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A SCOPING REVIEW OF MOTOR ASSESSMENTS FOR CHILDREN

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by

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ABSTRACT

A SCOPING REVIEW OF MOTOR

ASSESSMENTS FOR CHILDREN

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Motor skill assessments are used to evaluate a child's development and reveal potential deficits of the individual. The purpose of this study was to research and analyze a number of motor assessments for children that have been created over the past 30 years. This information will then be used, in the future, to create a new motor assessment that would be able to be utilized in therapeutic settings. To accumulate the articles to review, the website Rayyan was used. A total number of 14,524 articles were gathered and the screening consisted of assessing abstracts to determine whether an article was included or excluded from the data. Keywords were identified and exclusion reasons were also created to help the decision-making process. For this project, 1,555 articles had been screened; 183 articles were "maybe," 26 were included and 1,344 were excluded. From the 183 articles that were "maybe," 52 were decided to be included in the data and 131 were excluded. The following paper describes the results from this specific screening.

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CHAPTER 1

INTRODUCTION

Motor skills are important biological imperatives and are essential to develop humans' sense of control as one goes through life. These are skills that people are not born with, rather, they are learned and practiced until they are able to be performed. Children begin to acquire these skills in their early childhood and are recognized as fundamental motor skills (FMS). These skills consist of movements regarding stability, locomotion, and manipulation and each play an important role in the health and development of the child (Iivonen & Sääkslahti 2013). Because motor skills have many different names (FMS, gross motor/fine motor, motor competence or coordination, etc.), it is essential to define the concept that is being tested in the chosen motor assessment. Though the names fall under the umbrella term of "motor skills," each describes different criteria of movement; making sure that the motor assessment matches the desired skill is important and provides more accurate results and conclusions to the child's development (Iivonen & Sääkslahti 2013). Since most skills are learned in early childhood and adolescent years, the validity and reliability of motor assessments of the activities is crucial in determining normal development or deficits in children.

A variety of motor skill assessments are developed and are currently being used. Most of the items tested in each assessment differ, as well as their means for gathering their measurements. Others hold similarities in those aspects. Some motor tests use a more observational approach, using scales and raters to decide the degree of performance that the child or infant displays. This assignment of a rating may be done once, or multiple times, depending on if the assessment requires videorecording of the performance for other graders to examine the child. Other assessments are paper based, like surveys, that are given to caretakers, parents, or therapists to assess the child's motor behavior from their eyes. Another major factor of determining the correct motor assessment to use is whether the test is reliable for a child with a motor disability, or if it is only applicable to healthy, undiagnosed children. Age is also an essential determinant that may be considered when deciding on a motor assessment; some are appropriate for infants and others are best suited to young children and adolescents. Each test may have different beneficial impacts to the child's life as well. Like mentioned before, some assessments are useful in diagnosing a child with a characteristic of motor deficiency when compared to normative values of the test. It is imperative to keep a close eye on their progress since early recognition of any deviation from normal development of an infant or child is critical for implementing interventions and decreasing the chances of secondary consequences to arise (Camden et al., 2015). If the child is diagnosed with a motor disability through an assessment, the test may serve to track the child's progression from an intervention program. (Scheuer et al., 2019). The purpose of this research project was to categorize articles from the partial first screening of motor assessments. Eventually, this information will be used to determine the criteria for a new, beneficial, motor assessment for children to be created and utilized in the future.

CHAPTER 2

METHODOLOGY

A partial scoping review of the literature was conducted to gather all articles that analyzed psychometric properties of motor assessments for children. The tool used to conduct the review was called Rayyan. Rayyan is a website available for individuals to have the opportunity to collaborate on literature reviews. For this research project, librarians from the University of North Texas Health Science Center were able to grant access to five individuals from the University of Texas at Arlington (UTA) for the conduction of the review. Four were students from the UTA that did most of the screening and the fifth was a professor from UTA that was overseeing the project and provided aid whenever necessary.

The first screening was completed by assessing abstracts and titles of the articles that were compiled on the website. Each reviewer had the opportunity to include, exclude, or choose maybe (which was a button that allowed for further inspection of the article before a decision was made). For an article to be completely screened, it had to be scanned by two reviewers and the decision had to be unanimous. Additionally, to exclude an article, a reason had to be included to validate the reviewer's choice. There were seven possible options for excluding an article. The first reason was that an article had no psychometric properties. If an article was not testing the validity of a motor assessment, then it was also excluded for being unrelated to the topic of the study. Unrelated unspecified was used for articles that did not fit any of the other exclusion reasons, but still did not meet the criteria for the accepted articles. Since this is a study done for a motor assessment for children, if any of the articles presented a study whose subjects were over the age of twenty-one or were not humans, they were removed as well. If the article was a summary from a poster presentation symposium, a commentary, or a summary without the full text of the study, it was also excluded from the batch of articles. Duplicates and articles that were not in English were the last two reasons that an article would get excluded in the first screening. Keywords were identified for an easier selection process. Words that described a relationship between two variables like a cohort study, the effectiveness/the effect of an intervention or variable, or randomized controlled trials or play-based interventions. Articles were accepted if they evaluated the psychometric properties of an assessment, not the results the child had from being tested with the assessment. Key words that suggested an article was to be included were test-retest, validity, reliability, and psychometric properties.

Towards the middle of the screening, the articles that had not been defined as to whether they were to be included or excluded, but were viewed least once (in other words, were in the "maybe" category) were taken a closer look into. The studies that were proven to not meet the criteria of included articles were excluded and the ones that were accepted joined the included category. Once all the articles in the maybe section were screened, the total accepted articles at that point in time were evaluated further. To do so, the full article was then found, or requested from UTA's library database system if not available online. Categories were created in a table on Excel to organize each individual assessment that was reviewed. These included: the name of the assessment, the variable(s) that the assessment tested, the number of items included, subscales if applicable, ages of the children that partook in the study, disabilities/disorders they were diagnosed with if any, the psychometric properties that were used, and the modalities of the test. The information gathered from the screening of the included articles was then organized by the information that was presented by the categories.

CHAPTER 3

RESULTS

The search provided 14,525 articles and, for the timeline of this project, 1,555 had been screened by their title and abstract. A total of 1,344 articles were excluded for one of the seven reasons, 183 articles were in the maybe category, and the remaining 26 were the included articles. When the maybe articles were screened through a second time, the 183 articles had split into 52 included articles and 131 exclusions. This brought the result to 1,475 excluded articles and 78 included articles. Analysis of the inclusion articles then brought on 17 more exclusions and totaled the number of included articles to 63. Figure 3.1 illustrates the process that occurred when the articles were screened.

Figure 3.1: Mapping of the first screening

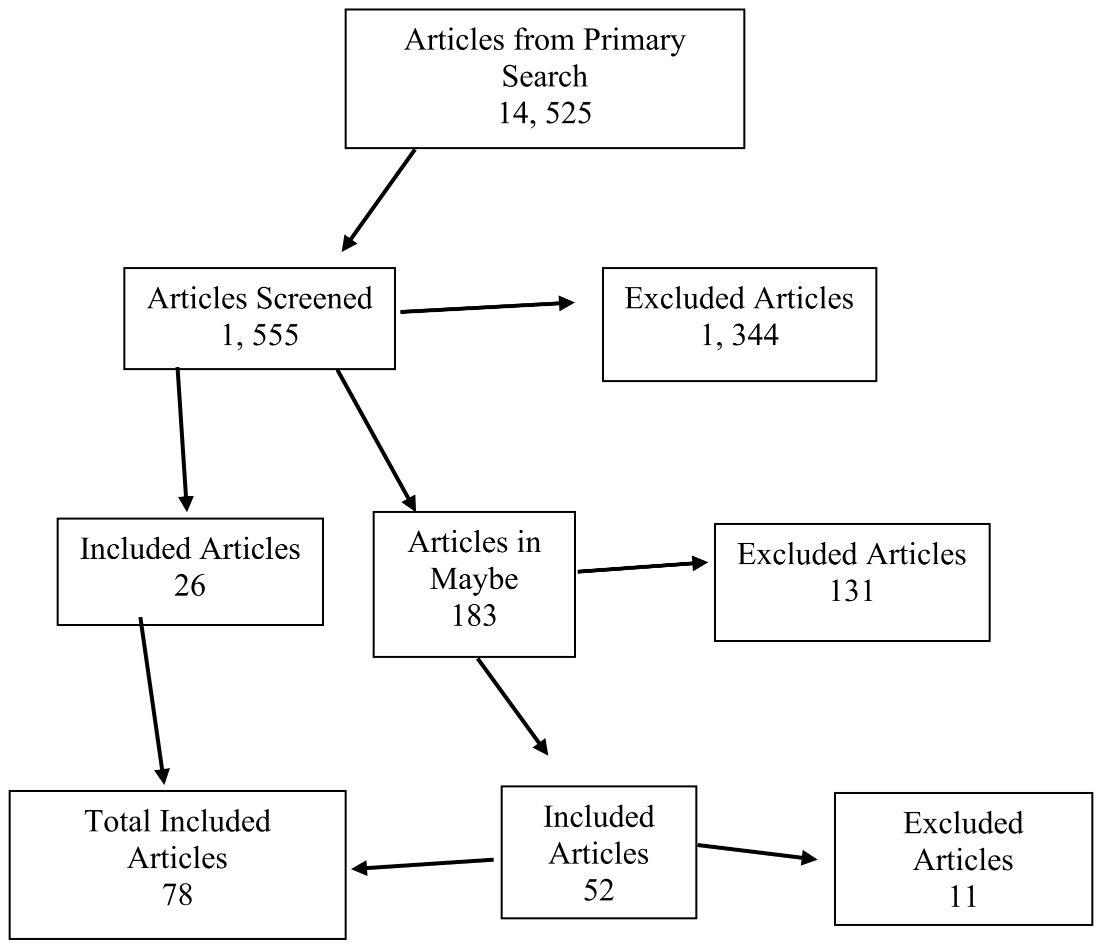
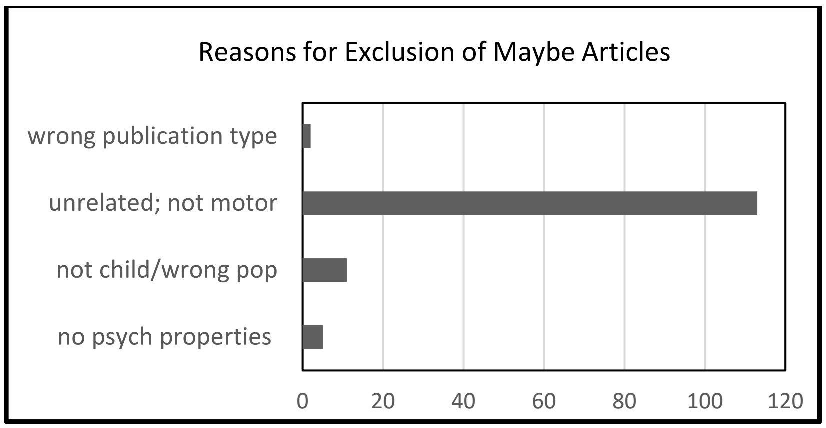


Table 3.1: Article count before and after screening of the maybe articles

Article Decision	Total Number Before	Total Number After
Exclude	1344	1475
Include	26	78
Maybe	183	0

A majority of the articles that were excluded from the maybe category was because at closer inspection, they did not focus on the validity of a motor assessment. The second reason was that the article tested on individuals that were over the age of 21 or had medical diagnosis that was only seen in adults. Not having any psychometric properties and being the wrong publication type were the last two reasons that were seen. A further breakdown of these results is seen in Figure 3.2.

Figure 3.2: Exclusion reasons for maybe articles



3.1 Assessments Presented

From the 67 included articles, 49 assessments were analyzed. The Alberta Movement Infant Scale was evaluated four times (Aimsamrarn et al., 2019, Boonzaaijer et al., 2017, Almeida et al., 2008, Albuquerque et al., 2017). Gross Motor Function Measure had two different versions that were investigated. The 88-item test was used three times (Bjornson et al., 1998a, Bjornson et al., 1998b, Avery et al., 2003) and the 66-item edition was evaluated twice (Almeida et al., 2016, Avery et al., 2013). One study measured the validity of the GMFM on children with cerebral palsy and utilized a modified assessment that did not test as many of the items as the original assessment (Boyce et al., 1992). The Test of Gross Motor Development was also a popular assessment that was examined. The second edition was evaluated in three different articles (Bandeira et al., 2020, Aye et al., 2017, Barnett et al., 2014) while the third edition was analyzed once (Allen et al., 2017). From the article analysis, it was also found that four articles tested the psychometric properties of skills specific to soccer players (Bekris et al., 2018, Bekris et al., 2018, Bonney et al., 2019, Bacvarevic et al., 2012). Additionally, eight articles did not have a motor assessment evaluated, rather, the validity and reliability of the means of measuring specific motor skills were looked into. These skills included: isometric force measurements, postural stability, grip and pinch, imitation of meaningful & non-meaningful gestures, steadiness in UE, quality of arm and hand skills, and movement time and accuracy (Berry et al., 2004, Alsalaheen et al., 2015, Boschi & Frère 2013, Bieber et al., 2021, Barozzi et al., 2014, Birnbaum et al., 1999, Boeschoten et al, 2007, Bertucco et al., 2013). The rest of the studies may be seen in Table 3.2.

3.2 Variables Tested

Nine articles evaluated balance and postural control (Atwater et al., 1990, Blomqvist et al., 2012, Alsalaheen et al., 2015b, Almutairi et al., 2020, Bartlett et al., 2008, Aras et al., 2018, Alsalaheen et al., 2015a, Barozzi et al., 2014, AYLWARD et al., 1988) while gait assessment and jumping each had two studies conducted to ensure their validity (Assi et al., 2009, Bakke, et al., 2017, Ayán-Pérez et al., 2016, Acero et al., 2011). By far gross motor skills of infants was the motor competence construct that was tested the most, having had twenty-two studies that viewed the assessment's capabilities whereas fine motor skills had only three (Aimsamrarn et al., 2019, Bandong et al., 2015, Almeida et al., 2016, Boyce et al., 1992, Borst et al., 2021, Boonzaaijer et al., 2017, Avery et al., 2003, Barnett et al., 2014, Bardid et al., 2016, Almeida et al., 2008, Bodkine et al., 2003, Boyce et al., 1995, Bjornson et al., 1998, Avery et al., 2013, Boulton et al., 1995, Bandeira et al., 2020, Aye et al., 2017, Baque et al., 2016, Bjornson et al., 1998, Allen et al., 2017, AYAN et al., 2019, Asunta et al., 2017, Azari et al., 2017). Fine motor skills were evaluated in the same assessments as gross motor skills (Azari et al., 2017, Bardid et al., 2016, AYAN et al., 2019). Variables for the other assessments may be seen in Table 3.2.

3.3 Number of Items and Subscales

Peabody Developmental Gross Motor Scale evaluated the largest number of motor skills; the test in this article had 170 items in 5 skill categories. The items were divided into 17 age levels with 10 items at each level (Boulton et al., 1995). Gross Motor Function Measure (GMFM-88) assessment saw the next largest item set. This test had two editions: one consisting of 88 items and the second only 66. The Epilepsi Barn Test was a protocol created to assess motor skills in children with epilepsy in categories including gross motor function, gait, balance, coordination, strength, range of motion, velocity, fine motor function, sensation, perception, and performance on neurological tests (Beckung, 2000). Alberta Infant Motor Scale tested 58 items with four subscales in prone (21 items), supine (9 items), sitting (12 items), and standing (16 items), These skills considered the weight-bearing capability of the body, the necessary posture control needed to perform the motor skill, and the voluntary movement of the infant (Boonzaaijer et al., 2017).

On the lower end, the Gross Motor Function Classification System is five level scale with an emphasis on the ability to initiate movement, posture and control while sitting, and walking (Bodkine et al., 2003). Though the Test of Gross Motor Development (2nd edition) looks at 12 total items (six locomotor skills and six object control skills), one article just examined the object control subtest from the assessment (Barnett et al., 2014). The other two studies that examined the same test used all 12 items to complete their results

(Bandeira et al., 2020, Aye et al., 2017). More details of the items for the remaining assessments will be shown in Table 3.2.

3.4 Ages and Disorders

Assessment that was validated with children that were diagnosed with cerebral palsy was reported on the most out of all the diagnoses. Down syndrome was also seen more than once in the list of tests. A majority of studies however, tested the validity of the assessments on children who did not have any motor dysfunctions or had very slight impairments. The ages of the subjects that were tested ranged from infants to teenagers. One study evaluated the psychometric properties of an assessment that measured motor skill development in infants as young as 23 weeks gestational age (Belfort et al., 2012). The oldest subjects were ones evaluated at 19 and 20 years old in four assessments (Blomqvist et al., 2012, Bloemen et al., 2017, Borst et al., 2021, Boyce et al., 1992). There were two articles that did not list the ages, just that the subjects were adolescents/children (YEFREMENKO et al., 2019, Bakke, et al., 2017). A majority of the ranges for the tests began at four years old, as can be seen in 12 studies (Bjornson et al., 1998, Aertssen et al., 2018, Allen et al., 2017, Bartlett et al., 2008, Basu et al., 2017, Ayán-Pérez et al., 2016, AYAN et al., 2019, Bart et al., 2010, Boeschoten et al, 2007, Barnett et al., 2014, Atwater et al., 1990, Boulton et al., 1995). The rest of the ages tested for the remaining assessments may be seen in Table 3.2.

3.5 Modalities

Out of the 63 assessments studied, 15 of them used performance-based assessments. Meaning that, the child’s number of successful kicks or passes was recorded, the height of the jump, the force the subject applied on the force plate was evaluated, or the voltage was recorded when the stylus pen the child was holding reached the designated hole (Bekris et al., 2020, Barozzi et al., 2014, Alsalaheen et al., 2015, Ayán-Pérez et al., 2016). Four studies were paper based, being surveys or questionnaires that either the parent or the caregiver had to compete about the child or infants motor capabilities (Belfort et al., 2012, Bartlett et al., 2008, Bart et al., 2010, Asunta et al., 2017). Forty-one assessments were based on therapists or professionals observing the child while completing the assessment and rating them on a scale. Twenty-one of those 41 assessments included video-screening of the child doing the assessment so that other raters may be able to score the child as well, providing for a higher validity of the assessment. A full list of how each study went about assessing the subjects can be found in Table 3.2.

3.6 Psychometric Properties

Test-retest reliability was evaluated 19 times, making it the most popular form of validity out of the accepted articles. This measured the stability of the scores between two or more tests the child completed (Blomqvist et al., 2012, Bjornson et al., 1998, Barozzi et al., 2014, Almutairi et al., 2020, AYAN et al., 2019, Aras et al., 2018, Abubakar et al., 2008, Ayán-Pérez et al., 2016, Basu et al., 2017, Baque et al., 2016, Alsalaheen et al., 2015, Bakke, et al., 2017, Brander et al., 1993, Bartlett et al., 2008, Aye et al., 2017, Atwater et al., 1990, Aertssen et al., 2018, Bart et al., 2010, Allen et al., 2017). After test-retest interrater reliability, the consistency between the scores of the raters, was measured 15 times (Allen et al., 2017, Birnbaum et al., 1999, Atwater et al., 1990, Brander et al., 1993, Bartlett et al., 2008, Aye et al., 2017, Atchison et al., 1998, Beckung, 2000, Borst et al., 2021, Boonzaaijer et al., 2017, Almeida et al., 2016, Barnett et al., 2014, Bakke, et al., 2017, Bodkine et al., 2003, Boulton et al., 1995). Concurrent, construct, and content reliability were also seen to be examined in a few studies. The psychometric properties tested of each assessment may be found in Table 3.2.

Table 3.2: Results and categorization of included articles

Study	Study ID	Name of the assessment	Variable	# of items	Subscales	Age	Pysch Properties	Disorder	Modality
Albuquerque et al., 2017	218564681	Alberta Infant Motor Scale	motor gross development	58	4	3-18 mo	concurrent validity	N/A	Observation-based
Belfort et al., 2012	218565530	Motor and Social Development (MSD)	cognitive, motor and social abilities	48		<32 wks	concurrent validity	Some with CP, some with sickness	Paper-based
Almeida et al., 2008	218564760	Alberta Infant Motor Scale	gross motor development	58	4	6-12 mo	concurrent validity and reliability	N/A	Observation-based
Azari et al., 2017	218565133	Bayley Scales of infant & toddler development	fine and gross motor		5	1-42 mo	construct and content validity	N/A	Performance-based
Bjornson et al., 1998	218565841	Gross Motor Function Measure	gross motor skills	88		3.2-18.1 yrs	construct validity	Spastic diplegia	Video-based
Bourke-Taylor, 2003	218566045	Melbourne Assessment	upper extremity limb function	16		5-14 yrs	construct validity	CP	Video-based
Bieber et al., 2021	218565751		action observation abilities, imitation of meaningful & non-meaningful gestures	34		6-10 yrs	construct validity	DCD	Video-based
Bekris et al., 2018	218565520	new dribbling agility test (DAT)	reactive ability in dribbling			10-16 yrs	construct validity and reliability	N/A	Performance-based
Bloemen et al., 2017	218565892	Skill-Related Fitness Tests (wheelchair)	anaerobic and agility performance	4		5-19 yrs	construct and content validity	Spina Bifida	Performance-based
Bonney et al., 2019	218565961	small sided games	kicking	1		13-18 yrs	content validity	N/A	Video-based
Bardid et al., 2016	218565302	Body Coordination Test for Children (KTK) and the Motor Proficiency Test	gross motor and fine motor	18 for MPT	4 for KTK	5-6 yrs	convergent and divergent validity	N/A	Observation-based
Avery et al., 2013	218565097	Gross Motor Function Measure 66 (GMFM 66)	gross motor skills	66		1-13 yrs	Criterion validity	CP	Observation-based
Aertssen et al., 2018	218564579	Functional Strength	strength in UE and LE	8		4-10 yrs	construct and test-	CP	Performance-based

		Measurement					retest validity		
Bart et al., 2010	218565381	Performance Skills Questionnaire (PSQ)	motor, processing, and communication skills	34		4-6 yrs	Internal consistency, test–retest, construct validity	None or mild disabilities	Paper-based
Allen et al., 2017	218564740	Test of Gross Motor Development-3 (TGMD-3)	gross motor skills	13	2	4-10 yrs	internal consistency, test–retest, interrater and intrarater reliability	Autism Spectrum Disorder	Observation-based
Birnbaum et al., 1999	218565791		steadiness in UE			6-10 yrs	intrarater and interrater reliability	N/A	Performance-based
Atwater et al., 1990	218565079	One-leg balance test & balance on tilt board	balance	2		4-9 yrs	Interrater and test-retest	N/A	Observation-based
Brander et al., 1993	218566110	Movement Assessment of Infants	motor behaviors	4		4 mo	Interrater and test-retest	high risk infants for abnormal motor development	Observation-based
Bartlett et al., 2008	218565399	Daily Activities of Infants Scale	postural control and movement	7		4-11 mo	Interrater and test-retest	N/A	Paper-based
Aye et al., 2017	218565116	Test of Gross Motor Development 2nd (TGMD-2)	gross motor skills	12		5.4 mo	Interrater and test-retest	N/A	Video-based
Atchison et al., 1998	218565048	School Assessment of Motor and Process Skills (School AMPS)	motor skills in ADLs	16		3-7 yrs	interrater reliability	unspecified disorder	Observation-based
Beckung, 2000	218565491	The Epiliepsi Barn Teste	motor and sensory skills	59		6-16 yrs	interrater reliability	Epilepsy	Performance-based
Borst et al., 2021	218565999	The Rett Syndrome Gross Motor Scale- Dutch	gross motor	19		5-19 yrs	interrater reliability	Rhett Syndrome	Video-based
Boonzaaijer et al., 2017	218565969	Alberta Infant Motor Scale	gross motor	58	4	1.5-19 mo	interrater reliability	N/A	Video-based
Almeida et al., 2016	218564758	Gross Motor Function Measure (GMFM-66)	gross motor	66		2-17 yrs	interrater reliability	CP	Video-based
Barnett et al., 2014	218565347	Test of Gross Motor Development-2	gross motor	6		4-8 yrs	interrater reliability & repeatability	N/A	Observation-based
Bakke, et al., 2017	218565196	Movement ABC-2 Test		8			Inter-rater reliability & test-retest reliability,	low vision	observation-based

							internal consistency		
Bodkine et al., 2003	218565909	Gross Motor Function Classification System	gross motor function	5		13.9 - 15.3 mo	interrater reliability, construct validity & criterion related validity	CP and DS	Video-based
Boulton et al., 1995	218566042	Peabody Developmental Gross Motor Scale	gross motor skills	170	5	4-10 yrs	intraclass and interrater reliability	CP	Observation-based
Boeschoten et al, 2007	218565915		quality of arm and hand skills	47		4-6 yrs	Intra-observer reliability	obstetric brachial plexus lesion (OBPL)	Video based
Berry et al., 2004	218565672		isometric force measurements	3		7-17 yrs	Intrasession & Intersession Reliability	CP	Performance Based
Baker et al., 2009	218565191	Gait Profile Score (GPS)	gait			mean 11-12 yrs	intra-session variability	CP, orthopaedic conditions, neurological conditions	Performance-based
Avery et al., 2003	218565096	Gross Motor Function Measure (GMFM-88)	gross motor	88		11mo-12y	Rasch analysis	CP	Observation-based
Barbosa et al., 2021	218565288	general movements optimality score (GMOS)		21		32-45 wks	Rasch analysis	N/A	Video-based
Barnett et al., 2015	218565340	Resistance Training Skills Battery (RTSB)	performance in resistance training	6		mean 15.1 yrs	rater agreement	N/A	Video-based
Alsalaheen et al., 2015	218564778	The Balance Error Scoring System (BESS)	balance	6	-	mean 15.9 yrs	reliability and concurrent validity (test-retest)	N/A	Performance-based
Boyce et al., 1992	218566063	Gross Motor Performance Measrue	gross motor	5		0-19 yr	reliability and construct validity	CP	Video-based
Alsalaheen et al., 2015	218564776		postural stability			14-17 yr	Reliability and construct validity	N/A	Video-based
Aarts et al., 2009	218564477	Video Observations Aarts and Aarts	spontaneous upper limb use	2		2.5-8	reliability and construct validity	Spastic unilateral CP	Video-based
Boschi & Frère 2013	218566015		grip and pinch	5		3-9 yr	reliability and construct validity	Some motor impairments	Video-based
Acero et al., 2011	218564528	Squat and Countermovement Jump Tests	jumping	2		6-8 yrs	reliability and repeatabilty	N/A	Performance based

YEFREMENKO et al., 2019	218564467	running test w/ metronome	running	4			reliability and reproducibility	N/A	Video-based
Boyer et al., 2013	218566078	Plank Isometric Hold	Torso Muscular Endurance	5		8-12 yrs	reliability, feasability, and validity	N/A	Performance-based
AYLWARD et al., 1988	218565123	Early Neuropsychologic Optimality Rating Scale (ENORS-9)	posture, tone, and movement	24		9-36 mo	sensitivity and specifity	None suspected at the start of the experiemnt	Observation-based
Blomqvist et al., 2012	218565896	Six balance tests: Extended Timed Up and Go Test, Dynamic One-leg Stance Test, a Modified Forward Reach Test, Force Platform Test, One-leg Stance Test and Full Turn Test	balance	1		16-20 yrs	test-retest and concurrent reliability	intellectual disabilities	Performance & Observation
Bjornson et al., 1998	218565842	Gross Motor Function Measure	gross motor skills	88		4.4-17.7 yrs	test-retest reliability	CP	Observation-based
Barozzi et al., 2014	218565364		postural stability	4 sensory conditions		6-14 yrs	test-retest reliability	N/A	Performance-based
Almutairi et al., 2020	218564764	The Modified Clinical Test of Sensory Interaction on Balance	balance	4	2	7-12 yrs	test-retest reliability	CP	Observation-based
AYAN et al., 2019	218565107	Basic Motor Ability Test	gross motor, fine motor, and balance	9		4-5 yr	test-retest reliability & construct validity	N/A	Performance-based
Aras et al., 2018	218564946	Early Clinical Assessment of Balance	postural stability	13		1.5-5 yr	test-retest reliabilty	CP	Observation-based
Abubakar et al., 2008	218564520	Kilfi Developmental Inventory	psychomotor function	69		2-3 yrs	test-retest reliabilty	neurodevelopment	Observation-based
Ayán-Pérez et al., 2016	218565109	Sargent Jump Test	jumping	3		4-5 yr	test-retest reliabilty	N/A	Performance-based
Basu et al., 2017	218565422	Tyneside Pegboard Test (TPT)	unimanual and bimanual dexterity	2		4-15 yrs	test-retest reliabilty & construct validity	unilateral CP	Performance-based
Baque et al., 2016	218565258	Timed Up & Go (TUG) test, 30-second	gross motor skills	13 items for Himat		8-16 yrs	test-retest reproducibility	aquired bain injury	Video-based

		repetition maximum (repmax) of functional exercises, 6-Minute Walk Test (6MWT) and Highlevel Mobility Assessment Tool (HiMAT)							
Assi et al., 2009	218565026	Davis protocol and Gillette Gait Index	gait			5-15 yrs	uncertainty and repeatability	Healthy and CP	Observation-based
Bertucco et al., 2013	218565698		movement time and accuracy			mean 9.7 yrs	usability and validity	dystonia vs normal	Performance-based
Aimsamrarn et al., 2019	218564622	Alberta Infant Motor Scale	gross motor	4		1-18 mo	Validity and reliability	N/A	Observation-based
Bandong et al., 2015	218565236	Four Square Step Test	gross motor			5-12 yrs	Validity and reliability	CP and Down Syndrome	Observation-based
Asunta et al., 2017	218565038	Motor Observatin Questionnaire	gross, motor, and perceptual	2		6-12 yrs	Validity and reliability	DCD	Paper-based
Bacvarevic et al., 2012	218565643	Testing of Kicking Performance	kicking accuracy	2		11.5 - 15.5 yrs	Validity and reliability	N/A	Performance-based
Bekris et al., 2020	218565521	Passing Accuracy Test (PAT) & Passing and Visual Recognition test (PVR)	passing accuracy and space detection	2		11-17 yrs	Validity and reliability	N/A	Perfromance-based
Bandeira et al., 2020	218565234	Test of Gross Motor Development (TGMD-2)	gross motor skills	12		3-5 yrs	Validity and reliability	N/A	Video-based
Boyce et al., 1995	218566067	The Gross Motor Performance Measure	gross motor performance	20		0-12 yrs	validity and responsiveness	CP	Observation-based

CHAPTER 5

DISCUSSION

The scoping review was completed to gather relevant information of motor assessments that have been created and used in the last 30 years. This research synthesis method was chosen for its ability to depict the depth of the specific topic and provide literature from multiple sources for review (Camden et al., 2015). In a systematic review done by Hulteen et al (2020), researchers looked at 107 studies. Their purpose for doing so was to review not only the validity and reliability of the scores from all types of gross motor competence tests, but also to determine the most common motor skill that was assessed throughout all the instruments. They researched 7 different databases to gather their sources and eventually were able to identify 57 different motor skill assessment tools that met their criteria. The researchers concluded that construct validity versus content validity was seen more often. Additionally, they noticed the Test of Gross Motor Development (second and third edition) were supported the most for validity and reliability. Here, the most common skills that were evaluated were the overhand throw, catching, jumping, and hopping (Hulteen et al., 2020). In 2019, Sheuer et al. (2019) also completed a systematic review for motor tests; this time, focusing on primary school aged children. Their purpose was to collect studies that used motor tests in children aged 4 to 12. They used 9 databases to search for their results and eventually accumulated 144 studies out of the 910 records that met their criteria; 20 test components were also identified. They were able to determine that the tests that focused more on the constructs of motor skills were most prominent and are used mainly for evaluating during research. Eddy et al., (2020) focused on the validity of observational assessment tools on fundamental motor skills. Once again, the criteria were school aged children, and they were able to collect 90 studies after reviewing 1,863 articles. They were able to identify the Test of Gross Motor Development and the Movement Battery for Children as being the most used research tools. TGMD yielded the most evidence for validity and reliability whereas the MABC had a 64% rate of the same results. A field-based testing protocol to assess gross motor skills in preschool children was also completed. Here, the researchers aimed to determine an assessment tool that is both reliable and valid for motor skills in children during field-based settings. The participants included 297 children from ages 3-5 using the Children's Activity and Movement Preschool Study Motor Skills Protocol and compared it to the Test of Gross Motor Development (second edition). In the end, they concluded that there was a high coefficient in test reliability, interobserver reliability and validity for the Children's Activity and Movement in Preschool Study Motor Skills Protocol (Williams et al., 2009). Ré et al. (2018) specifically compares the performance and motor delay categorization. The researchers compared the Test of Gross Motor Development (second edition) to the Körperkoordinationstest Für Kinder. The subjects included 424 able-bodied children with ages ranging from 5-10 years old. Between these two assessments, they both had low correlations across the children and the TGMD-2 was able to identify more children with motor delays as compared to the KTK assessment, providing the idea that it may be important to implement multiple assessments to assess motor skill competence.

For this partial scoping review, 1,555 articles were able to be screened because of the time constraint; however, the remaining 12,969 articles will be still screened in the coming weeks. The included articles will undergo a second screening, which will take an even closer look into the results of each study, similar to what was done in this project, but at an even larger scale to eventually create the criteria for a new motor assessment for children.

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BIOGRAPHICAL INFORMATION

Crystal Tavarez plans to graduate with an Honors Bachelor of Exercise Science in December of 2021. Her plans for the future consist of applying to graduate school and eventually becoming a physical therapist. Having started at the University of Texas at Arlington (UTA) in 2018, she has had the privilege of being a member of the Honors College all four years. During her time at UTA she started a job at Barkman and Smith Physical Therapy as a technician, completed her internship at Texas Rehabilitation Hospital, and volunteered with Dr. Tamplain’s volunteer program, the Little Mavs Movement Academy. While working on this thesis for the Honors College, she also completed another study over the affects energy drinks have on anerobic power output. Crystal is excited for what is to come next and cannot wait to begin her journey.