands. The book contributed to understanding the nuances of implementing Montessori principles in Dutch educational settings. Specifically, it addressed the debate between adhering strictly to Montessori principles or adopting a more flexible approach. The different perspectives in the book underscored the complexity of measuring Montessori implementation fidelity in the Netherlands and highlighted the ongoing discussions within the Dutch Montessori movement regarding the best practices for implementing Montessori education.

Considering the history of the Dutch Montessori movement, the conflicting viewpoints highlight the inherent tension between fidelity to Montessori's original ideas, as outlined in her books, versus adaptation to contemporary educational practices, insights, and cultural norms. Currently there are 219 Montessori schools in the Netherlands: 38 preschools (0–4-year-olds), 162 Montessori elementary schools (4–12-year-olds), and 19 secondary schools (12–18-year-olds), all still government funded and with a high degree of school autonomy (Dutch Montessori Association, n. d.).

Contemporary Montessori Fidelity Measurement

Historically, the Dutch Montessori landscape exhibits diversity in implementing Montessori principles, highlighting an ongoing debate between adhering to Montessori's original ideas and adapting to contemporary practices, emphasizing the necessity for further empirical examination. Although implementation variation has been, and still is, the subject of ongoing debate, there has paradoxically been no prior empirical study in the Netherlands that examined whether and to what extent Montessori schools differ from one another. Therefore, this research aims to examine the fidelity of Montessori implementation, where fidelity is defined as the degree to which a program is implemented relative to Montessori's original principles and closely adheres to her original ideas (Lillard, 2012). This approach does not presuppose that higher fidelity Montessori implementation is better. Instead, it acknowledges that empirical evidence regarding the implementation of Montessori's original principles contributes to a more comprehensive discussion on overall implementation.

Although several measures have been used in previous studies to represent Montessori implementation (e.g., AMI credentials, time children spent on working

with Montessori materials, using predetermined criteria), there is no widely accepted instrument to assess the fidelity of Montessori implementation (Murray & Daoust, 2023). The Teacher Questionnaire for Montessori Practices (TQMP), as developed by Murray et al. (2019), is a robust tool with some validity evidence to measure Montessori implementation. The TQMP consists of two questionnaires, one for early childhood and one for elementary, and allows teachers to indicate the practices in their classrooms in a granular way, taking several dimensions into account. Given the authors' call for continued research in the instrument in different environments, we used this instrument within the Dutch Montessori context.

This article focuses on the early childhood questionnaire as the elementary questionnaire is addressed in another study. Therefore, the aim of this study is to provide validity evidence for the translated TQMP by evaluating its psychometric properties. A second aim of this study is to explore how Montessori principles are implemented in Dutch early childhood Montessori schools.

Methods

Participants and Procedure

The Dutch Montessori Association invited all early childhood teachers of the 162 Dutch elementary Montessori schools to participate in this study by email. Montessori elementary education in the Netherlands is organized into three stages: Early Childhood groups (ages 4–6), Lower Elementary (ages 6–9), and Upper Elementary (ages 9–12). The email included a link to the online questionnaire and schools were asked to have their Early Childhood teachers complete the questionnaire. The questionnaire was administered in June–July 2019 after receiving active informed consent by the participants. This procedure complies with the standards set by the ethical commission of our university (den Ouden, n.d.). The questionnaire took approximately 15 minutes to complete.

The questionnaire was completed by 131 Early Childhood teachers from 97 different Dutch elementary Montessori schools, which represents 60% of all the Early Childhood Montessori schools in the Netherlands. The participants' ages ranged from 20 to 66 years ($M = 45.63$, $SD = 10.95$). Of the participating teachers, 74% had over five years of experience in Montessori education, 80.9% had completed their Montessori teacher training, 6.1% of the participants were not Montessori trained, and 13% were attending Montessori training. Approximately half

(50.4%) of the participants came from schools in the Randstad, a densely populated urban area in the western Netherlands, while the remaining half (49.6%) came from different parts of the Netherlands.

Instrument

We built on the efforts of Murray et al. (2019), who gave a detailed overview of the literature they used to construct their questionnaire. This is a self-report measure which, although subjective, provides a quick insight into the perceived level of Montessori implementation according to teachers. To develop an instrument that reliably reports Montessori implementation in early childhood, Murray et al. (2019) proposed three factors to measure Montessori implementation: Classroom Structure, Curriculum, and Children's Freedom, which are all grounded in the original works of Maria Montessori, to measure Montessori implementation fidelity.

The TQMP for early childhood consisted of 18 items, formulated as statements, and rated on a 4-point Likert scale ranging from (1) *strongly disagree* to (4) *strongly agree*. All 18 items of the TQMP were translated into Dutch. We adjusted the original scale to (1) *never occurs in my classroom* to (4) *always occurs in my classroom*, to simplify the questionnaire. Although Murray et al. (2019) operationalized the three factors in their questionnaires, the theoretical framework does not provide definitions. A definition of these factors is essential to establish content validity (Hardesty & Bearden, 2004). We added these definitions to clarify the three factors in the TQMP. Classroom Structure is defined as the ways in which the group is organized and how children are instructed to foster their independence and individual development (e.g., Montessori, 1937, 1949, 1997). The Montessori Curriculum for early childhood is defined as carefully constructed materials and activities to support the child's entire development, from social skills to mathematics. The curriculum covers exercises for Practical Life, Sensorial, Language, and Math skills, as well as an introduction to Cultural Subjects and related activities such as Art and Music. Children's Freedom is defined as the extent to which children have the freedom to make their own choices (e.g., Montessori, 1935, 1937, 1997).

After the translation of the items, seven Montessori teachers and/or Montessori teacher educators, all part of the Dutch Montessori Research Group, gave feedback on the phrasing of the items of the TQMP and the terminology of the 4-point Likert scale to

indicate whether the wording and phrasing of the items was correct and familiar to them. After discussing the feedback, no items needed rephrasing and the questionnaire was digitalized. Next, we piloted the questionnaire with Early Childhood Montessori teachers who volunteered to complete the TQMP to estimate the time required for completing the questionnaire, assess the smoothness of its digitization, and determine the clarity of the items. This pilot indicated that the phrasings of the individual items were well known and straightforward to Early Childhood teachers. They were able to complete the questionnaire in approximately 15 minutes, and the online version functioned correctly and required no further adjustments. Finally, the Dutch version of TQMP was administered digitally using Qualtrics, starting with a brief introduction about the aim of the study. It consisted of 18 items formulated as statements and questions could not be skipped to avoid missing data.

Analysis

Since the TQMP was already developed and tested by Murray et al. (2019), confirmatory factor analysis (CFA) was performed to evaluate how well the collected data fits into the prespecified factors (Brown, 2015). Additionally, multiple goodness-of-fit indices were examined to confirm the predicted three-factor structure: root mean square error of approximation (RMSEA), comparative fit index (CFI), the Tucker–Lewis index (TLI), and chi-square (Prudon, 2015). To indicate a good fit, RMSEA should be below .06, CFI and TLI values should be close to .95 (Hu & Bentler, 1999), and a chi-square test should be nonsignificant (Brown, 2015). Factor loadings higher than 0.3 were considered to indicate a moderate correlation between the item and the factor (Tavakol & Wetzel, 2020). The data were analyzed using JASP version 0.17.1.0. There were no missing data. Afterwards, an exploratory factor analysis (EFA) was conducted as the CFA resulted in a poor fit (as described in the Results section). According to Schmitt (2011), EFA is a reasonable next step when the CFA model has a poor fit.

To test the suitability of the data for an EFA, the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy (Kaiser, 1974) and Bartlett's (1954) test of sphericity were tested. The KMO measure should be above 0.50, and Bartlett's test should be significant (Williams et al., 2010) for EFA to be acceptable. The EFA was performed using oblique rotation as the factors were allowed to correlate with one another (Fabrigar et

Table 1*Descriptive Scores for All Items*

| | <i>M</i> | <i>SD</i> | Min. | Max. |
|--|----------|-----------|------|------|
| Classroom structure | | | | |
| Lessons are mostly given to individuals | 3.30 | .54 | 2.00 | 4.00 |
| Children's activities are recorded each day | 3.27 | .84 | 1.00 | 4.00 |
| Children give lessons to one another | 2.87 | .71 | 1.00 | 4.00 |
| There is a 3-hour uninterrupted work period | 1.75 | .99 | 1.00 | 4.00 |
| At least 3 age levels | 2.82 | 1.39 | 1.00 | 4.00 |
| Observation is used for daily lesson planning | 3.45 | .73 | 1.00 | 4.00 |
| Curriculum | | | | |
| Walk on the line carrying objects | 1.67 | .85 | 1.00 | 4.00 |
| Care for classroom plants | 3.57 | .79 | 1.00 | 4.00 |
| Children carry out Practical Life exercises during the work period | 3.05 | .89 | 1.00 | 4.00 |
| Classroom books feature realistic stories | 2.98 | .72 | 1.00 | 4.00 |
| Older children do golden bead addition | 3.27 | .71 | 1.00 | 4.00 |
| A full set of Montessori materials is available | 3.57 | .69 | 1.00 | 4.00 |
| Children regularly prepare food | 1.60 | .82 | 1.00 | 4.00 |
| Garden in a designated area | 1.89 | .80 | 1.00 | 4.00 |
| Children's freedom | | | | |
| Choose their work/activities | 3.53 | .52 | 2.00 | 4.00 |
| Determine how long to work with an activity | 3.28 | .59 | 1.00 | 4.00 |
| May choose to work alone or with others | 3.64 | .53 | 2.00 | 4.00 |
| Decide where they will work | 3.47 | .67 | 1.00 | 4.00 |

Note. All items are sorted by the constructs found in Murray et al. (2019).

al., 1999). The number of factors was determined based on parallel analysis (Horn, 1965), which is sometimes considered the best available alternative for determining the number of factors (Thompson & Daniel, 1996). In parallel analysis, expected eigenvalues are computed by simulating normal random samples that mimic the characteristics of the observed data in terms of sample size and number of variables. These expected eigenvalues are then compared to the observed eigenvalues, and the factor is considered significant when “the associated eigenvalue was bigger than the mean of those obtained from the random uncorrelated data” (Ledesma & Valero-Mora, 2007, p.3). Subsequently, problematic items were removed from the questionnaire, meaning that items with factor loadings lower than 0.3 were excluded from subsequent EFAs as well as cross-loading items with less than a .15 difference from the item's greatest factor loading (Tavakol & Wetzel, 2020; Worthington & Whittaker, 2006). Before omitting these items, their content and formulation was critically examined by the researchers, to ensure that the content of the item indeed

did not align with the factor structure. In the final model, the content of the items was examined, and a label was assigned by the researchers.

Results

Table 1 shows the descriptive statistics for all items of the questionnaire. These items are sorted according to the constructs found by Murray et al. (2019).

Confirmatory Factor Analysis

CFA was performed to check if the suggested factorial structure as derived from Murray et al. (2019) fits the data. Of the goodness-of-fit indices, only the RMSEA met the accepted threshold; the others did not, suggesting a poor fit of the predicted three-factor model of the TQMP (RMSEA = .06; TLI = .80; CFI = .83; $\chi^2(132) = 188.98, p < .001$). Additionally, six items featured low factor loadings of $< .30$. Table 2 displays the factor loadings obtained by the CFA. Based on these results, the factorial structure of the Dutch TQMP needed to be revised to improve its goodness of fit.

Table 2*Factor Loadings Derived From Confirmatory Factor Analysis*

| | Classroom structure | Curriculum | Children's freedom |
|--|---------------------|------------|--------------------|
| Lessons are mostly given to individuals | .130 | | |
| Children's activities are recorded each day | .457 | | |
| Children give lessons to one another | .315 | | |
| There is a 3-hour uninterrupted work period | .510 | | |
| At least 3 age levels | .482 | | |
| Observation is used for daily lesson planning | .439 | | |
| Walk on the line carrying objects | | .494 | |
| Care for classroom plants | | .337 | |
| Children carry out Practical Life exercises during the work period | | .582 | |
| Classroom books feature realistic stories | | .242 | |
| Older children do golden bead addition | | .298 | |
| A full set of Montessori materials is available | | .312 | |
| Children regularly prepare food | | .167 | |
| Garden in a designated area | | .204 | |
| Choose their work/activities | | | .249 |
| Determine how long to work with an activity | | | .396 |
| May choose to work alone or with others | | | .302 |
| Decide where they will work | | | .379 |

Note. Confirmatory Factor Analysis (CFA) was conducted with JASP version 0.16.4. Values represent factor loadings.

Table 3*Factor Loadings Derived From Exploratory Factor Analysis Based on a Three-Factor Structure*

| | Children's freedom | Teacher guidance | Curriculum |
|--|--------------------|------------------|------------|
| Determine how long to work with an activity | .681 | | |
| Decide where they will work | .614 | | |
| May choose to work alone or with others | .576 | | |
| Choose their work/activities | .355 | | |
| Children's activities are recorded each day | | .663 | |
| A full set of Montessori materials is available | | .579 | |
| Observation is used for daily lesson planning | .311 | .475 | |
| Care for classroom plants | | .360 | |
| Children carry out Practical Life exercises during the work period | | | .570 |
| Garden in a designated area | | | .569 |
| Walk on the line carrying objects | | | .483 |
| Children regularly prepare food | | | .355 |

Note. Exploratory factor analysis (EFA) was conducted with JASP version 0.16.4 with oblique rotation. Values represent rotated factor loadings, which are only displayed for items with loadings > .30.

Table 4*Descriptives of the Final Factors and Factor Correlations*

| | M | SD | Min | Max | α | Factor correlatives | | |
|--------------------|------|-----|------|------|----------|---------------------|------------------|------------|
| | | | | | | Children's freedom | Teacher guidance | Curriculum |
| Children's freedom | 3.48 | .41 | 2.00 | 4.00 | .66 | - | | |
| Teacher guidance | 3.47 | .53 | 1.75 | 4.00 | .64 | .233 | - | |
| Curriculum | 2.05 | .55 | 1.00 | 3.75 | .56 | .264 | .281 | |

Note. Subscale means are based on the average of items in the final factor structure. Mean scores could range between 1 and 4.

Exploratory Factor Analysis

The KMO statistic verified the sampling adequacy for the analysis (KMO = .692), which was above the acceptable limit of 0.50 (Williams et al., 2010). Additionally, Bartlett's test of sphericity was significant, $\chi^2(153) = 454.13, p < .001$, indicating that a factor analysis is suitable. The first iteration of the EFA showed a three-factor model with a moderate goodness of fit (RMSEA = .05; TLI = .85; CFI = .90; $\chi^2(102) = 130.85, p = .029$). Subsequently, considering the content of the items, items were omitted from consecutive EFAs when they showed a factor loading lower than .30. After several EFA iterations, the results of the improved models without problematic items suggested a three-factor model (RMSEA = .03; TLI = .95; CFI = .97; $\chi^2(33) = 38.21, p = .244$). Six items were omitted from the final analysis based on a low factor loading, resulting in three factors with a total of 12 items (see Table 3).

Four items loaded onto the first factor. All items were related to the freedom of children to choose and consisted of the same items as the scale Children's Freedom from Murray et al. (2019). Therefore, this factor was labeled *Children's Freedom*. The items in this factor reached Cronbach's α of .66. Four items loaded onto the second factor. One of these items had a cross loading with the first factor, but as this loading was higher than .150, the item was considered to be part of the second factor. Most of these items were related to how the teacher provided guidance to the child. Therefore, this factor was labeled *Teacher Guidance* (Cronbach's $\alpha = .64$). The third factor consisted of three items from the original Curriculum scale. Therefore, this factor was labeled *Curriculum* (Cronbach's $\alpha = .56$).

Montessori Implementation in the Dutch Context

The means of the factors give some insight into the extent of Montessori implementation in Dutch early childhood. Table 4 shows descriptive statistics and Cronbach's α of the factors. Additionally, factor

correlations are displayed in the table. Children's Freedom is implemented the most in Dutch Early Childhood Montessori classrooms, whereas Curriculum is implemented the least. The variation of the scores was the smallest for Children's Freedom, and largest for Curriculum. Mean scores within the factors ranged between 1.75 and 4.0 on a four-point scale with the largest range for Curriculum and the smallest range for Children's Freedom. Finally, all factors correlated with one another, with Teacher Guidance and Curriculum having the highest correlation.

Discussion

The unique Dutch educational policy, which includes government funding since 1917 and moderate regulations, offers a context in which Montessori schools have a great deal of autonomy to decide how to implement Montessori principles. This unique characteristic of the Dutch context has led to variations in implementing Montessori education since its introduction. These different perspectives on how to best implement Montessori principles, ranging from classic Montessori schools, closely following Montessori's guidelines, to more flexible, experimental Montessori implementation, have been a subject of ongoing debate in the Netherlands. However, to better understand the relationship between implementation and effectiveness, and to elucidate the varied effects of these implementation differences, research on Montessori implementation is essential. Therefore, this study aimed to validate the early childhood TQMP questionnaire and explored the implementation of Montessori principles in Dutch early childhood.

Main Findings

The initial CFA results for the translated TQMP indicated a poor fit with the Dutch context, prompting the need for adjustments to align the questionnaire's factor structure better. The EFA revealed a different factor

structure compared to the one identified in the Murray et al. (2019) study. Our findings indicate a three-factor model for assessing Montessori implementation in early childhood, comprising the dimensions of Children's Freedom, Curriculum, and Teacher Guidance. The first two factors, Children's Freedom and Curriculum, remained similar to Murray's original questionnaire. Children's Freedom retained the same items as the original TQMP, while in the Curriculum factor, the items "classroom books feature realistic stories" and "older children do golden bead addition" were omitted, and the items "a full set of Montessori materials is available" and "children care for classroom plants" were positioned into the Teacher Guidance factor. Indeed, the remaining factor, Teacher Guidance, diverged from the original TQMP. This factor consisted of four items, three of which reflected the teacher guidance of the child, complicating the interpretation of this factor.

We conducted calculations for mean, minimum, and maximum scores along with standard deviations to assess the implementation of Montessori principles in Dutch early childhood education using our three-factor solution (see Table 4). These results should be interpreted with caution because of the low alpha scores of the factors. Children's Freedom and Teacher Guidance were rated as being implemented the most; the mean score for Curriculum also indicated agreement among teachers regarding their level of implementation. However, for this factor, the minimum scores fell within the range of "completely disagree" and "disagree," suggesting that some teachers may not perceive these aspects as fully implemented in their Montessori classrooms. Standard deviations are the best indicator for variation between the different Montessori schools. The most variation was shown in the Curriculum factor, followed by Teacher Guidance and Children's Freedom. As Children's Freedom had both the highest mean and the lowest standard deviation, this suggests that it is implemented the most across Montessori schools, and its implementation is comparable across schools.

The results suggested that Montessori implementation in the Netherlands demonstrates diversity, with varying degrees of application for different Montessori principles. The standard deviations in the mean scores and the wide range of scores illustrated variation across the three factors, implying that schools employ these Montessori principles differently. On average, a strict, high-fidelity implementation of Montessori principles in the Netherlands is not prevalent, although the level of implementation is not low, either.

Directions for Future Research

While our study adhered to rigorous procedures for establishing validity, there is room for improvement in the Dutch TQMP, especially concerning the reliability of the factors. Many researchers recommend a Cronbach's α threshold of 0.70 (Tavakol & Dennick, 2011), although some argue that during the initial stages of research values as low as 0.50 can suffice (Field, 2018). None of the factors in the Dutch TQMP reached a score above Cronbach's α 0.70. Cronbach's α partly depends on the number of items in the scale; if the number of items increases, the reliability of the scale will increase (Field, 2018). All factors now contain four items. To enhance reliability, a first step for future research is to add more items to all factors. Additionally, the content of the factor Teacher Guidance is difficult to interpret and does not align with classifications in the literature. Therefore, it is necessary to review the theory and add additional items based on the literature to this factor. In addition, to increase reliability, existing items should be reviewed as well. Therefore, the forthcoming step is to refine the questionnaire, add additional items, followed by another round of data collection. Then, with the new collected data, revalidate the questionnaire to evaluate its psychometric properties. One other way to increase the validity of the findings on Montessori implementation is through triangulation. This can involve cross-referencing Montessori implementation data using methods such as classroom observation. Observation is a good method for overcoming the shortcomings of a self-report questionnaire. Therefore, forthcoming research should prioritize the development of a classroom observation tool that aligns with and complements the (Dutch) TQMP.

A first direction for further research is to improve and revalidate the Dutch TQMP. When completed, the next step could be the characterization of implementation types using latent profile analyses. While our study offers an overarching view of Dutch Montessori implementation, the substantial variability in Montessori implementation, as indicated by the standard deviations in mean scores, suggests the potential for identifying and describing distinct implementation profiles using latent profile analysis. A multilevel analysis, in which we explore at which level the variance in mean scores occurs (i.e., teacher, class, or school level) might also be part of further research.

Our study underscores the importance of considering the national context when assessing Montessori implementation. The validation of the TQMP revealed its

inadequacy within the Dutch context. Exploring whether the original questionnaire is also unsuitable for use in other international Montessori contexts warrants further investigation. We therefore call, in line with Murray et al. (2019), for the further development and refinement of both the elementary and early childhood questionnaires, with a larger and more diverse sample in different contexts.

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