

## **Nuryl White Paper**

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There is no argument that musical training leads to enhancements in cognitive function. But what about the effect of listening to music? Can music be used as a tool to enhance cognitive development? At Nuryl, we believe so. And there is a growing body of scientific research to reinforce this premise.

Nuryl has integrated principles of infant learning identified from decades of research in cognitive development into a music training curriculum designed to boost cognitive development in babies. So, what are these principles, why are they important, and how have these been incorporated into Nuryl's unique curriculum?

### **Principle 1: The music matters**

A baby, still nestled in the womb, can easily learn from the outside world just by listening in. Memories of songs heard in the womb can persist long after birth. And while babies are certainly learning the pitch and timbre of these sounds, the bigger question becomes how can babies learn more from the music than just the music itself?

To learn from music, the musical experience must exhibit cross-domain transfer i.e. the affect must be carried over to neural circuitry outside of the brain's so-called musical domain. In studies assessing cognitive gains from musical exposure, researchers are often careful to provide a complex, shifting, and surprising context believed to aid the learning process. For example, in a study where infants were exposed to songs in triple meter (notoriously difficult for little ones) in varying tempos interspersed with vocals, they show enhancements in recognizing variations to not only the music but also to speech. The babies not only learned the musical pieces, but they learned from them too. And they transferred this knowledge to other tasks, such as language processing.



Nuryl has designed a unique curriculum that utilizes High Information Music™. High Information Music is tonally rich with highly complex harmonies that move rapidly into unexpected places by incorporating unusual melodic structures. High Information Music uses thousands of combinations of complex intervals, harmonies, and motifs aimed to simultaneously stimulate multiple regions of the brain. Much of the music contained in the Nuryl curriculum is proprietary and is not available anywhere else.

## Principle 2: Babies need to be engaged in the process

Another critical, and often overlooked, element in infant learning is the need for social interaction. Purposeful engagement is paramount to learning. When a stimulus lacks meaning, babies, much like adults, are likely to ignore it.

Passive exposure to music may create memory traces and passing familiarity with the tune, but if music is to be used as a tool to stimulate other (non-musical) regions of the brain, the baby needs to be actively involved in the process. Indeed, researchers have shown that when music is present during play babies only learn when they are actively engaged with the music; listening passively to music in the background during unrelated play has no effect [3].

With this in mind, Nuryl guides caregivers on how to help their children interact with the music in a meaningful way. Seemingly simple actions, such as bouncing a baby and helping them tap out the beat have profound effects on a baby's learning. It is the caregivers' way of ascribing importance to the music, and a baby will take note. In order to guide parents to provide the recommended level of listening and interaction, Nuryl also tracks cumulative play hours each month and can even send reminders when the level of interaction falls below optimal levels.

## Principle 3: There is a critical time when experience-based learning is at its peak

A final element is timing. Timing is everything, right?

Sensory organs begin to take shape early on – at 7 weeks a tiny nose protrudes outwards and by 8 weeks little ears begin to form. As these organs develop they become increasingly sensitive and sensory-based learning can occur months before birth. In the first year of life, as babies begin to physically interact with their world, they will pass through distinct, sequential developmental windows focused on different types of sensory inputs. And the quality and richness of these inputs (experiences) are directly correlated to cognitive, social, and emotional development.

With respect to hearing, one of the most important a sounds a baby must master is the phonemes of their own language. At only 8 months of age, babies give their attention to learning language. And the richness of their experience with language will dictate what they learn. Babies, though born into a world with a decided preference of the sounds of their native tongue, can actually learn any language they are presented with during this critical time provided they are socially and actively engaged with the speaker [4]. Such studies highlight the importance of context and engagement on learning during this time of amazing plasticity.

At Nuryl, we specifically target a time of heightened brain plasticity, from 16 weeks prenatal to two years of age. During this time, music is used to shape the brain, and to lay down an extensive framework of lasting neural connections. At only three years of age, the brain begins to rapidly lose understimulated connections through the process of synaptic pruning. But those circuits that are engaged through repeated stimulation remain active, creating the framework. And the bigger the framework is, the easier it is to add new information. This is the central principle to plasticity – learning obtained from each new experience is based on learning from the previous experience. By targeting this developmental timeframe, Nuryl's innovative solution seeks to enrich and enhance the formation of this neural framework.

## Understanding our curriculum

Far transfer is a neuroscientific theory explaining how cross-domain learning occurs. In other words, capability or learning in one area can facilitate learning in seemingly unrelated areas. The idea behind Nuryl, simply put, is to promote far transfer effects in the brain, whereby purposeful engagement with music can provide a strong framework for learning new, seemingly unrelated, higher-order skills.

The brain is arguably the most complex and amazing organ. From humble beginnings, a narrow hollow tube emanating from a 16 day old ball of new life, it quickly takes shape. At birth, the brain contains billions of neurons capable of making trillions of new connections. At Nuryl, we know that a baby's sensory environment will become one of their greatest teachers. Thus, our mission is to enrich this environment by providing a unique curriculum, with principles affirmed in the scientific literature, to enhance learning while simultaneously engaging multiple brain regions to enrich neural circuitry during a time of heighten brain plasticity.

Nuryl: "Smart Music. Smart Baby."

Get Started with Nuryl Today!

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