Music and Language Development:

Traits of Nursery Rhymes and Their Impact on Children's Language Development

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Introduction

There are few moments in life more satisfying to a parent than experiencing his or her child's first words. It is not only a heartwarming event for the parent but also serves to establish successful cognitive development in the child. Before this milestone can be reached, however, vast amounts of external auditory stimuli are perceived and processed over several months to help a child while learning his or her first words and eventually their entire vocabulary. From birth--possibly even before birth--the amount and array of external stimuli profoundly affect a child's cognitive and linguistic development. In addition to verbal communication from parent to child, singing proves to be an integral aid to a child's development of speech and language, allegedly due to repetitions of words and rhythms. Nursery rhymes are, from infancy, among the most commonly presented forms of musical stimulus for children. The repetitive nature of the nursery rhymes undoubtedly supports language and speech development, but various characteristics of nursery rhymes, specifically pitch interval, meter, phrase length, contour, and harmony, also contribute substantially to the development of language in children; in my paper, I will analyze 21 nursery rhymes regarding these lesser-researched characteristics in an attempt to find whether or not these characteristics are consistently prevalent.

Much of the preliminary research pointed to the fact that music, *in general*, is very important to the development of children. Typically, when we think of children's music, we think of three types of music: lullabies, nursery rhymes, and folk songs. For the most part, determining which category a song falls into is straightforward, but songs such as "Home on the Range," "Rock-a-bye Baby," and "Yankee Doodle" seem to fit into multiple categories. According to the Merriam-Webster Dictionary, a lullaby is "a soothing refrain, specifically: a song to quiet children or lull them to sleep."[1] A folk song is defined as "a traditional or composed song typically characterized by stanzaic form, refrain, and simplicity of melody."[2] Lastly, a nursery rhyme is distinguished between the two because it is simply "a short rhyme [poem or song] for children that often tells a story."[3] The New Grove dictionary adds that a lullaby is a cradlesong, usually in triple rhythm,[4] and a folk song is "of unknown authorship passed orally from generation to generation, sung without acc., and often found in variants (of words and tune) in different parts of a country (or in different countries) … most of them are modal."[5] The New Grove Dictionary did not contain a definition for a nursery rhyme; perhaps this points to the lack of study in this area of music.

In an attempt to analyze musical characteristics of nursery rhymes, one must first explore brain development and how music aids this growth. It is first important to note how any type of sound wave is interpreted by the brain. Shortly thereafter, we will note the differences between the brain's interpretation of audible language versus audible music; from there we will be able to speculate concerning the effect music has on language development and which characteristics of nursery rhymes, if any, are constant.

State of Research

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[1] "Lullaby". In *Merriam-Webster.com* from <http://www.merriam-webster.com/dictionary/lullaby> (March 2, 2016).
[2] "Folk Song". In *Merriam-Webster.com* from <http://www.merriam-webster.com/dictionary/folk%20song> (March 2, 2016).
[3] "Nursery Rhyme". In *Merriam-Webster.com* from <http://www.merriam-webster.com/dictionary/nursery%20rhyme> (March 2, 2016).
[4] James Porter. "Lullaby." *Grove Music Online*. *Oxford Music Online*. Oxford University Press from <http://www.oxfordmusiconline.com/subscriber/article/grove/music/17160> (February 18, 2016).
[5] "Folk Music." *The Oxford Dictionary of Music*, 2nd ed. rev.. *Oxford Music Online*. Oxford University Press from <http://www.oxfordmusiconline.com/subscriber/article/opr/t237/e3871> (February 18, 2016).

The basis of this project is the idea that music affects the brain. In order to understand the musical aspect, we must first understand the brain during child development. This topic has been throughly researched over several decades, and all research points to the fact that children flourish when exposed to extensive amounts of stimuli during formative years.

Gary Matthews, researcher of neuron communication and professor at Center for Molecular Medicine at Stony Brook University, argues that early experiences "have a decisive impact on the architecture of the brain and the nature and extent of future capabilities."[6] This seems obvious that increased exposure leads to increased development, but the extent to which development increases is astoundingly profound. "Experiments with lab animals at the University of Illinois showed that animals in a stimulating environment developed 25% more synapses per nerve cell and 80% more blood vessels to nourish each cell."[7] Considering the amount of nerve cells in the brain, and how synapses are formed, this is an substantial improvement. Music comes in all different genres, forms, and styles; if there is one stimulus that is simultaneously novel and complex, it is music. In his 2009 book, *Music and the Young Mind: Enhancing Brain Development and Engaging Learning*, Maurice Harris mentions that fellow scientist Edwin Gordon, former Professor of Research in Music Education at Temple University in Philadelphia, argued that "a child who is not exposed to music at a young age is deprived of the optimal time for learning and development."[8]

Brain development responds so positively to extensive stimuli because of neural pathways. Also called neural networks, these neurons connect with each other to form a passage

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[6] Gary G. Matthews, *Intro to Neuroscience* (Malden, Massachusetts: Blackwell Science, 2000), 1.
[7] Maureen Harris, *Music and the Young Mind: Enhancing Brain Development and Engaging Learning* (Lanham, Maryland: Rowman & Littlefield Education, 2009), 2.
[8] Harris, *Music and the Young Mind*, 2.

of interaction. These connections created and strengthened during formative years greatly aid in the development of children, and make learning easier for the child down the line. Harris again argues, "The interconnections among brain cells are most important to further growth and development."[9] He then goes on to say that "the brain makes these [neural networks] at a very rapid pace in response to the various stimuli in the young child's environment and attests to the theory that the first few years of a child's life are crucial to his/her future learning development." [10] This brings us back to music, the great stimulus. Since music contains auditory, visual, and emotional stimuli, it is a crucial stimulus for children; the multimodal nature of music create neural networks faster and more efficiently than other stimuli. Again Harris agrees, stating, "research clearly demonstrates that the first years in a child's life constitute an extremely important time when music can stimulate the development of nerve connections among brain cells for optimal cognitive development."[11]

Colossal amounts of research can be found on the human brain--even today, millions of dollars are dedicated to brain research--but the effect of music on the brain has yet to be studied as extensively. However, there are some studies correlating specific musical attributes to cognitive improvement. Research being done on the success of children in relation to phonological proficiency alluded to the idea of music aiding the child's development. In their 2007 book, *Contemporary Perspectives on Social Learning in Early Childhood Education,* Olivia Saracho and Bernard Spodek echoed a familiar idea agreed upon by numerous researchers; although reading does teach a child to recognize word patterns and sounds, singing

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[9] Harris, *Music and the Young Mind*, 1.
[10] Harris, *Music and the Young Mind*, 1.
[11] Harris, *Music and the Young Mind*, 3.

is vastly more beneficial due to the fact that the child is actively learning.[12] From this widely hypothesized idea, the beginnings of research on musical aspects and the brain arose.

Of the research gathered on the subject, it was decided among experts that the main attributes of this phenomenon were rhythm and word repetition. Michael Thaut's 2008 book, *Rhythm, Music, and the Brain: Scientific Foundations and Clinical Applications,* was one such source that discussed in detail the importance of these characteristics in regard to children's language development.[13]

Even though some experts have argued that rhythm and word repetition are the key ingredients that make nursery rhymes helpful with language acquisition, some people argue against this notion. Juliette Alvin, music therapy expert, suggested that rhythm repetition might not be as helpful as once thought, stating, "repetitive or obsessive rhythm can be psychologically depressing."[14] Although rhythm is undoubtedly an important factor, Alvin put forth the notion that perhaps it is not the *most* important attribute of music that aids speech and language development. A fair amount of children's music is rhythmically repetitive, and yet we find that children are not psychologically depressed after countless repetitions of the song. This doesn't discredit her idea, however; it simply shows us that rhythm is not the *main* factor that makes music so beneficial to children's development--and by extension, that perhaps underlying musical attributes are as important as rhythm. Alvin supports this notion by looking outside the human gene pool, pointing out that animals "do not seem to respond to rhythm … the colour of tone and its frequency and intensity together with continuity make definite impressions [where

[12] Olivia N. Saracho and Bernard Spodek, *Contemporary Perspectives on Social Learning in Early Childhood Education* (Charlotte: Information Age Publishing, 2007).
[13] Michael Thaut, *Rhythm, Music, and the Brain: Scientific Foundations and Clinical Applications* (New York: Routledge Publishing, 2008).
[14] Juliette Alvin, *Music Therapy* (New York: Basic Books Inc, 1966), 68.

rhythm does not].”[15] Even though valid arguments have been brought up against the widely-accepted notion, supporting musical attributes--such as pitch interval, meter, phrase length, contour, and harmonic progression--have yet to be investigated in their part of this phenomenon.

Physiological Functions of the Brain

As stated earlier, in order to compare the effects of musical attributes on the brain, it is first important to understand how the brain functions, as well as how it responds to different stimuli. The auditory system is responsible for gathering and interpreting auditory stimulus; barring any impairment, this system allows us to hear, understand, and reciprocate speech and language.[16] All auditory stimuli begin the journey to the brain in the same way but are later distributed to the respective brain region that coincides with the classification of the stimulus. The main components of the auditory system are the outer, middle, and inner ear.[17] Through these vessels, the smallest sound waves are transmitted into neural codes that soon become thoughts and ideas.

Sound waves can only be interpreted if there is a receptacle to receive the stimulus. The outer ear, or the part of the ear we see with the naked eye, is built to draw sound into the ear and magnify the sound waves.[18] The concha, or the visible ear, and the ear canal, or the ear hole, are of great importance, as these body parts guide sound to the inner ear. Before sound travels to the inner ear, it first passes through the middle ear, which contains a tympanic membrane and three

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[15] Alvin, *Music Therapy*, 70.
[16] Jan Schnupp, Israel Nelkin, and Andrew King, *Auditory Neuroscience* (Cambridge: MIT Press, 2010) 1-2.
[17] Lynne Werner, Richard R. Fay, and Aurthur N. Popper, *Human Auditory Development,* in Springer Handbook of Auditory Research, vol. 42 (New York: Springer New York Publishing, 2012) 1-2.
[18] Schnupp, *Auditory Neuroscience,* 51.

small bones called the malleus, incus, and stapes.[19] Sound waves travel through the tympanic membrane to the malleus, through the incus, and finally to the stapes, until the vibration arrives at the beginning of the inner ear--specifically the oval window to the cochlea.[20] When sound waves arrive at the inner ear, they go through the spiral-shaped cochlea, wherein lies the Organ of Corti, a sensory receptacle that is responsible for turning vibrations into nerve impulses.[21] Those nerve impulses are then sent from the Organ of Corti to the auditory nerve, which sends the signals to the midbrain or cochlear nucleus, where it is then carried to other parts of the brain to be interpreted.[22] As stated before, the brain deciphers the type of auditory stimulus and then shuttles it to the correct location for interpretation; for this project, we will be looking specifically at how language and music stimulus gets interpreted.

Hearing and speaking language impact the brain differently but start their journey similarly. After the nerve impulse reaches the cochlear nucleus, it travels to the inferior colliculus, located in the midbrain, and is then transferred to the thalamus and cortex.[23] The primary auditory cortex, located in the inner middle part of the brain, is the first part of the cerebral cortex that receives auditory input.[24] The input is then transferred to the secondary auditory cortex, where, finally, a distinction is made between spoken and heard language.[25]

When a child hears someone speak, the stimulus gets transferred from secondary auditory cortex to the parietal and temporal Lobes. The parietal lobe is in charge of interpreting auditory

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[19] Schnupp, *Auditory Neuroscience,* 51.
[20] Werner, *Human Auditory Development,* 3.
[21] The Inner Ear. (n.d.). Retrieved Feb. 16, 2016, from http://www.asha.org/public/hearing/Inner-Ear/
[22] Schnupp, *Auditory Neuroscience,* 58-61.
[23] Schnupp, *Auditory Neuroscience,* 88-92.
[24] Tonya Hines, "Anatomy of the Brain" *Mayfield Clinic* <http://www.mayfieldclinic.com/PE-AnatBrain> (Feb. 22, 2016).
[25] Hines, "Anatomy of the Brain."

sensory information and interpreting language and is located in the left hemisphere of the brain.[26] The other part of the brain that becomes active is the temporal lobe, which is in charge of understanding and remembering language (interpretation and memory).[27] Therefore, a child listening to another person speak allows the child to recognize sounds, reinforce meaning, and commit them to memory. Notably, brain activity in regard to audible language is localized in the left hemisphere, as it will become of some importance later.

When someone hears another person speaking, the auditory stimulus gets transferred from the secondary auditory cortex to the frontal lobe and the angular gyrus. The frontal lobe contains the Broca's area, located in the frontal gyrus, which is in charge of speech production.[28] Although the frontal lobe is part of the right and left hemispheres of the brain, the Broca's area is generally found in the left hemisphere.[29] The second part of the brain stimulated by active speech is the angular gyrus, which lies in the midbrain and is connected to several lobes.[30] It is speculated that the angular gyrus is responsible, in some part, for speech production, although it has yet to be proven.[31] In summation, speaking and hearing spoken language generally provokes brain activity in the left hemisphere, where analytical thought, math and science, and reasoning are also located.

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[26] Hines, "Anatomy of the Brain."
[27] Hines, "Anatomy of the Brain."
[28] Kate Watkins and Tomáš Paus, "Modulation of Motor Excitability During Speech Perception: the Role of Broca's Area," *Journal of Cognitive Neuroscience* 16, no. 6 (2004): 978-87.
[29] Watkins, "Modulation of Motor Excitability," 978-87.
[30] Barry Horwitz, Judith M. Rumsey, and Brian C. Donohue, "Functional Connectivity of the Angular Gyrus in Normal Reading and Dyslexia."*Proceedings of the National Academy of Sciences* vol. 95, no. 15 (1998): 8939-44.
[31] S. Catrin Blank, Sophie K. Scott, Kevin Murphy, Elizabeth Warburton, and Richard J. S. Wise, "Speech production: Wernicke, Broca and beyond." *Brain* vol.125, no. 8 (2002): 1829-38.

Music and the Brain

Musical stimulus follows the same path from the thalamus and cortex to the primary and secondary cortices but is delegated to various parts of both the left and right hemispheres. Although research is still preliminary, Positron Emission Tomography scans (PET) and Functional Magnetic Resonance Imaging (FMRI) shows that listening to music activates almost every part of the brain in both hemispheres, unlike listening to spoken language.[32] Additionally, listening to a familiar song increases brain activity, specifically in the amygdala, which is responsible for emotional reactions, decision making, and memory.[33]

Though listening to music proves more stimulating than listening to spoken word, performing music proves even more stimulating than both. Anita Collins, a professor of Music and Arts Education at the University of Canberra and active researcher of capacity, adaption, and application of music education for early childhood, points out that the most obvious difference between "listening to and playing music is that the latter requires fine motor movement, which are controlled in both hemispheres of the brain."[34] She then elaborates, saying that the addition of fine motor functions and visual stimulation (i.e. reading sheet music) to auditory stimulation allows for even *more* brain function to occur while performing music versus idly listening.[35] Logistically, it makes sense--the more layers you add to the stimulus, the more activity in the brain. The implications of these findings are substantial and allude to the idea that actively performing music is the best way to encourage language and speech development. Once again,

[32] Oliver Sacks, *Musical Minds*, NOVA website <http://www.pbs.org/wgbh/nova/body/musical-minds.htm>l (Feb 10, 2016.)
[33] Sacks, *Musical Minds.*
[34] Anita Collins, "How Playing an Instrument Benefits Your Brain," (July 2014) TED video, 4:45 <http://ed.ted.com/lessons/how-playing-an-instrument-benefits-your-brain-anita-collins> (February 16, 2016) and Anita Collins, "About," <http://www.anitacollinsmusic.com/aboutanitacollins/> (February 16, 2016).
[35] Collins, "How Playing an Instrument Benefits Your Brain."

Collins confirms this notion by explaining the increased volume and activity of the corpus callosum, or the bridge between the two hemispheres of the brain, which allows information to be passed back and forth faster and through more neural networks.[36] Maureen Harris maintains Collin's proposal by claiming the multimodal nature of music experiences--involving auditory, visual, cognitive, emotional, and motor skills--helps the brain develop by integrating the two hemispheres of the brain, and thus plays a crucial role in the neurological development of the child.[37] Although further research is needed, these speculations nevertheless serve to prove a strong correlation between music performance and language development.

Another means of supporting the logic behind this correlation is to look at the parallels between music and language. Harris speculates that the process of language development contains four stages: listening, speaking, reading, and writing; the same is true of music learning. [38] Music is, in itself, a type of language, and thus the idea of learning music while also learning a first language is comparable to a child learning two languages at once; becoming trained in one only aids the other, and vice versa. Elena Mannes, author of *The Power of Music: Pioneering Discoveries in the New Science of Song*, supplements this idea, insisting that the relationship between music and language is "immense."[39] Richard Goldman, music critic and composer, delves further into why music and language parallel each other by stating, "Syntax is concerned with position and inflection, order and logic and relation; there is a syntax of music as there is of

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[36] Collins, "How Playing an Instrument Benefits Your Brain."
[37] Harris, *Music and the Young Mind,* 3.
[38] Harris, *Music and the Young Mind,* 4.
[39] Elena Mannes, *The Power of Music: Pioneering Discoveries in the New Science of Song* (New York: Walker Publishing Company, 2013).

language, for the same factors are involved."[40] By understanding how music and language are related, one can further hypothesize as to why music is so valuable to language development.

Characteristics of Nursery Rhymes

Now that we can solidify the effect of music performance on language and brain development, we can dig deeper into exactly what elements of music cause such effects. Juliette Alvin, music therapist and founder of the British Society for Music Therapy, proposed that the character of music and effects it provokes depend on the different elements, such as frequency, intensity, tone color, interval, and duration.[41] Children respond to music at a very early age; by 18 months, they are consistently able to grasp musical attributes such as rhythm and pitch, and by 36 months, they can reproduce whole songs, though generally not exactly on pitch.[42]

While there is no doubt that every aspect of music works synergistically to create an effective vehicle for learning, I have chosen a few musical elements that have not been studied at great lengths in regard to the effect it has on child language development. Pitch interval, meter, phrase length, contour, and harmony have each been studied as it pertains to music in general; by breaking down each element and analyzing exactly what each aspect brings to music (specifically in the 21 nursery rhymes in Appendix A in the back of this study), we can attempt to hypothesize how it effects language development.

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[40] Richard Franko Goldman, *Harmony In Western Music* (New York: W. W. Norton & Co Inc., 1965).
[41] Alvin, *Music Therapy*, 62.
[42] Ames, *The Gesell Institute's Child,* 125-27.

Pitch Interval

Music comes in all forms and genres, but one thing music must have is pitches and pitch intervals. Pitch refers to highness or lowness of sound, determined by its wave frequency and is measured in units of Hertz (Hz); for example, the A above middle C sounds at 440 Hz, and the B above that A sounds at 493.8 Hz.[43] Without pitch, we cannot differentiate music from sound. Alvin argues that pitch is an inherent part of sound, and even animals react to it.[44] On the most basic level, pitch, or frequency of sound, is essential to life; for humans, it distinguishes a mother's voice from a father's, and for animals it might distinguish friendly communication from a warning. For humans, however, pitch, in regard to music, has become synonymous with the notes on a musical scale. By age five, children have a large repertoire of songs for recognition and appreciation; although pitch originally seemed to be one of the important characteristics, it became clear that these nursery rhymes are available in several keys, and yet children still remember them no matter what key they are in.[45] Pitch interval, then, must be a main reason why children remember specific nursery rhymes, and by extension, why nursery rhymes are so beneficial to a child's development.

To describe pitch interval, we first must note that in Western diatonic scales, there are 12 notes, or semitones, that make up one whole octave. The sums of various semitones can create different pitch intervals, such as a perfect fifth (the sum of seven semitones) or a major third (the

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[43] Miguel Roig-Francoli, *Harmony in Context* (New York: McGraw-Hill, 2011).
[44] Alvin, *Music Therapy*, 62.
[45] Ames, *The Gesell Institute's Child from One to Six,* 125-27.

sum of four semitones).[46] All 21 nursery rhymes were analyzed for any commonalities of interval.

Originally, I had hypothesized that there would be a plethora of octaves, and perfect 5ths, since they are the first two intervals heard in natural harmonics. Upon analyzing, however, it became abundantly clear that the two intervals that frequented the nursery rhymes more than any other were the perfect unison (or rather a repetition of the same note that preceeded), and the major second (two semitones apart). In 21 nursery rhymes, there were 750 intervals; of the 750, 252 were perfect unisons, and 237 were major 2nds. A whopping 65% of all 21 nursery rhymes were comprised of only two intervals; certainly this suggests that there is a trend among the nursery rhymes that could suggest simplicity to reflect the young age of children, but perhaps it suggests that stepwise motion serves to help children remember nursery rhymes and by extension aids in their language development.

Surprisingly, the percentage of perfect fifths in all the nursery rhymes was only 2.1%, just 16 times out of 750, and the perfect octave was never utilized. The perfect fourth, the third harmonic, comprised 8.2% of the nursery rhymes. Although it makes sense musically to write in stepwise motion, we are also taught to utilize leaps a fair amount to create intricacies and more beautiful harmonies; for children's

More data points to another interesting fact, that not only are the kinds of intervals important, but perhaps the number of intervals--or pitches--is also relevant. Of the 21 nursery rhymes, the average number of intervals was 35 with a standard deviation of 10. Although the data is based on a small population, it's safe to assume that relatively small amounts of intervals

[46] The Oxford Dictionary of Music explains pitch interval further: "Interval." *The Oxford Dictionary of Music*, 2nd ed. rev., *Oxford Music Online*. Oxford University Press from <http://www.oxfordmusiconline.com/subscriber/article/opr/t237/e5189> (May 13, 2016).

perceived by a child *would* grant more easily memorable nursery rhymes. Though it seems almost too obvious, perhaps it is the most obvious fact--children are more likely to remember a short rhyme than a long soliloquy--that suggests an important underlying factor into why nursery rhymes and their music aid in the language development of children.

Meter

Meter, a second musical characteristic, aims to measure beats in an organized fashion. In other words, meter is the way that beats are grouped together.[47] When learning to read music, meter is one of the first things taught. How else can we begin analyzing music if we don't know where to begin or where to end? Wallace Berry, music theorist, stated that "meter is only one of numerous manifestations of groupings."[48] While that remains true, one could argue that meter is the most important manifestation of groupings, because it is the "starting point" of groupings; without meter, we would not have bar lines, nor would we know how to group notes. Berry continues, stating, "The analysis of metric structure … is the evaluation, identification, and/or interpretation of its two primary factors: pattern within the metric unit, its weak-strong components and associations and the accentual articulation of the units themselves, with consideration of their proportional interrelations."[49] Since it was stated earlier by Michael Thaut that rhythm and repetition seemed to be the driving factors in music's successful aiding of language development, it seemed natural that meter would be an under-researched characteristic that proved of great value. Again, Berry seemed to agree with this notion, arguing "The

[47] Further explanation of meter can be found in the New Grove Dictionary: "Meter." *The New Grove Dictionary of Jazz*, 2nd ed. Ed. Barry Kernfeld. *Grove Music Online.Oxford Music Online*. Oxford University Press from <http://www.oxfordmusiconline.com/subscriber/article/grove/music/J298700> (May 11, 2016).
[48] Wallace Berry, *Structural Functions in Music* (Englewood Cliffs, NJ: Prentice-Hall Inc, 1976), 303.
[49] Berry, *Structural Functions,* 318.

functions of meter … are a necessary, constant concern to which analysis should ideally proceed … and the functions of its varying qualities in shaping the expressive content as well as the structural unity and diversity of music [should be analyzed]."[50] Unfortunately, analysis did not seem to prove that a single unifying meter was a shared characteristic of these nursery rhymes.

Of the 21 nursery rhymes, 42% were in common time, or simple quadruple meter, around 10% were in simple triple meter, 19% were in simple duple meter, and around 29% were in compound duple meter. While the data suggests common time was the most common, it didn't suggest that an overwhelming majority were sharing this common characteristic. Although meter could potentially have an effect on children's language development, a universally shared meter does not seem to be the cornerstone of this phenomenon.

Phrase Length

When children sing, they often take unnecessary breaths at places professional singers would never dare (i.e., taking a breath in between a sustained word), but they also end up taking breaths at some correct locations, or ends of phrases, as well. In music, we use phrases as a way to connect musical ideas in meaningful groupings of melodic pitches and of lyrics.[51] An intriguing study by Mary Louise Serafine showed that when "subjects were told that they would hear a piece of music that could be divided into two parts … younger subjects were told that [one] doll would play the beginning of the piece … and [another] doll would play the end of the song … the subject's task was to start with his/her finger [pointed] at the first object when the

[50] Berry, *Structural Functions,* 318.
[51] The New Grove Dictionary explores musical phrase: "Phrase." *The Oxford Dictionary of Music*, 2nd ed. rev.. *Oxford Music Online*. Oxford University Press from <http://www.oxfordmusiconline.com/subscriber/article/opr/t237/e7894> (May 11, 2016).

music began and then at the second when he/she thought the second part started … all the subjects immediately performed the practice trial correctly."[52] Children's natural inclination to musical phrasing seemed to agree with the idea that it may be an important underlying musical characteristic. According to the Gesell Institute, children as young as 24 months recognize and sing phrases of songs, although "generally not on pitch."[53] Margaret Athery agrees that children have ease with identifying musical phrasing but suggests this ease comes later in life, stating that "a child just beginning school--usually ages four to five--has developed a sense of time and duration," which may aid them in identifying musical phrases.[54] Regardless of what age it begins, it's clear that the children listening to nursery rhymes are completely aware of phrasing, even though they may not know what it is or why is matters. Another thought offered into this argument suggests that the reason musical phrasing seems natural in children is because when they are first taught the songs, musical repetition suggests a natural "break" or phrase. Mary Louise Serafine states, "In Western Music, the boundaries between phrase groupings are signaled by repetitions of previous material, change in theme, rhythm, texture, dynamic level, or melodic/harmonic changes or resolutions."[55] For now, our aim isn't to figure out exactly how children attain this ability, but to see if phrase length is a shared characteristic shared among 21 nursery rhymes.

Of the 21 rhymes, 57% of the lullabies shared an average of two-bar phrases, while 29% of them shared an average of four-bar phrases. The remaining 14% were split between averages

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[52] Mary Louise Serafine, *Music as Cognition: The Development of Thought in Sound* (New York: Colombia University Press, 1988), 108.
[53] Ames, *The Gesell Institute's Child,* 125-27.
[54] Athery and Gwen Hotchkiss, *Complete Handbook of Music Games and Activities for Early Childhood* (West Nyack, NY: Parker Publishing Co. Inc., 1982), 79.
[55] Serafine, *Music as Cognition,* 76.

of one- and three-bar phrases. The data shows that even though *meter* varied greatly between even and odd amounts of beats per measure, *phrases* were generally split between an even-number of bars. I tend to agree with the idea that the repetition of melody probably has something to do with how phrase length is *perceived*, but that doesn't necessarily have any indication on how long the phrases need to be. However, the majority of the nursery rhymes are split between two- and four-bar phrases, so perhaps this indicates that phrase length is indeed a common underlying trait of music that aids in language development.

Harmony

Since all musical aspects of a song are in some way intertwined, analyzing one aspect of music will generally tie into another aspect--such was the case with pitch interval, contour, and harmony. When writing music, harmony is arguably one of the first things considered. Ernest Fowles argues that "The entire grasp of melody is derived from the stimulation of harmony."[56] So even though we may consider melody before putting a harmony underneath it, so to speak, our concept of melody comes from what we know about harmony. That being said, analyzing harmony can help understand melodic contour and pitch interval notation. Serafine supports this, saying "chords are an attempt to systemize and explain successive and simultaneous event." [57] Additionally, Elie Siegmeister continues that "harmonic motion lends to music a special momentum …. This momentum is sensed even by the untrained listener who is unaware of its cause."[58] This momentum is melodic contour, using pitch intervals to create a melody that eventually pulls back to the musical center of gravity or "tonic."

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[56] Ernest Fowles, *Ear, Eye, and Hand in Harmony Study* (London: Oxford University Press, 1928), 10.
[57] Serafine, *Music as Cognition,* 53.
[58] Elie Siegmeister, *Harmony and Melody* (Belmont, CA: Wadsworth Publishing. 1965), 10.

Before we get into contour, we should see if there are any commonalities of harmony between the nursery rhymes. Each nursery rhyme was analyzed for chord progression, and then compared to the rest of the rhymes. As one would guess, all 21 nursery rhymes' basic harmonic progression was tonic-dominant-tonic (I-V-I), and every nursery rhyme started with the tonic triad as its first chord.[59] Notably, 66.7% of the nursery rhymes' first (and second) harmonic progressions were I-V-I, 24% had the first progression I-IV-I, and the other 9.3% had a I-IV-V-I progression as its first. Again, this is unsurprising, as the tonic, dominant, and subdominant chords are the fundamental building blocks of music. What *was* surprising was the absence of any other chords (save one ii chord that served as a prolongation of the dominant chord). The overwhelming presence of the tonic, dominant, and subdominant was expected, but there are many opportunities for "complex" progressions (I-V-I-vi-ii-V-I) to be fitted within the confines of these very short rhymes. Perhaps the correlation between the frequency of unisons and major seconds and this repetitive "stunted" harmonic progression suggests that children can focus on language more when they have a repetitive, and naturally comprehendible harmony in the background.

Contour

Oftentimes I've heard people praise Whitney Houston's music, because in several of her songs, there is a melodic buildup that leads to one epic moment. While I think her undeniable talent definitely has something to do with it, I also think a lot of her songs have dramatically flourishing and emotionally moving melodic contour--put simply, the risings and fallings of the

[59] To explain the terms tonic, dominant, and subdominant, please consult: Andrew Surmani, *Alfred's Essentials of Music Theory: A Complete Self-Study Course for All Musicians* (Van Nuys, CA: Alfred Publishing Co., 2004).

melody help make songs enjoyable. When dealing with children's songs, melodic contour tends to be overlooked, because you can't get significant contour in a 12-bar song. However, if intervals between notes might be important, then the motion of the intervals probably holds importance as well.

Craig Russell defines melodic motion as "the general shape of melody, indicating its risings and fallings, rather like an imagines map of the tune, its rise of steps or leaps, and sense of emphasis or arrival at certain destination points."[60] By assessing the most commonly shared intervals, we've already established that in these nursery rhymes, we are mostly dealing with stepwise, conjunct motion. What I hoped to find was a recurring pattern of stepwise motion within the 21 nursery rhymes. Nye supports this hypothesis by stating, "tonal movement and direction are important concepts of melodic organization that should be emphasized in early musical experiences."[61] To analyze this motion, I essentially put melodic motion into 4 generalized categories based on phrasing: ascending, descending, arch (meaning the melody started and ended in the same place but first ascended and then descended), and inverted-arch (meaning the melody started and ended in the same place but first descended and then ascended).

While the overall contour of the nursery rhymes varied greatly, the initial and ending melodic contours appeared to share some common characteristics. Remarkably, 57% of the nursery rhymes began their first whole phrase with some form of arch, either regular or inverted; however, 66.6%, exactly two thirds of the sample, ended with a descending phrase. Descending step by step from the fifth to the tonic seems reasonable enough, as it strongly reinforces the tonic triad while reaching an aurally satisfying conclusion; this strong and stable conclusion

[60] Craig Russell, discussion with Ashley Gonzalez, May 15, 2016.
[61] Nye, *Basic Music: Functional Musicianship for the Non-Music Major* (Englewood Cliffs, NJ: Prentice-Hall Inc., 1973), 7.

might contribute to why these songs stay resonate so profoundly with children and aid in language development. Additionally, having an opening melody that essentially surrounds the tonic note by either ascending and then descending back, or vice versa, also seems like a reasonable way to start a nursery rhyme.

The reinforcement of the tonic at both the beginning and end of nursery rhymes--and music in general--may provide children with a base on which to grow their musical and language repertoire. Though the rules of music notation strive for a strong pull to the tonic, perhaps this pull is another main contributor to why nursery rhymes are so beneficial for language development.

Conclusion

There is no doubt: music has a profound effect on the mind and can increase neural networks to promote brain growth. This is also the case for young children and their nursery rhymes; there are many aspects that make up a song, and all these aspects help create memorable music that stays with them throughout adulthood. Of these aspects, only two have been studied at great length--rhythm and repetition of words. By analyzing 21 nursery rhymes, I have determined that pitch interval, melodic contour, phrasing, and harmony all seemed to contain similarities that suggest that indeed these characteristics have potential to be more pertinent to children's language development than just rhythm and word repetition alone.

It is clear that 21 nursery rhymes cannot represent the hundreds of nursery rhymes in the world, but it does offer a glimpse into the possible shared characteristics. More research is warranted to find out if these characteristics are truly representative of the whole population of nursery rhymes, and if so, further research will be needed to help us find the reason *why* and *how* these characteristics affect the child's brain.

<u>Appendix A: List of Nursery Rhymes Consulted</u>

List of 21 Nursery Rhymes:

Baa Baa Black Sheep; Bingo; Frere Jacques; Hey Diddle, Diddle; Hickory Dickory Dock; Hush, Little Baby; I'm a Little Teapot; It's Raining, It's Pouring; The Itsy Bitsy Spider; Little Miss Muffett; London Bridge is Falling Down; Mary Had a Little Lamb, Do You Know the Muffin Man?; Old MacDonald; On Top of Old Smokey; Pop! Goes the Weasel; Rain, Rain, Go Away; Row, Row, Row Your Boat; This Old Man; Three Blind Mice; and The Wheels on the Bus.

All Nursery Rhymes Can Be Found in the Following Collections:

Nursery Rhymes (Milwaukee: Hal Leonard Corporation, 1999).

Big Book of Nursery Rhymes and Children's Songs (Milwaukee: Hal Leonard Corporation and Music Sales, 2004).

Stephen Ducke, *30 Nursery Rhymes with Sheet Music and Fingering for Tin Whistle* (CreateSpace Independent Publishing Platform, 2014), vol. 2.

Appendix B: Diagram of the Nursery Rhymes Characteristics

	PITCH INTERVALS	METER	PHRASE LENGTH	CONTOUR	HARMONY
Baa Baa	U (30) m2 (4) M2 (15) m3 (0) M3 (0) P4 (1) P5 (3) M6 (0) M7 (0) P8 (0)	common	avg 2	arch, descend, arch	I-IV-I-IV-I-V-I-IV-I-V-I-IV-I-V-I-IV-I-IV-I-V-I
Bingo	U (16) m2 (3) M2 (9) m3 (1) M3 (4) P4 (3) P5 (0) M6 (0) M7 (0) P8 (0)	common	avg 2	low arch, arch, leap and descend, low arch	I-IV-I-IV-V-I-IV-V-I-VI-II-V-I
Frere Jacques	U (4) m2 (4) M2 (12) m3 (1) M3 (5) P4 (4) P5 (1) M6 (0) M7 (0) P8 (0)	common	avg 1	small arch, rpt, ascend, rpt, descend, low arch	I-V-I-V-I-V-I-V-I-V-I-V-I-V-I-V-I-V-I
Hey Diddle	U (14) m2 (4) M2 (13) m3 (1) M3 (1) P4 (2) P5 (0) M6 (1) M7 (0) P8 (0)	six eight	avg 4	unisons, ascend, (leaps between)	I-V-I-V-IV-I-V-I
Hickory Dickory	U (7) m2 (3) M2 (13) m3 (3) M3 (3) P4 (0) P5 (0) M6 (0) M7 (0) P8 (0)	triple	avg 3	arch, arch, ascend, descend	I-V-I-V-I-IV-I-V-I
Hush Lil babe	U (16) m2 (4) M2 (8) m3 (0) M3 (0) P4 (1) P5 (4) M6 (2) M7 (0) P8 (0)	common	avg 2	leap, arch, leap, arch	I-V-I-V-I

I'm a Lil Teapot	U (7) m2 (4) M2 (13) m3 (5) M3 (0) P4 (5) P5 (0) M6 (0) M7 (0) P8 (0)	duple	avg 2	arch, arch	I-IV-I-V-I-V-I-IV-I-IV-I-V-I-V-I
It's Raining	U (11) m2 (1) M2 (4) m3 (10) M3 (1) P4 (3) P5 (0) M6 (0) M7 (0) P8 (0)	triple	avg 2	low arch, rpt, low leap,rpt, descend	I-V-I
Itsy Bitsy	U (13) m2 (3) M2 (21) m3 (1) M3 (5) P4 (3) P5 (0) M6 (0) M7 (0) P8 (0)	six eight	avg 4	arch, leap, arch, leap, arch...	I-V-I-V-I-V-I-V-I
Little Ms Muffett	U (7) m2 (9) M2 (10) m3 (5) M3 (2) P4 (2) P5 (0) M6 (0) M7 (0) P8 (0)	six eight	avg 2	LNT, leap, rpt 5, descend	I-V-I-IV-I-V-I-V-I-IV-I-V-I
London Bridge	U (1) m2 (7) M2 (10) m3 (1) M3 (1) P4 (3) P5 (0) M6 (0) M7 (0) P8 (0)	common	avg 2	low arch, ascend, rpt, low arch, descend	I-V-I-V-I
Mary lil Lamb	U (18) m2 (0) M2 (31) m3 (4) M3 (0) P4 (0) P5 (0) M6 (0) M7 (0) P8 (0)	common	avg 2	low arch, ascend, low arch, descend (rpt)	I-V-I-V-I-V-I-V-I
Muffin Man	U (12) m2 (2) M2 (7) m3 (0) M3 (3) P4 (4) P5 (1) M6 (0) M7 (0) P8 (0)	common	avg 4	arch, low arch, descend, arch, descend.	I-IV-V-I-IV-V-I
Old MacDonald	U (34) m2 (0) M2 (12) m3 (0) M3 (0) P4 (9) P5 (0) M6 (3) M7 (0) P8 (0)	common	avg 2	leap down, descend, rpt, unison, leap down, descend.	I-IV-I-V-I-IV-I-V-I-IV-I-V-I

On Top of Smokey	U (8) m2 (4) M2 (12) m3 (6) M3 (6) P4 (4) P5 (2) M6 (0) M7 (0) P8 (0)	six eight	avg 3	ascend, arch, ascend, descend.	I-IV-I-V-I-IV-I-V-I-IV-I
Pop Goes Weas	U (6) m2 (1) M2 (6) m3 (5) M3 (4) P4 (4) P5 (1) M6 (2) M7 (0) P8 (0)	six eight	avg 4	arch, rpt 3, descend	I-V-I-V-I-V-I-IV-V-I
Rain Rain Go	U (7) m2 (2) M2 (4) m3 (9) M3 (1) P4 (2) P5 (0) M6 (0) M7 (0) P8 (0)	common	avg 2	alt btwn 2 notes, rpt one step lwr, descend.	I-V-I
Row Row Row	U (12) m2 (2) M2 (7) m3 (1) M3 (1) P4 (2) P5 (1) M6 (0) M7 (0) P8 (0)	duple	avg 4	ascend, descend	I-V-I
This Old Man	U (7) m2 (6) M2 (11) m3 (5) M3 (0) P4 (1) P5 (1) M6 (0) M7 (0) P8 (0)	duple	avg 2	alt btwn 2 notes, descend, ascend, descend.	I-IV-V-I-V-I-V-I
3 Blind Mice	U (13) m2 (9) M2 (15) m3 (2) M3 (1) P4 (6) P5 (1) M6 (0) M7 (0) P8 (0)	six eight	avg 2	descend, rpt 4, low arch, rpt 4, descend.	I-V-I-V-I-V-I-V-I-V-I-V-I...
Wheels on Bus	U (9) m2 (0) M2 (4) m3 (5) M3 (4) P4 (3) P5 (1) M6 (0) M7 (0) P8 (0)	duple	avg 4	arch, descend, arch, decend.	I-V-I-V-I

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