"Peek-a-boo!": determining the latency to laughter in the case of three different jokes within infants aged six to eighteen months

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Abstract

Laughter is universally experienced by humans, and infants usually begin exhibiting this behavior at three months. By understanding laughter, we can strengthen the important relationship between a parent and their child. Because of this importance, scientists have investigated infant humor perception based on parental affect, social referencing, etc. Thus far, infant response time to a joke, or the latency period, has not been explored. Strengthening our understanding of the latency period allows us to predict what factors may lead to laughter the quickest. This study is one of the first of its kind to investigate whether the latency period varies depending on age and joke type. Parental perception of their child's laughter responses was also investigated. The current work focused on three joke types: absurd (Not-A-Hat), conceptual (Peek-a-boo), and uncategorized (Tearing Paper). Participants were aged 6-18 months. It was found that the conceptual joke (Peek a-boo) had a significantly shorter latency time than the other joke types ($\bar{x}$ = 1.46s, p<0.001). In addition, infants aged 12-18 months obtained a longer latency time than those aged 6-12 months ($\bar{x}$ = 1.91s, p>0.05), although the difference was not significant. This study can help scientists predict patterns about what infants are more likely to laugh at, and help parents determine the quickest way to elicit laughter at different developmental stages. As laughter is one of the first forms of vocal communication, this study is vital for parents, so they can better nurture a secure attachment to their child.

Keywords: infant laughter, latency, attachment

Introduction

Watching a tiny baby giggle is one of the most keenly anticipated and cherished moments of parenthood. Laughter is a universal phenomenon experienced by humans (Engelthaler & Hills, 2017). This joyful action starts to occur in infancy at approximately three to four months of age (Caron, 2002; Foss, 1967). In comparison, smiles start at around six weeks and speaking begins at the end of the first year (Caron, 2002; Kraut & Johnston, 1979; Provine & Fisher, 1989). There is an abundance of ways to elicit laughter in a baby, and different jokes and techniques vary. To date, scientists are yet to fully understand why laughter emerges in the first place, but as we continue testing theories, we become closer to finding an answer.

Laughter is a vital part of our lives, starting at a very young age and lasting throughout our lifetime. Not only does laughter increase health in

people, it also leads to higher self-esteem, it mitigates stress, and it is linked to greater enjoyment of positive experiences (Cann & Collette, 2014; Galloway & Cropley, 1999; Martin et al., 1993; Mora-Ripoll, 2011).

Studies have already explored plenty of other factors that play a role in eliciting infant laughter, such as temperament, parental affect, and more. This study will further investigate the latency period to determine what impact it has on laughter during infancy. Specifically, we will investigate two cohorts of infants: younger (6-12 months) and older (12-18 months). This experiment will be done to study how latency to laughter develops during the critical first year and a half of a child's life.

Review of Literature

Infancy is a critical time for the development of secure attachment, which is facilitated by emotionally synchronous interactions with parents (Mireault et al., 2012). If the parent/guardian does not make an effort to bond, this may lead to an insecure attachment, which can cause many long-term poor mental health outcomes such as depression (Muris, Mayer, & Meesters, 2000). On the other hand, secure attachment has been related to positive outcomes including emotional regulation (Berlin & Cassidy, 2003), prosocial behavior (Markiewicz, Doyle, & Brendgen, 2001), and achievement (Cutrona, Cole, Colangelo, Assouline, & Russell, 1994), among others. Laughter helps to facilitate a secure attachment, which gives insight on how to best solicit a secure attachment, as it is one of the earliest sources of feedback from a baby.

Important Developmental Milestones

It has been established that five-month-olds are capable of independent humor appraisal. The developmental point at which infants rely on parental expressions and body language for laughter cues must occur at or before six months of age (Mireault et al., 2017). Knowing this, the current study's participants were chosen accordingly based on the fact that infants are independently able to laugh at the joke at hand.

Latency

Although much research has already been conducted on the science of laughter, a latency period has yet to be properly investigated. Latency can be described as the elapsed time between the start of the joke and the first instance of a response of laughter. One of the few studies that looks into the latency time period is by Mireault et al., (2015); however, this aspect of latency was not the main focal point. To date, this latency period has not been tested further, resulting in a dearth of literature. This current study aims to address this gap in the literature by investigating the latency to laughter within a larger age range, as well as different joke types.

Joke Categories

Specifically, this study will utilize parental joking. The first joke type is an absurd joke, or an event that is performed or happens in some way out of the ordinary, such as pretending, breaks social conventions. Next, a conceptual joke is one that requires an aspect of comprehending something as funny, for example, Peek-a-boo. For an infant to laugh, there has to be some type of understanding or, in some cases, a misunderstanding. Peek-a-boo requires the use of object permanence, or knowing that an object still exists, even if it is hidden (Moore & Meltzoff, 1999). Prior to the development of object permanence, which usually occurs around 5 months, infants may find the joke both slightly frightening and humorous. Because Peek-a-boo is a joke that has been named the universal way to make a baby laugh (MacDonald, 1993), it has been hypothesized that this joke will yield the greatest number of laughs. The final joke was Tearing Paper. Although it appears as though it should not elicit laughter, there is mounting evidence through videos seen on the Internet. It was ultimately included to gain more understanding about the joke as a whole. The reason these three jokes were chosen was to have the most variability of stimuli for laughter.

Ultimately, as we continue to further our understanding of latency, we are simultaneously helping parents/guardians create and nurture a more effective bond with their child. It is evident

that avoiding insecure attachment is a priority and developing a secure relationship is imperative. Overall, the goal of this study was to determine if the latency time period is impacted by age and/or joke type. Utilizing archival data from video footage collected for a previous study, this study analyzes trials of infants comparing two developmental cohorts reacting to three types of jokes. Additionally, this study may help explain how laughter plays a role in leading to more successful attachment between an infant and parent/guardian.

Objectives

1. Determine the frequency of trials that elicit laughter for each joke type
2. Measure latency time for each joke type and determine which type elicits the longest latency time in younger cohort (6-12 months)
3. Measure latency time for each joke type and determine which type elicits the longest latency time in older cohort (12-18 months)
4. Compare latency time for younger and older cohorts for each joke type

Hypotheses

H_1: As the age of the participant increases, there will be an indirect relationship to latency time.
H_2: Peek-a-boo will not have a significantly least amount of latency time.

Methodology

It should be noted the data used for this study was gathered from an ongoing study conducted by Dr. Caspar Addyman and his colleagues. Their original study was developed for a BBC documentary called Babies: Their Wonderful World. That overarching study included a wider range of infant ages and tested five different jokes. The goal was to explore which joke elicited laughter most often at specific ages, as well as how repetition of the same joke impacted length and frequency of infant laughter. This current study was not located in a lab, and all videos were collected from participants' homes using LookIT MIT software. Caregivers performed all of the jokes. There was no exploration of latency time to laughter in the original research, but I was able to collect data on this aspect of the parent-infant interactions from the data set.

My Role in the Study

After I initially learned about this niche field of infant laughter, I read 28 journal articles and college textbooks to familiarize myself with the topic. As I began to identify the researchers in this field, I independently reached out to Dr. Caspar Addyman from the University of Goldsmiths in London, UK. We began to plan for a study in summer 2020. To prepare for this, I collected my notes and pitched three ideas to my mentor about exploring social laughter in infancy. Unfortunately, the coronavirus pandemic necessitated that I change my initial research idea due to travel restrictions. My mentor and I communicated weekly through Skype discussing analyzing archival data. For the study itself, I was tasked with navigating a video coding program titled DataVyu, as well as run statistics on Excel and the statistical analysis program, Jamovi. Using DataVyu, I independently coded all of the videos that resulted in laughter and placed their latency time into the corresponding cell on the Excel spreadsheet. I eventually drew all of my own conclusions, which were confirmed by my mentor.

Participants

The original study was open to the public, and anyone could participate if their child was within their accepted age. My mentor and I decided to only analyze data on infants ranging from 6-18 months. Participants were split up into two distinct groups: one ranging from 6-12 months and the other 12-18 months.

Procedure

All of the videos were recorded auditory and visually. There were three trials per joke and three jokes per participant, totaling for a maximum of nine videos per participant. Parents were given directions on how to conduct the trials. For the *uncategorized* joke, the parent/guardian would stay quiet and tear a piece of paper. The *absurd* joke would begin with the parent/guardian placing any object besides an actual hat, usually a bottle, on their head and saying, "Look at my new hat!". Lastly, for the *conceptual* joke the parent would

cover their face with both of their hands and then uncover their face, simultaneously exclaiming "Peek-a-boo!".

Data Collection for this Study

Because laughter can be characterized and interpreted differently, a second coder was utilized; I functioned as the first. Latency time was measured if there was a distinctive pattern of vocalization that is instantly recognizable as laughter (Sroufe & Waters, 1976). After the proper video was located, it would be watched and recorded appropriately in the correct grid space. If laughter was not present, 'NL' would be marked for no laughter. If laughter was present, the latency period would be noted in seconds to the thousandths place. The corresponding video was uploaded to DataVyu and from there, onset value, (the time the ended) and offset value (the first instance of laughter) was calculated and entered into the spreadsheet.

Statistical Analysis

Preliminary statistical analyses were conducted using Excel. Statistical tests ran on Excel were averages of latency times, parental opinion, and chi-square analysis tests. After the first phase of analysis was completed on Excel, Jamovi was utilized in order to run an ANOVA and subsequent *post-hoc* tests. Alpha was set at 0.05.

Results

Parental Opinion

Notably, upon analyzing the data, we found discrepancies between what the infant's parents and the experimenters believed a laugh was. For the *conceptual* joke, each of the infants' parents believed their infant laughed 1.5 more times than the experimenter for the younger cohort and 2.85 more times the older cohort. For the *absurd* joke, all of the parents were 1.55 times more likely to think there was laughter than the experimenter for 6–12-month infants and 1.5 times for 12-18 months. Lastly, comparing the parents and experimenters' belief of laughter elicited during the *uncategorized* joke, parents were 2.21 times more likely to think there was laughter for 6–12-month-olds and 1.4 times more likely when comparing 12–18-month-olds. We did not analyze whether there was a significant difference between the counts for parents and coder.
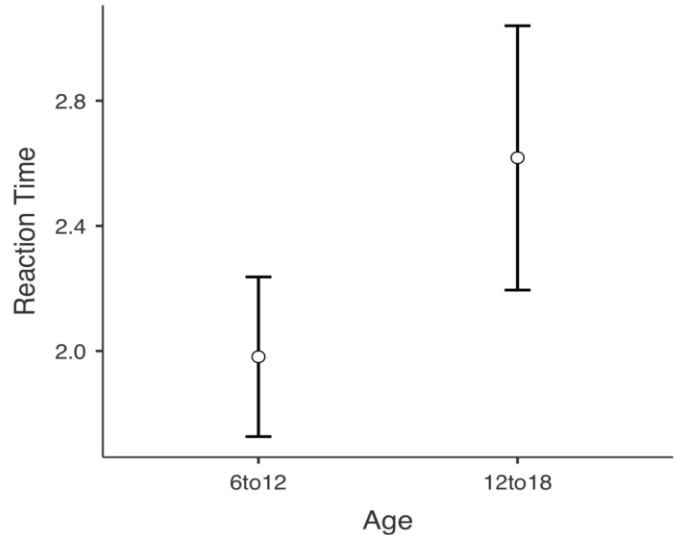

FIGURE 1. Comparing both age groups by reaction time.

Conceptual Joke Elicits Significantly More Incidences of Laughter Across All Ages

Peek-a-boo was the joke with the greatest number of trials with laughter present, with the experimenter reporting 51 trials resulting in laughter. Additionally, chi-square analysis found there was no statistical difference when comparing infants observed laughs vs expected laughs (p=0.080, p>0.05) throughout this joke. The *absurd* joke was the joke that had the second greatest number of trials resulting in laughter. For this joke, the experimenter recorded 34 instances of laughter. Also, when comparing expected laughter vs. observed laughter, the chi-square analysis tests showed no statistical significance, p=0.082. The *uncategorized* joke yielded the smallest number of trials that resulted in laughter, a mere 19 trials reported by the experimenter. Additionally, as seen in Figure 2 (overleaf), the *uncategorized* joke had the greatest difference of reaction times for the two age groups, most likely due to the small size of the participant group.

TABLE 1a. Post-hoc comparisons by age.

Comparison						
Age	Age	Mean Difference	SE	df	t	p_{tukey}
6to12 -	12to18	-0.636	0.249	88.0	-2.56	0.012

Latency Time per Age

When comparing the age groups to latency time, the t-test revealed statistical insignificance, however, the P_{tukey} test did hold statistical significance, p=0.012 (Table 1a). Surprisingly, there were longer latency times recorded for the older age group overall (Figure 1, overleaf). This is most likely due to the fact that there were very minimal trials with laughter present in the twelve-to-eighteen age group. When comparing the two age groups during the *post-hoc* tests, the P_{tukey} test revealed a significant difference between the age groups and their corresponding average latency reaction time (Table 1a). For the future, although we had many participants and had many videos to view, it may be worthwhile to look further into age groups as many of the older infants tested did not laugh; a much greater sample would help detect more accurate results.

Latency Time per Joke Type

Conceptual joke. The *conceptual* joke elicited the shortest latency time ($\bar{x}$= 1.8 sec.). Additionally, during the *post-hoc* test comparing the *conceptual* joke to the *absurd* joke, the t-test value does not remain statistically significant (t=-3.715), however, the P_{tukey} test is significant (P_{tukey}=0.001) and would reveal that the *conceptual* joke resulted in the least amount of latency time (Table 1b).

Absurd joke. Compared to Peek-a-boo, the *absurd* joke yielded an average latency time of 2.66 sec, which was the longest time out of the three jokes tested. Chi-square analysis tests for probability of laughter showed no statistical significance, p=0.082.

Uncategorized joke. Tearing Paper had an average latency time of 2.25 seconds, and the average time per trial ranged 1.49s. (Figure 1, overleaf), which was the largest out of the three jokes tested. After completing a chi-square

analysis test comparing the infants who laughed and those who did not, the statistical significance held true at p=0.011, different to the *absurd* and *conceptual* jokes. However, because this joke had fewer trials that resulted in laughter, this test should be repeated with a greater number of participants and trials that include laughter.

TABLE 1b. Post-hoc comparisons by joke type.

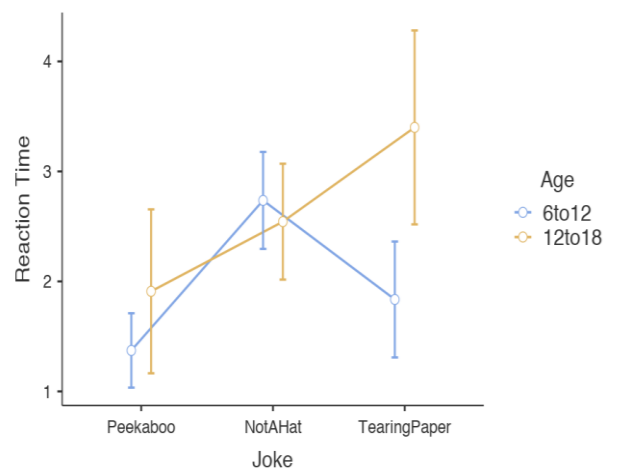| Comparison						
Joke	Joke	Mean Difference	SE	df	t	p_{tukey}
Peakaboo -	NotAHat	-0.9988	0.269	88.0	-3.7159	0.001
-	TearingPaper	-0.9768	0.330	88.0	-2.9567	0.011
NotAHat -	TearingPaper	0.0220	0.311	88.0	0.0707	0.997

FIGURE 2. This figure simultaneously compares both variables, Joke Type and Age, to reaction time. Error bars represent 95% confidence intervals.

Latency Time per Joke/Age

To begin, an ANOVA was run to test the statistical significance between joke type and age. There was a significant effect of laughter on joke type recorded at the p<0.05 level [F(2, 88) = 7.81, p < 0.001], as well as a significant effect of age on laughter at the p<0.05 level [F(1, 88) = 6.55, p = 0.012] (Table 2, overleaf). Interestingly, statistical differences were found to all result in statistical significance, and because of this, *post-hoc* tests

were run in order to confirm where the differences occurred between groups.

Table 2. ANOVA results comparing the latency time periods for both Joke Type and Age.

	Sum of Squares	df	Mean Square	F	p
Joke	15.37	2	7.686	7.81	< .001
Age	6.45	1	6.446	6.55	0.012
Joke * Age	8.00	2	4.000	4.07	0.020
Residuals	86.59	88	0.984		

Discussion

Parental Opinion

Results show an inconsistency between what the parents and the experiments believed counted as a laugh. This inconsistent appraisal of laughter was not expected as has rarely been reported in previous studies utilizing parents assessing laughter (Mireault et al., 2012). The most logical reasons for this phenomenon are parents may be more likely to show bias and be more optimistic about their child's laughter. Additionally, they are more experienced in the nuances of their child's expressions and verbalizations. This bias is an interesting notion, as the parents/guardians were directed to be impartial. Nonetheless, we ultimately included these data in order to lead to a possible further exploration of parental bias.

Laughter Counts by Age

The number of trials that were filled with the sound of laughter were shown to decrease with age, which is the opposite of what was predicted in the first working hypothesis. As age increased, it was expected that there would be more instances of laughter, as infants would be older and have more experiences leading to laughter (Figure 1).

Laughter Counts by Joke Type

It was predicted that Peek-a-boo would have the greatest number of trials resulting in laughter, as it is a joke that is used over many cultures and for many ages (MacDonald, 1993). The absurd joke yielded the second greatest number of trials resulting in laughter, which makes sense because this joke was definitely performed

in a humorous context, as it breaks social conventions. However, the uncategorized may not have been performed in a humorous context, which would lead to the probability of decrease in number of laughs. A difficulty within this present study has been a dearth of trials in which laughter ensues for the *uncategorized* joke. This joke should be further investigated, potentially highlighting a larger age range. As a result of the minimal number of trials with laughter present, the average latency times were scattered compared to the other two jokes, especially for the twelve-to-eighteen-month-old infants.

Latency Time per Joke Type

As predicted, Peek-a-boo resulted in both the greatest number of trials to elicit laughter as well as the shortest average latency to laughter time period. As a result, the null hypothesis regarding Peek-a-boo can be rejected. Looking in a forward direction, an investigation should ensue exploring the idea that prior exposure to a joke may influence results. For the absurd joke, although not tested in the present study, determining whether the length of this joke was statistically longer than the other two should be further investigated. In addition, the *absurd* joke is namely the joke with the most similar reaction time for both age groups (Figure 2, overleaf). Lastly, for the *uncategorized* joke, this joke may not have been performed in a humorous context. With this in mind, because it has been noted that the affective cues of others influence five- to seven-month-old infants to find absurd events significantly more amusing (Mireault et al., 2015), an investigation should further explore this joke in a humorous context. In addition, this joke should be explored developmentally to determine if this joke becomes funnier as age increases.

Attachment

Laughter has a strong immediate effect on the infant's social relationships (Mireault et al., 2018), the development of secure attachment, and humor development, which includes shared laughter and joint attention to an event. This emerges concurrently with attachment (Mireault et al., 2012). With more knowledge and insight into the latency period, there is an important

opportunity for parents/guardians to capitalize on. An aspect of this current study that was not analyzed was which joke led the infant to the best laughter. With the combination of understanding trends of what joke will elicit laughter quickest and funniest will help parents immensely with their task of connection and providing a supportive attachment system.

Conclusion

Overall, this study explored and determined whether there was an impact of age and joke type on a latency to laughter time period. After analyzing the data, we were able to reject the null hypothesis, stating that as the age of the participant increases, the latency time will increase. We found that infants aged 12-18 months were shown to have a longer latency time than those aged 6-12 months, although the difference was significant. Additionally, the data reject the second null hypothesis, stating the *conceptual* joke does not present with the least amount of latency time. We found that the *conceptual* joke had a significantly shorter latency time than the other joke types. Although not all values resulted in statistical significance, there is still a great deal to be gleaned from the gathered data.

Furthermore, there is a lack of studies investigating latency periods. This current study aimed to fill this gap by having its primary focus be the latency period. A limitation for this study was that there were several participants who did not laugh in many trials. With this in mind, a future study should be conducted with a larger sample size for the ages tested or analyzing a group of trials that only result in laughter. Especially for the *uncategorized* joke, as it has yet to be properly scientifically investigated. Additionally, it would be worthwhile to investigate the infants who produced longer latency times after a year to explore if attachment style or strength has changed.

Investigating laughter and latency periods plays an important role in nurturing a well-established connection between parent and child. Attachment is considered the cornerstone of healthy emotional development in infancy (Bretherton, 1992) and is related to a variety of long-term positive developmental outcomes (Berlin & Cassidy, 2003; Cutrona et al., 1994; Markiewicz et al., 2001). By improving understanding of latency, we can hopefully foster a more secure attachment between parent and child. We need to harness our knowledge of this vital human instinct to build better relationships which lead to a happier, more joyful childhood.

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