ORIGINAL ARTICLE / ÖZGÜN ARAŞTIRMA

DOI: 10.4274/tjcamh.galenos.2025.93798

Turk J Child Adolesc Ment Health 2026;33(1):41-49

Turkish Adaptation of the Milestones of Normal Development in Early Years (MONDEY-TR): A Scale for Monitoring Development in Children Aged 0-3 Years

Erken Yaşlardaki Normal Gelişimin Kilometre Taşları Ölçeği'nin Türkçeye Uyarlanması (MONDEY-TR): 0-3 Yaş Çocuklarının Gelişimini Gözlemlemeye Yönelik Bir Ölçek

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ABSTRACT

Objectives: Reliable tools for observing and documenting age-related changes in different domains of development are needed to track children's progress, but also to identify potential risks for developmental delays and disorders at an early stage. This study evaluates the Turkish version of Milestones of Normal Development in Early Years (MONDEY-TR 0-3), tests its psychometric qualities, describes developmental trajectories of Turkish children across eight central domains, and compares these results with those of German children.

Materials and Methods: The development of n=190 Turkish children aged 0 to 3 years was evaluated using MONDEY-TR 0-3. Findings regarding eight domains were compared with data from n=1,543 German children.

Results: MONDEY-TR 0-3 demonstrated excellent psychometric properties, including (a) high internal consistency for the total scale and individual subscales, (b) a clear age-related increase in subscale scores, and (c) strong similarities in developmental patterns between Turkish and German children.

Conclusion: MONDEY-TR 0-3 is not only a freely available and user-friendly tool for both parents and professionals, but also a reliable and valid instrument, suitable for research and practical applications supporting early childhood development.

Keywords: MONDEY, infancy, toddlerhood, child development

ÖZ

Amaç: Çocukların farklı alanlardaki yaşa bağlı gelişim süreçlerini takip edip belgeleyebilmek ve aynı zamanda gelişimdeki gecikme veya bozuklukları erken dönemde belirleyebilmek için güvenilir ölçeklere ihtiyaç vardır. Bu çalışma, erken yaşlardaki normal gelişimin kilometre taşları Türkçe versiyonunu (MONDEY-TR 0-3) değerlendirerek psikometrik özelliklerini test etmekte, Türk çocuklarının sekiz temel gelişim alanındaki gelişimsel süreçlerini incelemekte ve elde edilen sonuçları Alman çocukların verileri ile karşılaştırmaktadır.

Gereç ve Yöntem: Yaş aralığı 0-3 olan n=190 Türk çocuğunun gelişimi MONDEY-TR 0-3 kullanılarak değerlendirilmiştir. Sekiz gelişim alanına ilişkin bulgular, n=1.543 Alman çocuğunun verileriyle karşılaştırılmıştır.

Bulgular: MONDEY-TR 0-3, güçlü psikometrik özellikler sergilemiştir: (a) toplam ölçek ve alt ölçeklerde yüksek iç tutarlılık, (b) her gelişim alanında yaşa bağlı belirgin bir artış ve (c) Türk ve Alman çocuklarının gelişim kalıplarında güçlü benzerlikler gözlemlenmiştir.

Sonuç: MONDEY-TR 0-3, yalnızca ebeveynler ve çocuk gelişimi alanındaki uzmanlar için ücretsiz ve kullanıcı dostu bir ölçek olmanın ötesinde, erken çocukluk gelişimi alanında yürütülen araştırmalar ve pratik uygulamalar için de güvenilir ve geçerli bir ölçüm aracıdır.

Anahtar Kelimeler: MONDEY, bebeklik, erken çocukluk, çocuk gelişimi

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Received/Geliş Tarihi: 05.03.2025 **Accepted/Kabul Tarihi:** 26.08.2025 **Publication Date/Yayınlanma Tarihi:** 13.03.2026

Cite this article as/Atıf: Şamdan G, Pauen S. Turkish adaptation of the milestones of normal development in early years (MONDEY-TR): a scale for monitoring development in children aged 0-3 years. Turk J Child Adolesc Ment Health. 2026;33(1):41-49

Introduction

Children are born with different personality traits and grow up in diverse learning and living environments. These differences significantly impact their development, as do maturational changes and everyday experiences. But despite the high individuality of developmental pathways, there are also commonalities in the sequence and age at which children achieve certain milestones of development. These commonalities can help us identify children at risk for developmental delays. For caregivers, it thus makes sense to observe their children's developmental progress in everyday settings. Such careful observations allow for individualized monitoring of each child, and they make it easier to provide developmental support and intervention when needed.[1] We can learn about children's special interests and needs, but also about potential developmental risks and delays in certain areas.[2] In this process, caretakers play a key role. According to Vygotsky and Cole[3] they can support children in taking the next developmental step by providing targeted, suitable stimulation. To identify and address a child's support needs, standardized, reliable, and valid tools for documenting developmental progress are essential. These tools should be theoretically and empirically well-founded, cover all relevant aspects of child development, meet high-quality standards in terms of their test construction, and facilitate longitudinal observations, while also being user-friendly and cost-effective.[4] Among the available options are developmental tests conducted directly with the child and applied by trained professionals such as pediatricians or psychologists (e.g., Denver II developmental screening test[5]), as well as screening tests that can be carried out by professionals in daycare centers (e.g., Ages & Stages Questionnaires III[6]). However, there is also a need for methods that allow for continuous monitoring of a given child's development in various domains, which can be easily applied by caregivers in day-care centers and by parents at home.

Milestones of Normal Development in Early Years

Milestones of Normal Development in Early Years (MONDEY[1]) is a collection of developmental skills that infants and toddlers typically achieve until the age of three years. The instrument has been designed for parents and professional caregivers to help them monitor and accurately document a given child's developmental progress. MONDEY's main goal is to provide ongoing developmental support, to identify potential developmental delays early on, and to provide caregivers with suggestions on how to promote the child's development in everyday interactions.[4]

MONDEY 0-3 covers eight main developmental domains: (1) gross motor skills, (2) fine motor skills, (3) perception, (4) cognition, (5) language, (6) social relations, (7) self-regulation, and (8) emotions. Each domain is further subdivided into several subdomains, which are then specified by milestones. Milestones are precisely defined behaviors that can be observed in everyday life with a particular child and that illustrate major steps in early development.[1,4] A total of 111 milestones can be achieved up to a child's fourth birthday.

The instrument can be applied in mainly two different ways: (a) by reviewing the complete list of 111 milestones on one specific occasion to determine whether the child demonstrates each behavior described, thereby providing an overall assessment of the child's current developmental status; or (b) by continuously documenting development, thereby recording each milestone with the date when it was first observed, thus facilitating ongoing monitoring over time.[1]

From a developmental research perspective, this form of documentation offers the advantage of capturing interindividual differences by recording the timing of skill acquisition.[7] Using age norms, this kind of instrument can also help identify developmental strengths and weaknesses, indicating whether additional standardized diagnostic procedures need to be applied.[8] From a practical perspective, different actors (e.g., day care teachers and parents) can use the same tool to discuss the development of individual children, thereby detecting progress in specific domains more easily.

So far, MONDEY 0-3 has been applied by many thousands of parents and early childhood educators, and has become a standard instrument in German day care institutions and homes. It has been tested for various quality standards, such as the understandability and observability of its milestones and the acceptance of the scale by daycare teachers.[9,10] Tests of its psychometric qualities revealed high internal consistency scores (with Cronbach's α=0.97 for the total scale and $0.67<\alpha<0.95$) for individual subscales).[11] Furthermore, all milestones have been shown to load positively on their assigned developmental domain while revealing much lower loadings on other domains.[4] The hierarchical organization of milestones, each contributing to one specific developmental domain, and the domains contributing to a general development factor, has been demonstrated via confirmatory factor analyses.[4] In addition, the strong correlation between general development score and children's age supports criterion validity, indicating that the tool accurately reflects real-world developmental progress. Studies on the objectivity of MONDEY 0-3 observations indicate overall agreement between professionals and parents.[11] At a more detailed level, the authors found that this agreement tends to be higher for easy-to-observe, less context-dependent behaviors (e.g., gross motor skills, fine motor skills, language) compared to more interpretive, situation-dependent behaviors. Furthermore, agreement between pairs of educational professionals was found to be significantly higher on average than agreement between parent-professional pairs.

Today, MONDEY 0-3 is also used in several other large-scale projects, such as BeoKiz, commissioned by the Berlin Senate in Germany, to screen children in daycare centers, and BRISE, a large longitudinal study funded by the German Federal Ministry of Education and Research, which measures the development of children from disadvantaged neighborhoods. A recent study from the BRISE project using MONDEY-data showed that infants' development during the first year of life does not vary with their mothers' educational level,[12] thus suggesting that the scale provides equally valid results for diverse populations.

Current Research

The current study aims to test the reliability and the validity of the Turkish translation of MONDEY 0-3, thereby raising the following questions:

(1) What is the internal consistency of MONDEY-TR 0-3 for the overall scale and for each subscale?

(2) How does the development of Turkish children progress in each developmental domain between 0 and 3 years of age?

(3) How does the development of Turkish children compare to that of German children, both in general development and when looking at individual scales?

Materials and Methods

Measures

Child development was assessed with the German and Turkish versions of MONDEY 0-3. Overall, 111 milestones were administered, assessing eight main developmental domains: (1) gross motor skills, (2) fine motor skills, (3) perception, (4) cognition, (5) language, (6) social relations, (7) self-regulation, and (8) emotions. Each milestone included a title and a brief explanation describing a specific behavior. Caregivers were asked to indicate whether they had observed the behavior more than twice in the child or whether the child had not yet exhibited the behavior. To provide some examples, the following list includes one milestone per developmental domain:

- **Gross motor skills:** Standing with support: the child can stand on her own two feet for at least 3 seconds while holding onto something with just one hand in order to keep her balance.
- **Fine motor skills:** Stacking a minimum of three objects: the child stacks at least 3 building blocks or other objects on top of each other to form a tower, without any part falling.
- **Perception:** Actively searching for an object that has been covered up: shortly after seeing an object being completely hidden under a cover, the child tries to remove the cover to get to the object.
- **Cognition:** Creative use of tools and implements: the child is lacking a tool to achieve a specific goal (e.g., a shovel to dig sand) and makes use of an implement which has not been designed or is normally used for that purpose (e.g., a spoon) without getting any hint from another person.
- **Language:** Saying first words: the child uses a specific sequence of sounds to name something (e.g., "do-do" for "door"). The same sequence is used in different situations, intended to have a similar meaning.
- **Social relations:** Checking social acceptance of own behavior: before doing something, the child looks to a trusted person in order to check whether this behavior is acceptable. He/she seeks eye contact in a questioning or provocative manner before proceeding.
- **Self-regulation:** Calming down with the help of another person: with the help of a familiar adult, the child can calm herself down after crying within 3 minutes.

Scoring and Statistical Analysis

Each milestone was scored as either 0 (not yet reached) or 1 (reached). To be scored as "reached," caregivers had to observe the behavior occurring more than twice. If the caregiver selected "unclear," this response was treated as functionally equivalent to "not yet reached" and was therefore coded as 0.

All MONDEY scores were standardized. Since the number of milestones varied between developmental domains, we divided the raw sum value by the total number of milestones per domain. This provides a conceptually simple and easily interpretable metric for cross-domain and cross-sample comparisons.

Procedure

Ethical clearance was granted by the local ethics committee of Heidelberg University (reference number: AZ Pau 2023 1/1, date: 03.11.2023) in line with the Declaration of Helsinki.

German data from a continuously ongoing MONDEY 0-3 study was used to allow for a direct comparison between the Turkish and the German sample. Data were collected either via online form or face-to-face after receiving instructions on how to interpret each milestone.

The German version of MONDEY 0-3 (MONDEY-DE 0-3) was translated by a native Turkish speaker, also fluent in German, who was also an expert in developmental psychology. It was later checked by two other native Turkish speakers who were also experts in developmental psychology. They suggested eight word-level changes and one sentence-level modification in total. After discussing the critical items together, all but one of these suggestions were accepted. In cases of uncertainty or disagreement, the established English version of MONDEY was consulted to ensure conceptual equivalence.

The Turkish version (MONDEY-TR 0-3; see Online Supplement) was administered online between July 2023 and July 2024 to assess child development on all eight domains of development previously mentioned. Caregivers were invited via an online link shared through social media platforms, primarily Facebook and Instagram. An outreach flyer was designed to be visually appealing and accessible. It was distributed through parent-focused community pages, daycare-related groups, and family-oriented influencers. The recruitment strategy aimed to maximize diversity by targeting a broad range of geographic regions, socioeconomic backgrounds, and caregiving contexts. Both primary caregivers and daycare caregivers were eligible to complete the questionnaire.

To mitigate a potential social desirability bias, several strategies were employed. First, participants were informed that the data would be used only for research purposes and that all responses would remain strictly confidential, with no identifying information being collected or reported. Second, the introduction to the survey emphasized that the listed

developmental milestones span a range of 0-3 years, and that younger children typically do not achieve many of these milestones yet. This clarification aimed to reassure parents and normalize developmental variability. Finally, the survey was framed as a tool to help caregivers better understand their child's current developmental stage and anticipate future progress, thereby supporting the child's development more effectively. This supportive, non-evaluative framing was designed to reduce any implicit pressure on parents to present their child's development in an idealized manner.

Participants

German Sample

A total of n=1,543 primary caregivers filled out the MONDEY 0-3 questionnaire (child gender balanced: 47.2% female).

Turkish Sample

n=307 caregivers started to fill out the questionnaire. However, participants who (a) did not complete the questionnaire (n=99), (b) whose children were born before the 28th week of pregnancy (n=2), or (c) whose children were older than 36 months (n=16) were excluded from the analysis. The chosen cut-off score for gestational age meets the World Health Organization's definitions of extreme prematurity,[13] which is associated with significantly increased risks of long-term neurodevelopmental impairments.[14,15] This resulted in a final sample of n=190 participants (mostly parents and females, n=3 educators; n=179 females; see Table 1) with valid data sets. Their children were between 0 and 3 years old [mean=16.07, standard deviation (SD)=9.80]. The sample included n_1=76 children aged 0-12 months, n_2=70 children aged 13-24 months, and n_3=44 children aged 25-36 months (53.2% female). Hence, the oldest age-group was smaller compared to the other two.

Table 1 provides an overview of the sociodemographic data for both samples. As revealed by Table 1, the German sample is much larger, with the greatest subgroup of caregivers reporting on the development of very young children. Furthermore, it reveals that Turkish caregivers (mothers and fathers) participating in the online survey have a higher educational level than those in the German sample.

Table 1. Sociodemographic data of participants

	Germany	Türkiye
Child age		
0-12 months	n_1=1296	n_1=76
12-24 months	n_2=198	$n_{2=}$70
24-36 months	n_3=49	n_3=44
Adult characteristics		
Responding adult (parent)	100%	98.4%
Maternal education		
<College	33.2%	17.2%
College	46.7%	79.7%
Paternal education		
<College	44.8%	26.6%
College	45.8%	71.4%

Hypotheses

Since MONDEY has been designed to assess general development and thus consists of milestones of universal relevance, we expect results for the Turkish sample to match previous findings.

(1) In line with previous work using the original version of MONDEY 0-3, the Turkish version of MONDEY is expected to show high internal consistency both for the total scale and for each subscale.

(2) We expect the slopes for most developmental domains to be linear, with only a few exceptions.

(2a) There is a large consensus among developmental psychologists that most changes in perception happen during the first year of life.[16] Hence, we expect to find a rapid increase in scores on the MONDEY-TR 0-3 scale perception until the second year of life, which slows down later until it reaches a ceiling effect during the third year of life.

(2b) For cognition, the opposite trend can be expected, since cognitive progress during the first year of life is difficult to observe, whereas major progress can be seen easily during the second and third years of life.

(2c) Similarly, advances in self-regulation, as assessed in MONDEY-TR 0-3, are expected to occur only beyond the first year of life, when the sleeping pattern adjusts to a regular day-night cycle, potty training may start, and the child gradually learns to control her/his own needs.

(3) We assume that the Turkish and the German samples reveal largely comparable changes in scores on individual developmental domains.

Table 2. The internal reliability scores for individual MONDEY-TR 0-3 scales

Scale	Cronbach's alpha (α)
Gross motor	0.947
Fine motor	0.914
Perception	0.769
Cognition	0.920
Language	0.943
Social relations	0.941
Self-regulation	0.732
Emotions	0.907

MONDEY-TR: Turkish version of Milestones of Normal Development in Early Years

Results

Internal Consistency

First, we checked for the reliability of the MONDEY-TR 0-3. As reported in Table 2, internal consistencies of individual scales ranged from well acceptable (α=0.73) to very high (α<0.95), and Cronbach's alpha for the overall scale was excellent (α=0.99).

Age Trends

In the next step, we checked whether the age trends observed for the Turkish sample were in accord with our hypotheses. As expected, a linear increase in MONDEY-TR 0-3 scores was observed for most domains of development (see Figure 1). One exception was perception, where children showed a sharp increase in MONDEY-TR 0-3 scores during their first year of life and then reached a ceiling effect between the second and third year of life. Also consistent with our hypothesis, scores for the scale cognition were low during the first year of life but increased sharply thereafter. About the domain of self-regulation, no clear change in slope was found, but the corresponding developmental progression remained behind that of the other scales at all ages, suggesting that self-regulation development advances slowly among Turkish children. These findings are fully consistent with the general developmental literature,[17,18] as well as with results obtained for the German version of MONDEY 0-3 (for a direct comparison between German data and the present studies, please see Figures 2 and 3).

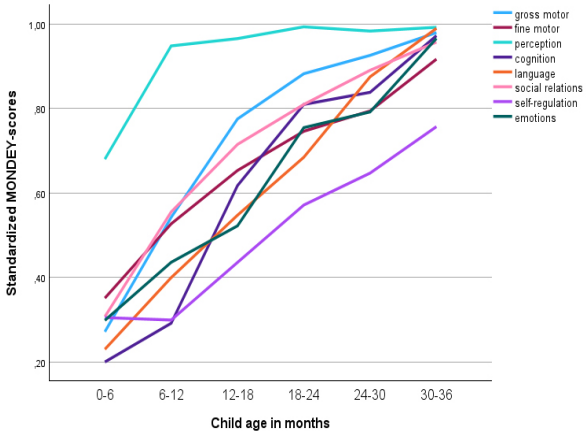

Figure 1. The development of Turkish children in eight developmental domains
MONDEY: Milestones of Normal Development in Early Years

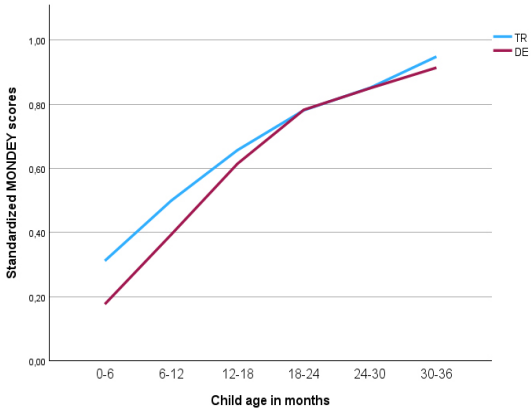

Figure 2. Comparison of Turkish and German children for general MONDEY scores
MONDEY: Milestones of Normal Development in Early Years

Group Comparison

When comparing the standardized sum scores of Turkish and German children across all domains (see Figure 2), Turkish children showed a significantly higher overall score for the age group 0-6 months (mean=0.31, SD=0.27) than German children (mean=0.18, SD=0.09); t(24,137)=2,527, p=0.018. However, this group difference decreased afterwards and was no longer evident from 18 months onward. As expected, Turkish children (mean=0.95, SD=0.04) and German children (mean=0.91, SD=0.07) both achieved the great majority of all milestones towards the end of the third year of life (30-36 months), and revealed no significant difference between groups [t(28)=1,148, p=0.075].

To get a more detailed idea about group differences and their developmental changes, Figure 3 shows a comparison of each subscale of MONDEY-TR 0-3 and MONDEY-DE 0-3 standardized scores, revealing similar trends. For some domains, scores increase steadily with age (e.g., language, emotions), for others, they describe an asymptotic curve (e.g., gross motor, fine motor, perception, social relations), reaching almost a ceiling effect in the second year of life for Perception. For one domain (i.e., cognition), they indicate slow progress during infancy, followed by rapid acceleration afterwards. For self-regulation, the curves for Turkish and German children seem to deviate substantially during the second year. Otherwise, they are comparable across groups.

To statistically test the group differences visualized in Figure 3, separate linear regression analyses were conducted with age, child group (Turkish vs. German), as well as their interaction as predictors, and standardized subscale scores of MONDEY 0-3 as outcome variables. Across all subscales, developmental scores increased with age (p<0.001), reflecting a general growth pattern. A statistically significant interaction between age and child group (p<0.001, Bonferroni-corrected α=0.00625) was found across all developmental domains, indicating that the rate of development differed between Turkish and German children. However, corresponding effect sizes were generally very small to moderate (Cohen's f^2=0.006-0.104), suggesting that the overall developmental trajectories remained largely comparable across groups.

The observed similarities between the Turkish and German samples across developmental domains suggest that, in the absence of nationally representative Turkish norms, the German norms, which are based on a larger sample of more than 1.000 cases, may serve as a temporary reference point for interpreting MONDEY-TR 0-3 scores.

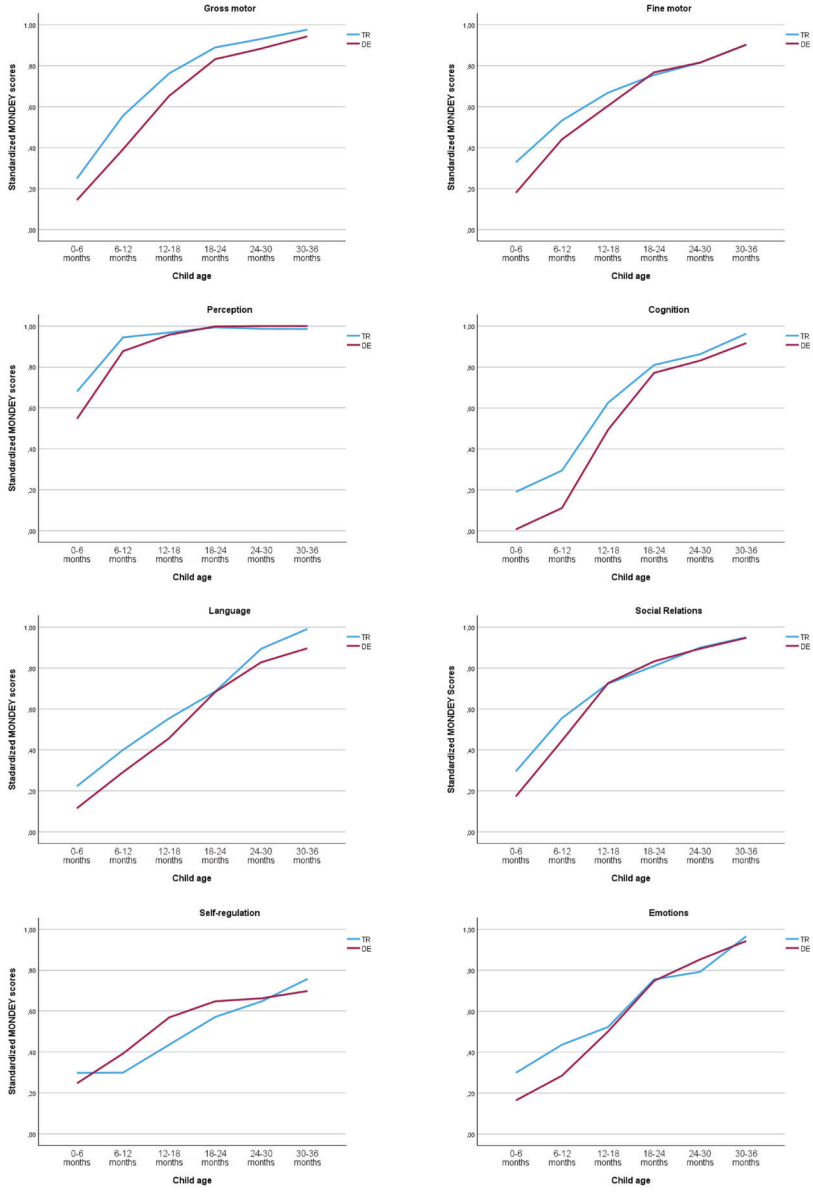

Figure 3. Comparison of Turkish and German children on each subscale. Note: For detailed statistical analyses, including significance levels and effect sizes, please refer to the Results section
MONDEY: Milestones of Normal Development in Early Years

Discussion

The present study demonstrates excellent psychometric qualities of MONDEY-TR 0-3, as indicated by (a) high values for internal consistency of the total scale and each subscale, (b) a clear increase in scores for each subscale with age, and (c) strong similarities of developmental changes between German and Turkish children.

The high internal consistency of MONDEY-TR 0-3 underscores the robustness and intercultural validity of this instrument, which qualifies as a reliable and valid tool to assess early development. Moreover, the high convergence of developmental trajectories across German and Turkish children – despite differences in data collection methods (online vs. partly face-to-face), sizes of age groups, and caregivers' cultural and educational backgrounds – underscores the cross-cultural construct validity and ecological robustness of the MONDEY-TR 0-3.

Interestingly, Turkish parents reported earlier milestone achievement in the first two years, with trajectories converging thereafter – an unexpected pattern that may have several explanations. One possible explanation is a social desirability bias: Runge and Soellner[19] found that parents of Turkish origin demonstrated higher levels of social desirability compared to German parents. Similarly, Bornstein et al.,[20] who conducted

cross-cultural comparisons regarding parental social desirability when reporting about their children, revealed that parents from individualist cultures, such as the United States and Sweden, exhibited the lowest levels of social desirability. Since Germany also has a strong individualist orientation, German parents may have felt less need to grant their children skills that they have not yet developed. However, social desirability alone may not fully account for this pattern. Other contributing factors may include cultural differences in child-rearing expectations and variations in parental education levels. For instance, a study from Türkiye[21] found that caregivers with higher levels of education demonstrated greater parenting knowledge. These caregivers may be more attuned to tracking their child's development or more confident in interpreting developmental milestones. Furthermore, cultural models of parenting may emphasize different developmental priorities and timelines. In line with this argument, one study[22] showed that Turkish mothers of preschool-aged children expected their children to develop competencies in several domains later than Dutch mothers. This contrast highlights the complexity of cross-cultural developmental assessment, where factors such as child age, cultural context, task framing, and caregiver education may each influence how developmental behaviors are perceived and reported. Since the curves of both groups converged towards the end of the third year anyway, the observed group difference should not be overinterpreted, however.

In accordance with the literature, infants show substantial perceptual abilities already at birth, which undergo significant refinement during the first year of life, due to the maturation of the nervous system.[23] This rapid early development is reflected in a strong increase of milestones achieved during the first year of life in the MONDEY-TR 0-3 perception subscale, which contrasts with the more gradual progress observed in other domains. These findings align with the assumptions of the Turkish Ministry of Education's education program[24] which states that infants can already focus on an object about 30 cm away (corresponding to MONDEY item Nr. 38) at one month, track moving objects from one side to another at around 3 months (corresponding to MONDEY item Nr. 39), and search for an object that has disappeared from view at around 6 months (corresponding to MONDEY item Nr. 43). These examples regarding perceptual development highlight the strong correspondence between the MONDEY-TR 0-3 milestones and the Turkish developmental literature.

Unlike other developmental domains, self-regulation scores did not reach their maximum at three years of age, neither in the German nor in the Turkish sample. This is largely due to two key milestones: Nr. 97: "Wanting to go to the toilet/potty", and Nr. 98: "Remaining dry all day," which many three-year-olds were still not yet capable of, according to their caregivers. Although toilet training can begin as early as 18 months, the shift toward child-oriented approaches has led many children to achieve full control only in their fourth year of life.[17] Whereas many aspects of self-regulation show substantial progress throughout early childhood and beyond[18], others emerge earlier. According to the Ankara developmental screening inventory[25] - a widely used scale to assess child development through parent reports - children typically calm down when being held in their caregiver's arms during the first three months of life (corresponding to MONDEY item Nr. 92). They begin to control their behavior in response to verbal cues such as "no" around 10-11 months (similar to MONDEY item Nr. 93), and they can communicate their need to use the toilet (aligned with MONDEY item Nr. 97) by the second year of life.

Interestingly, German and Turkish children differ somewhat in the slope of their self-regulation development, with Turkish children reaching slightly lower scores than German children between 6 and 24 months of age. This may be due to the fact that self-regulation is strongly influenced by cultural factors.[26] German parents are known to have high expectations regarding their children's self-regulation development, compared to parents from other countries,[27] but overall, research on cross-cultural differences in children's emotional and behavioral regulation is still scarce.[28] Most studies involving Turkish children start to systematically monitor self-regulation rather late in life (i.e., at the age of 48 months[29]), thereby neglecting the unique milestones typically reached within the first three years of life.

While the discussion has mainly focused on self-regulation and perception due to their distinct developmental trajectories, the remaining domains show broadly parallel patterns across the two groups. Although minor variations can be observed (e.g., slightly earlier gains in Turkish children), these differences do not suggest cultural divergence. According to Keller,[30] the acquisition of specific developmental competencies is shaped not only by biological maturation but also by culturally prioritized goals. She distinguishes between two broad cultural models: Western middle-class babies and traditional farmer babies. Children assessed in our study – both Turkish and German – fall into the first category. As such, they can be expected to exhibit broadly similar developmental trajectories, consistent with Keller's[30] account of culturally shared developmental priorities within an ecological context. In contrast, Rogoff[31] cautions against rigid cultural typologies and instead encourages a focus on the regularities within variation – i.e., identifying meaningful patterns of similarity and difference without presuming fixed group categories. In line with this view, research has repeatedly shown that several domains of early development reveal similar developmental trends across cultures.

Motor development, for instance, follows a consistent sequence globally, with socioeconomic factors and cultural practices influencing timing to some degree, but not altering the underlying maturational trajectory.[32] Early cognitive capacities also emerge in a relatively uniform sequence, supported by shared neurodevelopmental maturation.[33,34] In language development, large-scale cross-linguistic data show that the timing of vocabulary growth is remarkably similar across diverse linguistic environments, despite differences in language-specific structures and interactional styles of early

language input.[35] Emotional development likewise reveals early universals in the expression and recognition of basic emotions like happiness, fear, and anger, although cultural variation is more evident in regulation and display rules.[36] The convergence observed in our data across these domains may therefore reflect both shared developmental ecologies and similarities in formal early childhood systems (e.g., preschool education, health care access) that support development in comparable ways across national contexts.

Study Limitations

This research demonstrates the reliability of MONDEY-TR 0-3 for documenting infant and child development during the early years within Türkiye and Turkish-speaking communities. Unlike screening tools such as the Ages & Stages Questionnaires III,[6] which require specialized training and specific materials, MONDEY offers a practical and easily accessible instrument for caregivers. Because it is based on everyday observations, it can be used in professional settings, such as kindergartens, but also in home environments by primary caregivers without any special expertise in developmental psychology.

MONDEY can also induce a meaningful dialogue and collaboration between childcare professionals and parents, enabling them to monitor a given child's development in parallel. Available age norms of MONDEY 0-3 (n=677) help to detect developmental delays[37] and thus allow for targeted interventions. As revealed by the data presented, the high reliability of individual scales and the high similarity in results regarding developmental changes on each MONDEY domain suggest that German norms can also be applied to Turkish children until more validation studies are conducted in Türkiye.

Nonetheless, the following constraints should be considered when interpreting the presented results: while parents are invaluable resources for assessing their children's development, there is an inherent risk of observation errors and response biases. Parents may face difficulties in accurately evaluating developmental domains that are hard to observe (e.g., cognitive development), their evaluation is often influenced by their personal relationship with the child (especially regarding their assessment of social and emotional development), and their judgements may also vary with situational constraints (e.g., regarding the domain of self-regulation).[11] Additionally, cultural differences may influence their assessments.[14,15]

Another limitation concerns the generalizability of the findings from the Turkish sample. Despite efforts to recruit a broad participant base via social media platforms, the sample was skewed toward caregivers with higher educational attainment, suggesting that it primarily represents families from relatively higher socioeconomic backgrounds. This may reflect both greater digital access[38] and higher levels of motivation among more educated caregivers to invest in services related to child development.[39] Such sampling biases may influence the timing of milestone attainment, as socioeconomic factors are known to shape early developmental experiences.[40] Future studies should thus aim to include more diverse populations, including caregivers from rural areas or with lower educational backgrounds. Collaborations with local authorities and childcare institutions may support broader implementation of MONDEY-TR 0-3 across a wider demographic range.

Furthermore, while the German sample served as the original norming group for MONDEY, the comparatively smaller size of the Turkish sample should be taken into account when interpreting between-group comparisons. In addition, the given sample size did not allow us conduct a confirmatory factor analysis to evaluate the factor structure of MONDEY-TR 0-3. Future research with a larger and more diverse Turkish sample is needed to further validate the instrument's structure and robustness, and to enhance its cross-cultural comparability.

As MONDEY-TR 0-3 is freely available online to everyone working or living with young children (www.mondey.de), it offers promising opportunities for research and practical applications.

Conclusion

The findings presented in this report show that MONDEY-TR 0-3 is a psychometrically robust instrument with good internal consistencies across all scales, monitoring progression in all main domains of development, and leading to comparable results for Turkish and German children. As an openly accessible resource for both caregivers and researchers, MONDEY-TR 0-3 presents valuable opportunities for application in research and early childcare practices. Future studies may explore its alignment with clinician-administered developmental assessments, assess the predictive validity of MONDEY-TR 0-3 in longitudinal contexts, and further validate its use in diverse cultural and linguistic populations.

Ethics

Ethic Committee Approval: Ethical clearance was granted by the local ethics committee of Heidelberg University (reference number: AZ Pau 2023 1/1, date: 03.11.2023) in line with the Declaration of Helsinki.

Informed Consent: Written informed consent was obtained from all parents.

Acknowledgements

We sincerely thank our interns, Hande Özdemir, Ayşenur Süt, and Pelin Hastoprakcılar from Middle East Technical University, for their significant contributions and dedicated support to this research.

Footnotes

Authorship Contributions

Concept: G.Ş., S.P., Design: G.Ş., S.P., Data Collection or Processing: G.Ş., Analysis or Interpretation: G.Ş., S.P., Literature Search: G.Ş., S.P., Writing: G.Ş., S.P.

Conflict of Interest: The authors declare no conflicts of interest.

Financial Disclosure: The authors declare that this study received no financial support.

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