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Clapping Games for Child-Development: Systematic Review and Meta-analysis

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There exists a small body of work which examines clapping games in the context of play, music or culture and investigates them in respect to learning or child-development. However, there have been no systematic reviews on this topic. In light of the recent emergence of neuroeducation as a field of study, this thesis reviews studies of the past twenty years which investigate clapping games as a phenomenon which facilitates development or learning. Findings reveal scant evidence that clapping games impact all four areas of development. Gender, social, group and ethnic identity is impacted as clapping games act as a conduit for cultural transmission. Self and emotional regulation behaviours seem to emerge while engaging in clapping games though not as much as in other more individualistic musical activities. Those who spontaneously engage in clapping games on their own initiative seem to perform better academically, while those (especially second grade boys) who engage as an interventional practice improve in the core skills of reading and writing and the physical skills of hand-eye coordination and visuo-spatial perception. Neurocognitive research on clapping games' component features of rhythm, interpersonal synchrony and coordination, motor and speech coordination, and the effects of rhyme and melody on these processes are considered. Implications for teaching practices and future studies on the area are discussed.

Keywords: Clapping games, far-transfer, near-transfer, educational neuroscience, cognitive domains, Self-regulation,

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## 1. Introduction

Clapping games exist as a universal form of child-lore alongside jump-rope games, tags, rhymes, chants, count-outs and other forms of play belonging to the culture of the child. They are social games as their play involves intimate contact with others, but also teaching friends and learning from others requires certain socio-emotional skills. They are seen as a type of musical play in that they involve the rhythmic integration of somatic and cognitive resources like melody, movement, spoken-poetry, drama, interpersonal interaction and coordination. In the game, these resources are synchronized into a performative skill where rhythm and rhyme (tempo) provide structure that seems to aid in memorization and maintaining attention. As a type of musical play, they build on our early form of communicating with caregivers that consists of a sort of rhythmic sing-song deemed by Malloch & Trevarthen (2009) as “communicative musicality” (p.31). This form of communication is expressed in infancy and is used as an early form of relating to caregivers (Malloch & Trevarthen, 2009). While didactical, folk, and musical research suggest a link between children’s musical play and development (Batchelor & Bintz, 2012; Harter, 1998 as cited in Curtis 2004 p. 422; Pellegrini et al., 2002, 2004; Pellegrini & Bohn, 2005); few studies investigate clapping games specifically.

The idea that clapping games impact development is a common assumption largely untested in the research. Most of what we know which could possibly connect clapping games to child development comes from studies not on clapping games themselves, but on some of the elements that make up musical play or group music-making in general: rhythm, synchrony and coordination. Results from recent brain, cognition and behavioural research on interpersonal synchrony, interpersonal coordination rhythmic processing, training and movement provides evidence to support the idea that clapping games which utilize these resources, perform some developmental function in children. Impacts have been found on prosocial behaviours, social cognition (Cheng et. al 2019; Hadley et. al., 2015; Keller et. al., 2014; Lang et. al. 2016; Novembre et. al., 2019; Panasiti et. al 2017; Pfeiffer et. al 2018; Zamm et. al 2016) and motor coordination(Lang et. al. 2016) via motor simulation mechanisms( Hadley et. al., 2015) and temporal prediction ability (Pacenka et. al., 2011). Such research provides evidence that clapping games may support social and emotional development. Links have also been found between music training, rhythmic processing, rhythmic tapping, rhythmic cueing, and rhythmic

movement to language and literacy processing and skills as well as to motor dexterity and phonological awareness ( Corriveau & Goswami 2009; Muneaux *et al.* 2004; Overy, 2000; Overy et. al. 2003; Weinert, 1992). Supporting these links are abilities in temporal processing (Corriveau & Goswami 2009; Thomson & Goswami, 2008) and steadiness of neural responses to sound (Tierney & Kraus, 2013). Such research provides evidence that clapping games may support cognitive and physical development. Additionally, neurological research investigating activities which involve the rhythmic synchronization of movement and speech provide evidence that the simultaneous chanting and rhythmic clapping involved in clapping games enhances verbal processing (Bella & Falk, 2016 ). Therefore, the heavy involvement of sensorimotor synchronization, interpersonal coordination, and rhythm production in clapping games, provides evidence that they impact cognitive, social, emotional and motor development.

Clapping games also involve the verbal aspect of reciting rhymes. Research on the developmental impact of nursery rhymes suggests that chanting in rhyme provides an aural opportunity to develop vocabulary while rhyming alone supports phonological awareness (Mullen, 2017 p.46). Studies in early child development provide further evidence that clapping games support development. For example social, behavioural research in this area supports the idea that the interpersonal aspect of clapping games supports the development of joint-attention. Joint attentions is a communication skill which involves directing one's visual focus on the same object as another's (Kinard & Watson 2015). Abilities in this skill impacts socio-emotional cognition and development as well as development of language skills (Kinard & Watson 2015). Additional research in play provides arguments that the interpersonal aspect of clapping games supports the development of one's ability to "infer what someone else is thinking" (Bornstein & Lamb, 2005 as cited in Thomson 2017 p.162) ie. one's theory of mind. These interpersonal skills are foundational to healthy socio-emotional development.

Still, despite the body of research which suggests the developmental impact of these games themselves, or of their consisting elements, there are only a few studies which investigate these claims directly. This thesis reviews studies that isolate clapping games from other forms of child-lore and musical play in order to describe findings relative to social, emotional,

cognitive and physical development in childhood. A discussion follows where the findings of the review are linked briefly to relevant research in neuroscience. The review concludes with remarks on the implications of clapping games for teaching and classroom use.

### *1. 1 Justification*

There is a current effort to link neuroscience and education; the burgeoning discipline is known variously as “*Neuroeducation, Educational Neuroscience, and Mind, Brain and Education*” (Thomas et. al., 2018 p.1; Howrd-Jones p.4). Part of this venture consists of efforts to make relevant research in neuroscience more accessible to educators (Lichtman, 2001, as cited in Bergen & Woodin, 2017 p. 120) and education policymakers(Thomas et al. 2018 p.1) Another part consists of investigating successful pedagogical practices on a neurological level(Thomas et. al. p.10). This feat which simultaneously seeks to validate those educational methods that are thought to have some effect on the brain( Bergen & Woodin, 2017 p.119). It is in support of the latter venture that this review is conducted. However, this review extends the meaning of pedagogical practices and methods to include those activities which children play amongst themselves and which teachers may on occasion use didactically. This extension is based on two views: the first is a view of education that recognizes and values the intrinsic-autonomous learning of children themselves (here, I do not mean the type of autonomous learning that educators try to foster in children toward extrinsic curricular or pedagogical goals, though this too is valuable )both in their autodidactic behaviours and interpersonal behaviours with peers, and by extension the activities in their play as pedagogical devices aiding development. The second is a view of the teacher’s role as observer. In this capacity, teachers monitor playground activity and may make connections between play behaviour outside and learning behaviours in the classroom.

### *1. 2 Aim and Research Question*

The aim of this review is to describe what has been researched on clapping games since the emergence of neuroeducation as a field of study. The review focuses on investigations that concern physical, emotional, social and cognitive development in order to ascertain their potential use as interventional or learning enhancement activity in schools. Considering Bergen

& Woodin's (2017) supposition that play supports the developing brain (p.115), a central goal is to explore possible neurocognitive linkages between playing clapping games and development. Though such an exploration may seem controversial and outside the realm of teacher education (see Bishop, 2014; Bowers, 2016; Bruer, 1997 for arguments against a blending of education and neurocognitive science and Gabrieli, 2016; Howard-Jones et al., 2016 for debates on the same); it is being done from the teacher's perspective in accordance with Bergen and Coscia's (2001 as cited by Bergen & Woodin, 2017) call for teachers to find pedagogical practices worth investigating neurologically (p.3). The overall purpose of the review is to deepen the understanding of clapping games in such a way that illuminates their value as a traditional activity already enjoyed by children during the school hours. The research question is: In which ways do clapping games effect the different areas of child development?

## **2. Clapping Games: Definition, Significance and Lines of Investigation**

### *2.1 What are Clapping Games?*

Also known as clapping songs, hand-clapping games, chants or rhymes; Clapping games are performed with two or more people and involve rhythm, movement and speech in a display of joint-synchrony. Clapping games are multimodal in that they make meaning through the simultaneous use of various somatic and cognitive resources (Marsh & Dieckmann, 2017, p. 463; Addo, 1996 p.3). They involve clapping hands in various rhythmic patterns while chanting, rhyming, singing and engaging in other types of dramatic movement such as patting the thighs, snapping the fingers, bumping hips, or spinning (Addo, 1996 p.3). The games are played in various spaces where children have free-time such as the playground, but they can be played anywhere and thus are often used as a way to relieve boredom during down-times such as when waiting in line, or in the gap between activities (Curtis 2004, p.422). They are mainly played by children between the ages of six and ten ( Brodsky & Sulkin, 2011 p.1115; Ferré, 1993 as cited in Casals 2015, p.57), and are more popular amongst girls than boys (Marsh & Dieckmann, 2017 p.4 ; Curtis 2004, p.421). Eliassen (2009) credits African musical traditions as the source of some clapping games (p.142). However, their recorded existence begins in 1698 with “Pat-a-cake, Pat-a-cake, Baker’s Man” ( Arleo, 2001) as cited in Batchelor & Bintz, 2012 p. 341).

Clapping games are still popular with children around the world today. Recent research by Veblen et al. (2018) illuminates the games’ present-day popularity as a teaching and learning device on youtube and found 184 clapping games performed by children from every continent. In more novel research, these games have also been used in robotics research as a potential method to gauge and foster robot-human relationships (Chellali et al. 2017; Fitter & Kuchenbecker, 2018; Fitter & Kuchenbecker, 2019)

### *2.2 The Significance of Clapping Games as a Topic of Study*

Clapping games have generally been a topic of interest in folk studies as a form of child-lore: the activities which children pass on to each other (Grider 1980, p.159) and make-up their culture. The central question in this subset of research can be summarized as: what, why and how

are children teaching and learning from each other (Grider 1980, p.159). We can find four compelling reasons for the study of child-lore from Carpenter (2018). The first reason concerns child-lore's survival across generations. Carpenter argues that it is this very staying power that makes the discipline one worthy to be studied: why have these games and songs endured? what significance do they carry? The second reason is child-lore's ability to show the process of cultural acquisition. Third, is the centrality of those activities to childhood, and how experiences during this time influence the developing personality. Lastly, and perhaps most importantly, studying child-lore is a worthwhile occupation because it empowers the station of the child. It does so through viewing children's culture as more than insignificant play, and in turn serves to help validate children as full human-beings( p.19).

Clapping games as a topic of study also derive significance in relation to neurocognitive research. Here, viewing clapping games as a multimodal activity, supports theory that they may enhance cognition in other distally related activities. When this type of cognitive transfer takes place it is called a *far transfer effect* as opposed to a *near transfer effect*.

Near transfer effects are common. They are seen in one's aptitude to, for example, write letters and color pictures. Far transfer effects however, are elusive. An example would be a person's good aptitude in learning programming languages enhancing their ability to learn spoken languages. In fact, far transfer seems so elusive, that a recent study by Sala and Gobet deems it a "chimera"( p. 518).

Still, according to Thomas (2018) the idea of finding an activity which results in far transfer effects is a popular goal in neuroeducation; and the reasons driving the search are obvious. However, research in this area must tread carefully, for the allure of being able to extend one's skill to other domains with less effort attracts the consumer industry as well. Indeed, part of the effort of neuroeducation as a field of research, is to combat the explosive amount of "brain-based" products that have hit the market riding on dubious claims dubbed "neuromyths" by neuroscientists (Howard-Jones et. al, 2016 p.17). These myths are harmful because they produce erroneous teaching methods based on scant research (Thomas et al., 2018 p.10 ).

### *2.3 Previous Research*

The universality of clapping games coupled with their endurance across time and their attractiveness to children of a specific age-group have made them an activity of interests in several fields of study. Research in clapping games can be divided into five areas: corpus, ethnomusicological, didactic, therapeutic, and neurological (Naranjo & Naranjo, 2013 pp.211-212). Ethnomusicologists study the musicology of the games, folklorists study the games' transmission across generations and their use amongst children. Through didactic studies we find interesting ways to use these games in the classroom. Additionally, through behavioural and neurological research we learn about the impact of different elements of the games on the mind and the brain.

There is a wealth of work within the former three areas and an overlap between ethnomusicological and corpus studies because they both encompass folk or cultural studies. The latter two perspectives examine the lyrics, melodies, and movements of the games.

More specifically, it is in corpus studies where the games are transcribed and collected. The most notorious works in this area are Opie and Opie's (1985) *The Singing Game and The Lore and Language of Schoolchildren* (1959). These works investigated the games' transmission across generations, their use as an inclusive or exclusive social tool; and the occurrence of immoral themes. (Jopson, et. al. 2014).

Ethnomusicological research investigates the games' history, transmission and musical attributes through observational and interactional field work. They also share with corpus studies, the task of examining the lyrics, melodies, and movements of the games. For example, through Curtis' (2004) work we learn that many clapping games are variations based on one tune. This area of research may also focus on different themes within a particular culture. In this vein, they reveal connections between those component aspects and the larger geo-cultural context in which they are played. Here, themes of identity emerge encompassing gender, ethnicity, age, musical tradition and culture. For example in Koop's (2010) investigation on how children learn music in Ghana; clapping games, amongst other forms of musical play, made up the focus of the study. Playground culture forms the backdrop of Countryman's investigation on how language is used in various play practices during recess (2014).

Didactic studies focus on how the games can be used academically. In this area Harris (2000) describes a Korean hand game and suggests its use as a contextual element when studying about Korea, its culture, or current events. Cardany (2014) suggests engaging in a particular clapping game as a way for children to imbibe the urban culture of the characters in the story “Lemonade in Winter”.

Works which investigate clapping games in the neurological and therapeutic field are sparse and do so in an indirect way. Neurological studies *could* search for the underlying neural mechanisms functioning during clapping games, while therapeutic studies *could* investigate the games’ effect on certain skills and actions relevant to the rehabilitation and or improvement of certain illnesses (Naranjo pp.211-212). I stress the potential because, though Naranjo & Naranjo cites a few different studies within these areas (Thaut, 2005; Alten- müller et. al. 2006; Brodsky & Sulkin, 2011; Naranjo, 2012; McIntosh, 1997), only the one conducted by Brodsky& Sulkin (2011) separated clapping games from other types of musical play and investigated them exclusively. Their work is included in this review. The other cited works focus on a broad spectrum of musical play in such a way that conclusions about clapping games exclusively cannot be made. These other works are significant for musical play in general, and in this way illustrate themes and point to further studies that could be investigated for hand-clapping games specifically. For example, clapping games as facilitating the relationship between rhythm, music and general-motor control which impacts the finesse of our movements. Hence the significance of this review which aims to be a resource for child development related findings from research targeting clapping games specifically.

### **3. Theoretical Framework: Connecting Neurocognitive Science to Clapping Games and Clapping Games to Child Development**

#### *3.1 Rhythmic Resources: A Neurological Case for Clapping Games*

Inspiration for this review comes from my teaching practice experience in a school for dyslexic students. There, during a music lesson, I was struck by the level of difficulty experienced by the students in learning the clapping game “Ms Mary Mack”. I had planned on using the game as a device to teach polyrhythms; however, the students seemed to have significant difficulty performing in even the most basic clapping pattern in synchrony. I recognized that there seemed to be something in this game that made it particularly challenging for dyslexic students; and I presumed that clapping games could become a potential interventional activity. Indeed there is compelling neurocognitive research that the elements that make up clapping games: rhythm, interpersonal synchrony, coordination, and their incorporating rhyme and melody support different areas of development. These elements are made possible through abilities in temporal processing and have been found to be supported by motor simulation mechanisms.

##### *3.1.1 Rhythm and Cognitive Development*

In fact, research has long since established that children with dyslexia having a timing deficit that weakens the ability to perceive, process and produce rhythm (Corriveau & Goswami 2009; Muneaux *et al.* 2004; Overy *et. al.* 2003; Thomson & Goswami, 2008; Weinert, 1992) Considering the role that rhythm plays in language in terms of phonology and prosody, it is not surprising that a weakened ability in temporal processing impacts the development of reading skills (Overy, 2000). This knowledge forms the backdrop of a significant amount of studies that have found improvements in literacy skills, through various types of musical interventions for both dyslexic children (Cogo-Moreira *et.al.*, 2013; Flaugnacco *et. al.*, 2015;) and children in general(Tierney &Kraus, 2013). In fact, as reported in ScienceDaily (2010), an unpublished study by Sulkin found that clapping games improved reading abilities significantly over music instruction. This may be due to the involvement of interpersonal synchrony. There is also evidence linking synchrony to speech production. For example, Bella & Falk (2016) found an improvement in verbal processing ability when timing speech to rhythmic

movement. Thus, as form of musical play relying heavily on rhythm, clapping games are a promising activity for cognitive development in language.

Toplak(2006) has also reviewed studies that provide evidence of a timing deficit in ADHD which, in this case is linked with attention. Timing deficits are evidence of an impairment in temporal processing which on the one hand, may effects one's rhythmic ability but may also effect the ability to coordinate one's movements in time, ie. *synchrony*. Khalil et al. (2013) found that participating in activity of group rhythmic synchrony helped children maintain attention.

Fitzpatrick et al(2017) report a similar relationship between interpersonal synchrony and attention in their research exploring social motor coordination and the social behaviours characterized in autism. A simple clapping game was used to gauge autistic children's spontaneous synchronization skills. It was found that this activity is associated with "responding to joint attention, cooperation, and theory of mind"(Fitzpatrick et. al 2017).

Rhyming ability is also implicated for impairments in temporal processing due to its being an aspect of phonological awareness Amaral et al.(2015). Bebout & Belke (2017) found that a combination of rhyming and melody in language play helps to learn language. This is perhaps due to the work of Obermeyer et al. (2013) which found that when speech is rhymed or metered it is viewed as likeable(as cited by Bebout & Belke, 2017). From this finding Bebout & Belke (2017) extrapolate that it is that very likability which helps to capture the attention and aids in content memorization.

### 3.1.2 Rhythm, Social and Emotional Development

Interpersonal synchrony or social motor coordination is the simultaneous coordinated action between people. It is a joint-action skill that is heavily impacted by rhythmic ability through motor simulation mechanisms. These mechanisms have been attributed to understanding other's actions in terms of right and wrong and predicting the outcome of such actions( Novembre et. al. 2019; Panasiti et. al. 2017). Likewise, prosocial behaviours like turn-taking, monitoring ones' own actions, and matching one's own emotional states to other's in order to make the best of a social situation are all possible through motor simulation (Hadley et al. 2015). In turn, these skills are linked to social and emotional development. The social bonding and pos-

itive social attitudes that are produced through interpersonal coordination have been attributed to motor simulation mechanisms(Lang et. al 2016). Similarly, social motor coordination is strengthened by self-control skills and supported by empathic abilities because they aid in predicting other's behaviours(Novembre et. al. 2019). Thus, two of they main skills forming the crux of a a successful clapping game, rhythm and interpersonal synchrony, promote collaborative and prosocial behaviours which are enhanced by empathy and self-control.

### 3.1.3 Rhythm and Motor Development

Research in autism has shown the role that rhythm plays in motor development. In autism, a cerebellar dysfunction manifests in motor deficits like prolonging the time taken to perform rhythmic movement sequences, clumsiness and difficulties with coordination and unsteady gait. In turn these motor deficits impact social development because communication skills rely on motor and sensory responses ( El Shemy & El-Sayed, 2018 p.1063).

Work by El Shemy & El-Sayed (2018) finds a link between bilateral coordination in rhythm and cognitive skills. In short, the temporality of motor actions is associated with controlling cognitive and physical functions. (p.1064). This works because rhythm triggers the areas of the brain associated with movement and causes the swift synchronization of those movements(p. 1063).

Then based on neurological, behavioural and cognitive research, synchrony and coordination, the two main elements that makeup clapping games, are interconnected in part through abilities in temporal and attentional processing, motor simulation mechanisms and cerebellar functioning. These neurostructures and cognitive mechanisms effect different aspects of rhythmicity. In turn, the different ways of functioning which rely on temporal abilities ie. joint-attention, social-bonding, empathy, smooth movement, language production and reading, to name a few are effected. In this way, clapping games seem to offer opportunities to foster and strengthen healthy cognitive, physical, emotional and social development. Then, as a child-accessible social musical activity, This idea is based off evidence linking the cognitive temporal processes, attentional processes practice of memorizing rhymes, initiating, teaching and learning new songs with their movements.

### *3.2 Four Areas of Child Development*

Child Development can be divided into four areas: cognitive, social, emotional and physical. All of the areas are inter-dependent and so for example, when social-emotional development is weak, then so may be one's ability to concentrate (Raver, 2002, p.2). A recent example of this phenomenon comes from research in Jyväskylä which found that children who exhibited anti-social or negative social behaviour struggled with learning at school (Metsäpelto et. al 2015). Furthermore, the growth of one area impacts the others (Raver, 2002 p.2). The interconnectedness of the developmental areas is particularly true for social and emotional development which help one to both acquire and maintain healthy relationships( Delahooke, 2017 p.2).

#### *3.2.1 Social Development, Emotional Development*

Emotions help us to recognize threats and danger, but they also direct how we behave around others.(Delahooke, 2017 p. 1) Thus, considering the goals of this review, the view of emotional development in terms of school readiness is held and thus is defined as *children's ability to regulate their emotions in ways which neither alienate themselves or others* (Raver, 2002 p.7). Through our relationships we learn how to feel comfortable with ourselves and safe in the world (p.1) Therefore, social development is taken to mean *how well a child can get along with others*.

#### *3.2.3. Physical Development*

Physical development is often divided into several skills like, gross, fine, bilateral coordination etc. (van der Fels, Irene M.J. et al., 2015). Though these skills point to different capabilities of the physical body, they underpin all other areas of development. Without the proper motor functions one would be limited in ways to interact with both other people and with the physical world (Libertus, K., & Hauf, P. (2017). Physical development in this research means *the child's ability to interact physically with the immediate environment*.

#### *3.2.4. Cognitive Development*

Cognitive development can be described in terms of age phases, like Piaget's stages or through Montessori's sensitive periods. These theories provide a loose framework for checking milestones of child development; however According to Wilks et al. (2010), they do not encompass what has in the past and continues to be commonly observed in children by parents. Another way to describe cognitive development comes from a neurocognitive perspective where cognition is divided into areas of functioning or *domains*. The DSM-5, divides cognition into six domains: language, perceptual motor function, executive function, social cognition, learning and memory, and complex attention. In children, we assess development in these domains through their skill and ability in learning. (American Psychiatric Association, 2013 p.364) Thus, the benefit of viewing cognitive development from a neurological perspective is twofold: (1) The relation of the six domains of cognition to the other areas of development are quite clear; and (2) The six domains of cognition are directly related to many of the core skills needed to thrive in primary school. Some examples of these are: literacy, numeracy, communication, working together, personal growth, problem solving and critical thinking (Lamb, S. et. al, 2017). In this research, cognitive development means, the child's expressed ability in the six domains of cognition (Sachdev et. al 2014; Wilks et. al 2010).

#### *3.2.5 Child Development Framework for the Analysis of Clapping Games*

Then, concerning clapping games' impact on development, we are looking at the ways in which clapping games may impact children's ability to: (1) regulate their emotions, (2) get along with others, (3) physically interact with the immediate environment, and (4) learn.

## 4. Method

### 4.1 The Search

A systematic review of empirical studies targeting clapping games as a method to improve or develop some aspect of cognition, or as a phenomenon which brings to light certain developmental processes was conducted. Web of Science, Elsevier Science, Scopus, EBSCO Databases (Academic Search Premier, CINAHL, ERIC, Teacher Reference Center), Proquest, Springer were searched using combinations of the terms hand clapping, clapping, handclapping and games, songs, rhymes, chants, plays, play. displays the search strings used in accordance with the respective database.

The search was limited to studies published between January 1, 2000, and October 3, 2019 because efforts to link neuroscience and education emerge in the early 2000's with the founding of the International Mind, Brain and Education Society (Thomas, 2018). The search was also restricted to research articles published in English. After removing duplicates, the remaining articles were filtered based on firstly, the abstract and secondly, the full text. Via citations, this second phase revealed two relevant and accessible articles not present in the initial phase.

### 4.2 Search Criteria

When filtering through the articles, determining relevance was based on keywords (see *Attachment 1*). relating to the design of the study, the target intervention or method employed and the type of results expected. Thus the inclusion criteria was as follows: 1.) empirical study; 2.) clapping games or some interpretation of clapping games must be the independent variable or the observed phenomena; 3.) Qualitative analysis and/or hypothesized results must be an aspect of one of the six areas of neurocognition: perceptual-motor function, language, social cognition, complex attention, executive function, learning and memory as related to child development; 4.) Subjects must be primary aged schoolchildren; 5.) original study.

Besides the inverse of the inclusion criteria, the exclusion criteria was: 1.) clapping games could not be discerned as the target phenomenon; and 2.)the method/intervention activities

were so mixed that clapping could not be isolated from the rest. The first exclusion criterion was needed for articles which use a non-specific term to denote clapping games (ie. “singing games” or “musical play”) without either providing a detailed description, or differentiating and analyzing one type of play from the next. Both exclusion criteria came into play when the BAPNE or some other trademarked method was employed.

#### *4.3 Article Presentation*

The search resulted in four final articles divided between experimental research and ethnomusicological studies. Of the experimental research, one of the articles describes three separate studies. The other conducts a study based on three separate hypothesis out of which only one was relevant to clapping games specifically. For the ethnomusicological studies, one was conducted in Catalonia, Spain and the other in Tennessee, U.S.A. The entire search process is depicted in *Attachment 2*.

All of the studies were applied research and the data represented both quantitative, qualitative and mixed types. The two ethnomusicologies were observational; hence their descriptive objectives. Additionally, the two experiments were randomized control trials. The study locations were geographically diverse and represented Israel, The United States, Spain and Cyprus. Though not stated in the articles, it is assumed that the participant origins are at least as equally diverse as the study locations. Publishing genres were interdisciplinary and represented areas in early child development, play, music, culture and social justice. Though the year 2000 was the limit set for the article search, the earliest publication was 2011 and the latest 2015. *Attachment 3* shows an overall snapshot of the chosen articles.

#### *4.4 Meta-Analysis*

It is not only the findings of relevant studies that indicate pedagogical practices worth investigating neurocognitively, but also the assumptions which generated the initial investigation. The practices or activities themselves (clapping games in this case) simply serve as evidence that certain cognitive resources may be being used; it is the assumptions and theories about these cognitive processes that point the way toward possible cognitive and brain structures and mechanisms supporting them. Such is the “indirect, two-step route between neuroscience

and education” (Thomas, p.3); which uses behavioural and cognitive theories from the psychological field to inform education, but also to be validated and modified neurologically by neuroscience. Without this reference to neuroscience, teachers would inadvertently err in their didactic approach by relying on behavioural theories whose descriptions may not parallel with the actual functionality in the brain (Thomas, p.2). In this vein, the studies collected in this review undergo a meta-analysis which considers both findings and the assumptions or theories made about the ways in which clapping games shapes behaviour (behaviour relevant to learning and participating in the academic environment). Findings are classified according to their area of child development and reported in the *results* section. The discussion briefly considers the relevant article theories according to current research in neurocognition.

## 5. Results

### *5.1 Clapping Games and Social Development: Identity*

As an oral tradition that mirrors the social, political and cultural milieu of the moment, clapping games have been found to serve as both a reinforcer of and a conduit in informing children's gendered, group, personal identity and in certain cases, status, self-image and self-worth. This impact on identity is a transmission of the local culture which occurs through the context of time and place in which the games are played. Topics of transmission include: norms, taboos, social status, gender-roles, musical and cultural heritage. With the exception of musical heritage, information on these topics is transmitted through the lyrical use of parody, which lightens the burden of the message informing you of the role that you must play in life. These lyrics point out the absurdity of one's role, all the while drilling in the message through intoxicating musical devices. In one instance, the musical devices themselves form the transmitted information. The very infectiousness of the games, their use of rhythm, rhyme and social intimacy leads to their being played over and over again. Consequently, through sheer repetition, the cultural message is drilled in.

Through their analysis of clapping games in Spain and Catalonia from the 1920s to 2015 and through qualitative interviews of both adults and children, Casals (2015) found that the major movements and political regimes of the times influenced the nature of clapping games; the lyrics of which contained messages of gender roles, including: sexuality, social norms and the taboo. Likewise Moore found a similar trend when tracing the musical heritage of African Americans. She linked the chronological appearance of certain musical devices in popular African-American music to their appearance in clapping games of the respective time. This link provided the African-American children who played these games a route of participation to their wider musical culture. Simultaneously, however, the games with their popular musicality served as an ideal channel for informing these children of their lower-status in life and the attitudes to take toward this reality.

### *5.1.1 Gender Roles*

During the Francisco Franco regime, where a traditional family model was imposed upon the populace, lyrics referred to the religious and to the duties of one's role as defined by the dictatorship (Casals, 2015 p. 59). For gender roles, this meant household duties and childcare for the woman and non-domestic paid work for men in the public sphere, supported by the polarization of the characteristics of gender (ie. weak women as opposed to strong men). At this time clapping games were somewhat indistinguishable from other musical forms of play because the lyrics of these games was used interchangeably. Being so, they were played by girls in single-gender schools and by both girls and boys in mixed-gender schools; however there is no mention as to whether boys in single-gender schools played these games. The lyrics of the games were controlled by the teachers; however they were often altered by the children to showcase violations of social norms that occurred during the time and thereby reinforced social roles.

Contrastingly, during the feminist movements of the 60s and 70s, lyrics describing social norms were replaced with the those describing the taboo. At this time, mixed gender schools became more common, and clapping games individuated as a "girls' game". Through these games girls were able to claim their own space, where they could monitor and describe gender roles on their own terms. These games used parody and the absurd and they often described active and sometimes hyper-sexual women.. Sex, killing and dying were other frequent topics that went against the hegemony; as girls could now, "articulate publicly—or at least with boys nearby physically—their own critical discourse on gender and sexuality as well as the boundaries of their own spatial organization of gender-based play" (p.61).

### *5.1.2 Musical Culture & Ethnic Identity*

The Clapping games played by African American children reflect certain elements within the different genres of African American music. Such music contains a hybrid of characteristics from both the culture's original African roots and its acquired American heritage through slavery. Because drums were forbidden to be played by slaves, the heavy use of drums in traditional African music is replaced by an emphasis on polyrhythmicity and polymelody in African-American musical genres. The call-response format of spirituals and work songs; the

syncopation, melody and improvisation of ragtime and jazz; the bending, sliding and blue notes of blues music; and the shouts and melismata of gospel music are all reflected in the clapping games played by African-American children. Thus, for these children, clapping games play a role in transmitting their musical culture.

However, clapping games also serve as a conduit for other psychological elements of African-American culture. Elements pertaining to identity are transmitted not only through the musical aspects of the games, but through the speech-text as well. Attitudes of resilience and discontent; the social status of inferiority; the social norms of everyday life, including the historic harsh reality of living in poverty are all reflected in the lyrics of clapping games.

Furthermore the social aspect of clapping games helps to build personal identity in terms of self-image and worth. This occurs through the in-group gender bonding that clapping games foster. Moore( ) commented that the children she observed explained to her that the clapping games that they played were “theirs”(p. ). They implied that other children in the world may play them, but that those games would be inevitably different. Then, clapping games also serve as a way for these children to establish their sense of belonging to their ethnic group.

According to Casals (2015 ) it is the repeated performance of clapping games by children which helps to transfer cultural meaning. In the case of his research, part of this meaning was the Spanish language replacing the local Catalan(p.66 ) . For Moore (2012 ) this meaning was “issues of race, poverty and social injustice” (p.1). However in both studies, the overall developmental aspect that clapping games foster is one’s sense of self in terms of gender (female), role (specific to time and geo-political location) and status.

## *5.2 Clapping Games and Emotional Development: Self-Regulation*

Self-regulation is the behavioural skill gained when through “internalizing their interactions with adults via the appropriate psychological tools” children replace “other-regulation” for the ability to regulate the self (Zachariou & Whitebread, 2015 p.117). Being behavioural in nature, it involves social, emotional and cognitive areas of development. To investigate whether self-regulatory behaviours emerge during musical play (of which clapping games were a part), Zachariou & Whitebread (2015) utilize a framework which breaks down the concept into three aspects: emotional/motivational regulation; which will be discussed in this section; metacognitive knowledge, metacognitive regulation; which will be discussed in section 5.3.

There are three popular frameworks used for studying emotional development from a psychological perspective. One of these focuses on parental influence. The other two focus on emotional competence as either knowledge of emotions or ability to regulate emotions. It is the latter which has been found to emerge through playing hand-clapping games.

Zachariou & Whitebread (2015) found that roughly twenty percent of the self-regulatory behaviours present during six 35-minute long musical play interventions were emotional regulatory behaviours. These were further categorized as either emotional/motivational monitoring (ie. smiling during a task) or emotional/motivational control (ie. resisting distraction) (p.122). Unfortunately, this data is not broken down by type of musical play, thus no conclusions can be made about the amount of emotional regulation during clapping games specifically. However, the qualitative data on clapping games revealed an interesting finding: a non-relationship between self-regulatory behaviour in general and emotional regulation (p 125). Thus, having good abilities to self-regulate in general does not mean the one will also be successful with emotional regulation.

Overall, the study found that though emotional regulation occurs when children engage in clapping games, its presence is not as prevalent as when engaging in other forms of musical

play, like for example, when playing an instrument. The authors speculate that the discrepancy is due to the nature of the game which does not allow much space for the features which characterize self-regulation to emerge; namely, freedom to explore and direct challenge (p.123).

### *5.3 Clapping Games and Cognitive Development*

Clapping games have been found to impact developing cognition through its fostering self-regulatory behaviours and its supporting the attainment of core-skills. Self-regulation not only concerns emotional development, but cognitive development as well. Besides emotional regulation, Zachariou et. al (2015) divide self-regulatory behaviours into two other categories: metacognitive knowledge and metacognitive regulation. The latter, being subdivided into knowledge of tasks, persons and strategies, also involves social development. While, the former is divided into activities: planning, monitoring, control and evaluation. These metacognitive skills have been found to emerge when children engage in clapping games.

#### *5.3.1 Core-Skills*

A link has been found between skillfulness in clapping games and academic achievement. The study compared the quality of first-graders' performance in clapping games at the beginning of the school year (scored by blind judges using a performance tool developed by the authors) to their end-of-year skills in math, reading and writing and sociality (ascertained by home-room teachers using a scoring tool developed by the authors). Performance quality was divided into four domains each of which was further comprised of subcomponents. Thus, (1) Movement : familiarity of the actions, action fluidity and accuracy; (2) Language: familiarity of the rhyme or chant and level of fluency in its recitation; (3) Socialization: coordination, and ability to be patient, tolerant and supportive of partner.; (4) Music: familiarity with the melodic qualities of the song or rhyme and the accuracy, fluidity and of these qualities in the performance. musical and rhythmic accuracy, musical fluency and speed of the performance. The results revealed a significant association between performance quality in all of the domains and skills in reading and writing. However, performance quality measures in all domains did not correlate significantly with social and math skills. Thus, though a positive correlation be-

tween skillfulness in hand-clapping games and what the authors deem “efficient learning” was found, the study cannot reveal whether this result is due to engagement in clapping games themselves or the learners who may be naturally skilled academically and thereby show an inclination to playing clapping games. (Brodsky & Sulkin, 2011 p.1119).

### 5.3.2 *Far-Transfer Effects*

Adept visual and aural memory have also been linked to engagement in clapping games. These skills were found when clapping games were tested for their potential transfer effects across areas of cognition. For this investigation, researchers compared the results of an aural dictation task completed by two groups of second grade children: those who spontaneously engage in clapping games and those who do not. Aural dictation was chosen as the *far-transfer* activity since these games utilize aural-temporal processes without directly practicing the skill of dictation. The activity was evaluated based on the quality of the dictated text written by the participants. The text was judged on four separate components: (1) content output: how much of the dictation was written in comparison to the amount heard. (2) content errors, (3) text readability and (4) text appearance. The results found that the participants who spontaneously played clapping games were also more skilled in aural dictation based on every measure. Content output, a measure of aural memory, was 30% more. Content errors which measures visual memory were less than half. Furthermore, handwriting was more controlled which resulted in better legibility (Brodsky & Sulkin, 2011 p.1123). Nevertheless, results of the study still do not reveal whether the discrepancy of dictation quality between the two groups is due to engagement in clapping games themselves or due to the natural skills of those better performing children also predispose them to prefer playing clapping games.

### 5.4 *Clapping Games and Physical Development*

The same study reveals a link between clapping games and aspects of *Physical Development*. Here again, clapping games’ involvement of temporal processes made it an appropriate activity to test the transference of another skill using the same processes — “bimanual rhythmic patting (Bi-Pat)”(p.1123). This activity tests the game in a potential *near transfer* skill, because unlike dictation which is distantly related to clapping games, the rhythmic, synchronous

and coordinated bimanual movements required for this task are more similar. The BiPat requires each hand to pat with open palm or closed fist a presented rhythmic string in time to a pre-set metronome independently of each other. Beats were presented on cards with graphical representations of hand formation. The cards were presented in both vertical (easy to read ) and horizontal (difficult to read) orientations in order to test visio-spatial perception. The same second-graders mentioned above participated in this study with the same results: those children who spontaneously engage in clapping games (group 1) had higher BiPat scores than those who did not (group 2). These results show a link between clapping games and skill in both eye-hand motor sequences (p.1123) and visuospatial perception skill. The link connecting this latter skill to clapping games is evidenced by the better accuracy in BiPat regardless of the card orientations. Though both groups were more accurate when presented with the vertical representations of the beat than horizontal ones, the scores of group 1 were two times higher for the vertical representations and four times higher for the horizontal representations than the scores of group 2. Thus Clapping games impact motor development by improving temporal processes.

## **6. Clapping Games and Development: Rhythm and the Neurological Link**

### *6.1 Clapping Games and the neurology of identity development*

Though, clapping games as a cultural conduit is a relatively well-known phenomena, little is known about the developmental neural processes that make this so. One route toward understanding is considering empathy as an integral part of identity formation and designing experiments to find out how we build a sense of belonging to our social group. The findings from such experiments indicate that it is during pre-pubescence that social development skills are being adjusted at the neural level (McLean & Syed, 2015 p.430). For example, a study by Saxe et. al. (2009) revealed that it is between the ages of 6-11 when the areas of the brain responsible for the way we conceptually perceive the other, like the temporoparietal junction (TPJ) undergo developmental change (McLean, Kate C. 2015 p.430). Neurologists speculate that these types of neural changes during pre-pubescence may affect the how and why of the cultural transmission of values. They propose that cultural identity is acquired “during developmental transitions [between 6-8 and 9-11] and that neural changes within the bilateral TPJ likely facilitate cultural changes in identity formation” (McLean, Kate C. 2015 p.430).

In recent research the TPJ has also been suggested as “a key factor in the emergence of synchronization strategies” (Dumas et. al., 2019). According to Heggli et. al., (2019), synchronization strategies are needed when people perform a rhythmic task together like performing music. This type of rhythmic joint action produces intentional synchrony as opposed to the synchrony produced when an audience applauds or when a couple walks together which the study’s authors describe as “emergent”(p.2). Considering clapping games as an interpersonal rhythmic activity requiring synchronization strategies, perhaps provides a clue, via the TPJ, as to how (or why) the gender and ethnic messages transmitted through clapping games stick. Afterall, it is during that time period between childhood and pre-pubescence that the TPJ is “facilitating cultural changes in identity formation” (McLean & Syed, 2015 p.430).

## *6.2. Clapping Games, Self-regulation and Neuroscience*

The finding that clapping games does not elicit as much self-regulatory behaviour as playing a musical instrument, for example is not surprising when it is considered that one is a social activity while the other is performed independently. Research in neuroscience on self-knowledge has found that “self-referential processing often involves stimuli that are implicitly and subjectively experienced as strongly related to one’s own person (Northoff et al., 2006). Thus, playing an instrument alone may very well be experienced by many as an activity more related to the self, than playing clapping games.

Though self-regulation behaviours emerge during clapping games as a form of musical play, this does not necessarily mean that the more a child engages in musical play, the more self-regulated that child will be as an adult. The emergence of self-regulated behaviours is an important finding for musical play in general and clapping games specifically, but the only study cited that shows a link between childhood and adult self-regulatory abilities is one where self-regulation was explicitly promoted (Schweinhart & Weikart, 1998 as cited in Zachariou & Whitebread, 2015 p.117 ). The promotion of an ability specifically differs greatly from its natural emergence during a particular activity. Considering the identity value model of self-regulation which, drawing from research in social psychology and cognitive neuroscience “predict[s] that identity can promote self-regulation in identity-relevant domains by increasing the value of goal-relevant behaviours. (Berkman, Livingston & Kahn, 2017 ). Thus, if playing clapping-games is not considered relevant to one’s identity, then those self-regulatory behaviours that emerge during clapping games may not remain, that is unless the play is within a context where self-regulation is being specifically promoted.

## *6.3 Clapping Games and Core Skills*

As expected, clapping games are implicated for core skills because of their heavy involvement of sensory-motor skills which is underpinned by rhythmic processing and temporal abilities. They involve bimanual coupling and hand skills which have been found to be a predictor of academic achievement. Still, simply by playing clapping games interpersonal awareness is needed to maintain joint-attention and cooperation; two skills which are in constant demand at

school. Thus clapping games are a good fit for developing these skills. However, though playing clapping games spontaneously may indeed aid development of critical core skills, the same may not be said for teaching clapping games in the classroom. The former is intrinsically motivated while the latter isn't. Using clapping games as a didactic tool may alienate some, and bore others.

#### *6.4 Clapping Games and Far-Transfer*

Brodsky and Sulkin (2011) consider clapping games as potential activity yielding far transfer effects based on previous musical interventional experiments, most of which lacked the requisite passive and active controls. On spatial-temporal reasoning of which only one had both passive and active controls. Though Brodsky and Sulkin make a valid argument in considering clapping games for far transfer, this still cannot be determined from even their own experiment due to the lack of passive controls in their experimental design. According to Sala and Gobet (2017), the exclusion of passive controls is a common mistake in experiments testing for far-transfer effects. Passive controls minimize observer bias, enhance objectivity and provide greater validation on the effects of the intervention. Thus, the results of the three experiments by Brodsky & Sulkin (2011), though helpful for future research on the developmental impacts on clapping games, are not reliable as proof of far-transfer effects.

## 7. Conclusion

There is evidence to support the pursuance of the validation of clapping games neurologically as both a teaching practice and an interventional activity which aids development. Though there are reasons that clapping games may support far-transfer, there is no reliable evidence that this is so. However based on this review, engaging in clapping games seem to aids some aspect of all four areas of development. In this way, considering) Bergen & Woodin's (2017) explanation that, "Educators should provide environments with many opportunities for exercising social-emotional, physical-sensory-motor, and language- cognition abilities in order to promote the strengthening of synaptic connections" (p.69) makes the continued use of clapping games in the classroom a warranted and justified activity. Bergen & Woodin (2017) go on to say that although " there is no brain research evidence linking play development to specific areas of neurological development, educators who give opportunities for play are likely to be supporting brain functioning" (p.115); thus also warranting the encouraged use of clapping games on the playground.

### *7.1 Assessing the Validity of this Research:*

Rationale was logical and warranted the search which though thorough and systematic would have produced a richer review if the time limit were not set for the year 2000. The analysis fits the study design and the frameworks are clear thus the review is easily replicable in the future. Considering the small amount of studies reviewed, the conclusions made are not at all generalizable nonetheless they are succinct enough to use as a general map of the type of research done n this field as well as to point the way for future investigations.

#### *7.1.1 Validity of articles:*

There were two types of studies reviewed here: ethnomusicologies which were observational and interventional studies which used both qualitative and quantitative data. The two studies in the latter group were weak because though they used active controls, they did not use passive ones. The lack of passive controls weakens the results because, according to recent research by Sala and Gobet (2017) it is not possible to tell if they were generated because of

author bias. Additionally, all of the studies had small samples sizes rendering general conclusions unfeasible. Small sample sizes also had the effect of creating unavoidable gender biases for two of the studies done by Brodsky and Sulkin (2011). However considering the scarcity of peer-reviewed interventional studies focusing on clapping games, the two reviewed here are a promising start.

The validity of the two ethnomusicologies was assessed using the Coreq list. An acronym standing for: Consolidated criteria for Reporting Qualitative Research (Tong et. al. 2007), this list is appropriate because, as a reporting guidance tool created especially for studies using focus groups and interviews it can be used by researchers to ascertain the “rigor of analysis and credibility of their findings”( Moher 2014, p.214-226). The checklist is divided into three sections. In the first section, which lists criteria about the research team themselves, only a few characteristics were listed about the researchers in both studies. Also both studies lacked information about their relationship to the participants in the study. The next section, study design was also half-complete for both studies. Both described their theoretical frameworks and basic information about the participants in the study and how they were selected, but more detailed information about the sample and the data collection was not mentioned. The last sections tells about data analysis and findings. Both studies were weak in reporting details about how the data was analyzed. Only one out of five criteria in that subsection was reported. Findings, however were thoroughly reported. The articles are strong thematically, and though participant information was scarce, the findings derived did not require such information.

### *7.1.2 Validity of my work:*

The starting point for the search of this review was comprehensive in that it included all of the major databases relevant and accessible to me at the time. However, the search query had too few terms and should have included singing games. Such an inclusion would have brought in other works, for example, Minks (2008). Such an inclusion would have brought in other works, for example, Minks (2008). Also, the methods section of promising articles should have been read in order to ascertain if clapping games was used as an interventional activity. Due to this oversight a notable work (Fitzpatrick et. al. 2017) evaluating clapping games as a method of spontaneous synchronization that could support communication skills and social

interaction. Additionally, due to the English language limitation, several studies found in the search were not included. Additionally, after the relevant articles were found, their reference lists were searched. However, though this subsequent search revealed an unpublished study, the author of this study was not contacted. The eligibility criteria, though precise, were too restrictive in the time-based requirement. In hindsight, however, editing the criteria to reflect these conclusions, would not have resulted in more relevant studies. The fact remains that research investigating links between child-development and clapping games specifically are scarce.

### *7.2 Putting into practice*

Despite the limited amount of studies investigating links between aspects of child development and clapping games, there is evidence that such a link exists. Clapping games can be used as an activity to both assess neuropsychological development and remediate development in children. As an interventional activity, its use among first and second graders may reap the most benefits, especially among first and second grade boys. There are two reasons for these benefits. The first is due to the games' popularity amongst children of the age when neuroplasticity can be most exploited. The second is because the characteristic features of clapping games: bimanual coupling, visual- motor integration, motor planning proprioception and sustained attention; have been shown to effect structural and functional change in the brain (p.1132). Pending further research, clapping games may prove beneficial as an interventional activity aimed at improving children's self-regulatory abilities. Such an improvement would enhance children's learning capacities, and could easily be implemented by inclusion in music class. Though, as a supervised activity, its self-regulatory promoting effects would be diminished, they would still be promoted. (Zachariou & Whitebread, 2015 p.129) Then, at the interventional level, clapping games can be most useful to the special education teacher. In the intercultural classroom teachers could encourage the sharing of clapping games across ethnic and cultural groups. Such could result in improved learning capacities, but also better camaraderie across groups.

### *7.3 Future Research*

Replications of the Brodsky & Sulkin (2011) and Zachariou & Whitebread (2015) experiments with all three control groups would give stronger support for the validation of clapping games both as an activity which aids in certain core and metacognitive skills. Also, more empirical evidence on the relationship emotional regulation and clapping games. Furthermore, research aimed at deepening the understanding of a geographically and culturally-specific gender identity and girlhood would benefit from investigating the local clapping games. (Casals p.54 )Extending investigations of this type to encompass girls' ethnic identities would also be beneficial; at least in the context of African-American culture. From a broader perspective, however, more research on identity formation and cultural transmission at the neurocognitive level could help inform the findings from various ethnomusicological studies and also ground them neurologically.

In order to make clapping games as an interventional, remedial or cognitive enhancing activity more effective and efficient we would need to know more about the seemingly innate gender differences in developmental motor control between the genders. Girls perform better in handwriting and composing texts than boys. Likewise, it is girls who prefer playing clapping games which seems to magnify this intrinsic bias. Such knowledge could help inform investigations for other types of activities that could be better accepted by boys. For example, the investigations in this review could be extended to include various types of traditional games namely: jump-roping, cheerleading type activities like: stomp/step and almost dancelike/military like activities like: marching and chanting/singing (ex. South African gumboot dance). This suggestion is made for two reasons; the first being these activities having withstood the test of time, hence their natural popularity, gives credence to their possibly serving some developmental function. The second is because of their ecological nature. These games are social, need almost no equipment, and can be enjoyed outside. At a time when life has become increasingly individualistic, social ecological games like these offer respite from the isolation that perhaps leaves many with the feeling of being out of synch with others. Lastly, with the exception of cheerleading and jump-rope, these activities are popular with both genders and thus could offer a more attractive alternative to boys who seem to be more in need of the developmental support that these social rhythmic activities offer.

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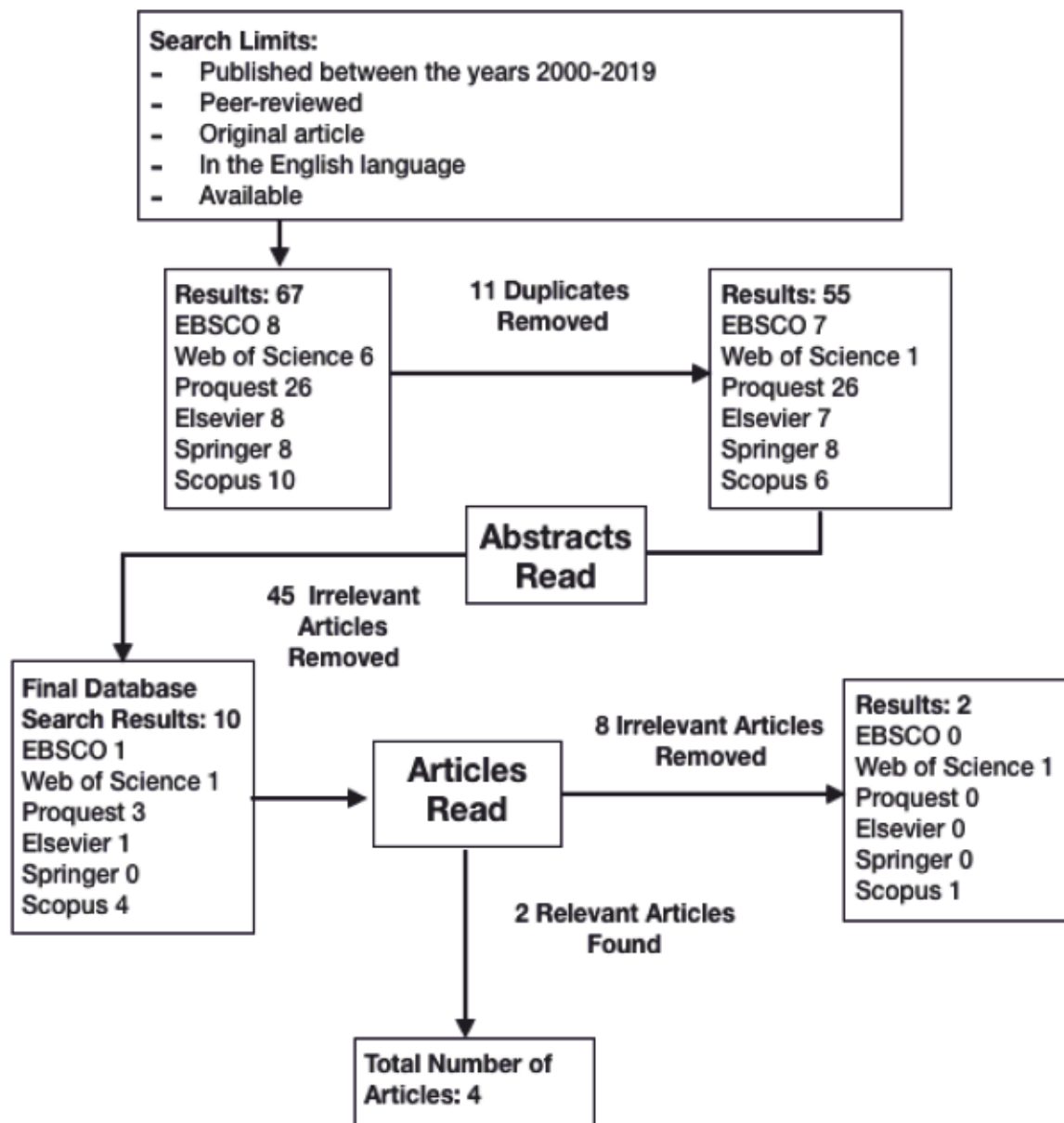
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**Attachment 1.**

<p><b>Elsevier, Web of Sci- ence, Pro- quest, EBSCO Data- bases</b></p>	<p>“hand clapping games” OR “hand clapping songs” OR “hand clapping rhymes” OR “hand clapping chants” OR “hand clapping play” OR “handclapping games” OR “handclapping songs” OR “handclapping rhymes” OR “handclapping chants” OR “handclapping play” OR “clapping games” OR “clapping songs” OR “clapping rhymes” OR “clapping chants” OR “clapping play”</p>		
<p><b>Scopus</b></p>	<p>“hand clapping games” OR “hand clapping songs” OR “hand clapping rhymes” OR “hand clapping chants” OR “hand clapping play”</p>	<p>“handclapping games” OR “handclapping songs” OR “handclapping rhymes” OR “handclapping chants” OR “handclapping play”</p>	<p>“clapping games” OR “clapping songs” OR “clapping rhymes” OR “clapping chants” OR “clapping play”</p>
<p><b>Springer</b></p>	<p>“hand AND clapping AND games” AND OR AND “hand AND clapping AND songs” AND OR AND “hand AND clapping AND rhymes” AND OR AND “hand AND clapping AND chants” AND OR AND “hand AND clapping AND play”</p>		

## Attachment 2.



### Attachment 3.

Author(s) and Year Published	Study Location	Journal	Study Design/ Approach	Data Type	Perspective	HC games as...	Target Aspect of Child Development
Brodsky, W., & Sulkin, I. (2011)	Israel	Early Child Development and Care	<i>Study 1:</i> Correlational	Quantitative	Examine	Musical Play	Motor and cognitive skills
Brodsky, W., & Sulkin, I. (2011)	Israel	Early Child Development and Care	<i>Study 2:</i> Case controlled	Quantitative	Explore	Musical Play	Motor and cognitive skills
Brodsky, W., & Sulkin, I. (2011)	Israel	Early Child Development and Care	<i>Study 3:</i> controlled trial (participant allocation method not mentioned)	Quantitative	Investigate	Musical Play	Motor and cognitive skills
Moore, M. C. (2012)	USA	The Oxford Handbook of Children's Musical Cultures	Descriptive	Qualitative	Explore	Musical Play	Culture, identity, musical features, stabilizing social issues
Casals, A., & Riera, J. (2015)	Spain	Atlantis-Critical Studies In Gender Culture & Social Justice	Qualitative	Qualitative	Explore	Play-ground Play	Identity, gender, culture, stabilizing social issues
Zachariou, A. & Whitebread, D. (2015)	Cyprus	International Journal of Educational Psychology	Descriptive	Quantitative	Explore	Musical Play	Self-regulation