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Loss of dance and infant-directed song among the Northern Aché

Highlights

- No dance or infant-directed song was observed among the Northern Aché of Paraguay
- Reported absence is based on behavioral observation over 122 months of fieldwork
- Behaviors were likely lost due to cultural declines from population bottlenecks
- Findings challenge claims of the universality of dance and lullabies

Authors

Manvir Singh, Kim Hill

Correspondence

mvrsingh@ucdavis.edu (M.S.),
kim.hill@asu.edu (K.H.)

In brief

Singh and Hill report no evidence of dance or infant-directed song among the Northern Aché of Paraguay, based on 122 months of fieldwork. Their findings challenge claims of these behaviors' universality, suggesting that dance and infant-directed song are maintained partly by cultural transmission and can be lost following demographic decline.



Report

Loss of dance and infant-directed song among the Northern Aché

Manvir Singh^{1,3,*} and Kim Hill^{2,*}

¹Department of Anthropology, University of California, Davis, One Shields Avenue, Davis, CA 95616, USA

²Institute of Human Origins, School of Human Evolution and Social Change, Arizona State University, PO Box 874101, Tempe, AZ 85287, USA

³Lead contact

*Correspondence: mvrisingh@ucdavis.edu (M.S.), kim.hill@asu.edu (K.H.)

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SUMMARY

Dance and infant-directed song are often considered universal behaviors, a view that has been supported by considerable cross-cultural research.^{1,2} The conclusion that humans in every documented society engage in these behaviors has, in turn, influenced evolutionary theories of music, which often treat human musicality as an adaptation, with benefits stemming from moving in synchrony and/or singing to infants.^{3,4} Drawing on 122 months of fieldwork conducted between 1977 and 2020, we here report no evidence of either dance or infant-directed song among the Northern Aché of Paraguay. Excluding church singing introduced by missionaries, Northern Aché adults sing alone and in a very limited number of styles. Several lines of evidence suggest that dance and infant-directed song were lost following reductions in population size that curtailed cultural complexity among the ancestors of the Northern Aché. Although our observations are consistent with a universal psychological capacity for dance and infant-directed song, they indicate a critical role of cultural transmission in supporting these behaviors while demonstrating the value of testing claims of cultural universality in remote and minimally acculturated populations.

RESULTS AND DISCUSSION

Music appears to be a human universal,¹ defined here as a behavior present in all human populations.^{2,5} Absolute universals contrast with “near-universals,” which occur in most but not all human populations, and “statistical universals,” which appear above a predefined threshold.⁵ Universality is of interest because of its implications for our understanding of human psychology and its evolution: a behavior that exists in all human populations likely emerges from cognitive capacities that are shared among humans everywhere and rooted in our common biological substrate.

Surveys of ethnographic corpora and large discographies have provided evidence for the absolute universality of several musical behaviors, foremost among them dance music and lullabies.^{1,6} Of various functional domains (including love songs and healing songs), dance songs and lullabies also are the most recognizable to naive listeners and exhibit the most stereotyped forms across cultures.^{1,2,7,8} This evidence of universality has partly inspired theories that musicality is a genetically evolved adaptation. Leading theories, for example, postulate that music biologically evolved to enable social bonding (with group dance and mother-infant bonding providing quintessential examples)⁴ or to serve as a credible signal in the contexts of coalitional signaling (dance) and infant care (infant-directed song).³

Responding to such evolutionary theorizing and claims of universality, researchers have surveyed ethnographers and ethnographies and concluded the potential non-universality of some behaviors—namely, of group music-making^{9,10} and lullabies.¹¹

However, the reliability of some claims is uncertain. For example, various ethnographic passages purportedly reporting a lack of lullabies are open to interpretation (as among the Innu: “The writer has knowledge of no lullabies, fables, or moral stories being used to inculcate good behavior”); in other cases, different passages about the same society provide conflicting reports (as among the Navaho and Shipibo).¹¹ Moreover, the reason for the behaviors’ absence is uncertain. For example, it is unclear whether societies presumably without lullabies lost them recently in history and—if they did lose them—which demographic or social factors contributed to such disappearances.

Here, we report relevant ethnomusicological data for the Northern Aché. The Aché of eastern Paraguay were full-time hunter-gatherers until the time of contact in the 1970s. The second author (K.H.) has worked with a northern subpopulation of the Aché, referred to here as the Northern Aché, since 1977. The Northern Aché population stood at about 240 individuals in 1930. By 1970, it had grown to 547. By 2010, when last censused by K.H., it numbered approximately 800 individuals. Along with other researchers, K.H. has conducted extensive research on Aché socioecology, including research on foraging, time allocation, food sharing, reproductive strategies, and life history.¹² He is fluent in the Aché language and has spent 122 months—well over 3,000 nights—in Aché communities, usually residing in Aché huts with a family or in a nearby camp. He has amassed thousands of hours of direct follow observation, including that of women and their infants (see [STAR Methods](#) for details). As a part of his research, he and A.M. Hurtado recorded Aché songs and, along with Aché assistants, transcribed and translated lyrics.





Figure 1. Childcare, dancing, and fire-keeping among the Aché

(A) A Northern Aché mother uses tickling to calm an infant (photo credit: Kim Hill).

(B) Southern Aché individuals play flutes and dance collectively (photo credit: Bjarne Fostervold).

(C) A Northern Aché hunter blows on the embers of a burning stick to keep it lit; having lost the ability to make fire, men and women preserved fire in this way (photo credit: Kim Hill).

There is no reason to suspect that some behaviors were systematically under-observed. The Aché have no secret ceremonies from which K.H. would have been excluded. Unlike some other lowland Amazonian forager groups, such as the Hiwi of Venezuela, the Aché lack social norms demanding modesty or separation between the sexes. Men and women can interact openly and casually; K.H. was thus free to observe, interact with, and interview women and their children. He has also spent more than 250 nights in forest camps during foraging treks. Containing roughly 25–40 individuals, forest camps cover an area of approximately 50 square meters, and everyone's behavior is observable to everyone else. According to data collected in 1981 and 1982, forest camps contained, on average, 6.5 adult women and 2.89 infants.¹³

Northern Aché individuals sing in camp every night and sometimes in the morning, as well as occasionally in the middle of the night when they have difficulty sleeping. The styles and themes of singing are very limited. With the exception of singing introduced by missionaries (see below), men sing in a single style: a wordless, open or closed mouth melody for 10–15 s that alternates with a rapid burst of partially adlibbed, rhythmically chanted lyrics with no melody (Audio S1). Women, despite singing much less frequently than men, sing in three styles: style 1, a melodic but wordless section of about 10 s followed by a melody with lyrics of the same length, which are then both repeated; style 2, a sung melody of rhyming lyrics of about 20 s followed by a short break, and then more sections of singing; and style 3, about 15 s of ritual weeping followed by melodically intoned lyrics for about 15 s that end in a wail, with both sections repeated several times (style 3, Audio S2). Men sing mostly about hunting and sometimes about current events and social conflict. Women sing almost exclusively about loved dead relatives. All adult singing is performed alone and by a single individual.¹⁰ Children sometimes sing in imitation of adult styles.

Northern Aché individuals also perform short melodies on bamboo flutes. Although Clastres observed a Southern Aché man who sang a mournful lament intermittently interrupted by four-note melodies on a flute,¹⁴ such combinations of instrumental and vocal music were rarely, if at all, a feature of Northern Aché traditional music production.

Neither infant-directed song nor dancing (movement intentionally synchronized to music) has ever been observed among the Northern Aché by K.H. or other outsiders. By this usage, “infant-directed song” includes, but is not limited to, songs used to soothe infants (lullabies). These patterns do not seem

to reflect a lack of usefulness. Northern Aché parents frequently calm fussy infants using playful infant-directed speech, funny faces, and smiling or giggling (Figure 1A). Given the relaxing effects of lullabies on infant arousal,¹⁵ parents would presumably find them useful as well.

No systematic behavioral research has been conducted among Southern Aché groups. However, Bjarne Fostervold, an American missionary born in Paraguay who has spent almost 50 years living with one of the three dialect groups of Southern Aché, has communicated that they also do not exhibit infant-directed song. Unlike the Northern Aché, however, some southern populations were seen to dance—and sing in synchrony—in the years following contact and settlement (Figure 1B).

Although we can confidently assert that the Northern Aché did not dance or sing lullabies during the fieldwork period starting in 1977, it is possible that such behaviors have since been introduced by Paraguayan missionaries, particularly following the end of fieldwork in 2020, which coincided with growing acculturation by outsiders. Catholic and Evangelical missionaries began to administer Aché communities shortly after contact and later introduced church singing, which involves typical church hymns, sometimes translated into the Aché language.

It is also possible that dance was lost when the Northern Aché were settled on reservations, given that individuals completely or nearly stopped engaging in other behaviors, such as polygyny, club fighting, puberty ceremonies, and hunting magic. Nevertheless, K.H. has neither observed dancing in forest camps nor heard people acknowledge its loss or reduced frequency, as they have done for other behaviors.

Converging lines of evidence suggest that dancing and infant-directed song were lost during larger cultural declines following earlier population bottlenecks (the so-called Tasmania effect^{16,17}). Like the Awá, Sirionó, and Yuqui, the Aché were hunter-gatherers who spoke a Tupi language and lived in mobile bands. Cultural phylogenetics reveal that such populations were probably not always hunter-gatherers but instead derived from ancestral societies that were sedentary, practiced horticulture, and may have had cultural traits including canoes, shamanism, and corporate group structure (e.g., a system of clans).¹⁸ Moreover, the Northern Aché exhibit less cultural complexity than their southern relatives—they have lost the ability to make fire (Figure 1C), have less complex religious beliefs than the Southern Aché, do not have stringed instruments, and lack several styles of singing, including a women's lamentation sung in groups^{10,14} (Table 1)—likely reflecting a serial founder effect. Genetic analyses corroborate these patterns; the Northern

Table 1. Cultural traits among the Southern and Northern Aché

Trait	Southern Aché	Northern Aché
Infant-directed song	absent	absent
Shamanism ^a	absent	absent
Horticulture ^a	absent	absent
Canoe-making ^a	absent	absent
Dance	present	absent
Fire-making	present	absent
Group music-making	present	absent
Stringed instruments	present	absent

^aDetermined by Walker et al. to be present among proto Tupi using ancestral state reconstruction.¹⁸

Aché are genetically most closely related to other Tupi-speaking populations (with evidence of Jê introgression) but show much lower levels of heterozygosity in a large sample of genetic loci than most other Amerind native populations, consistent with them undergoing one or more genetic bottlenecks.^{19,20} Some Northern Aché individuals have reported that their ancestors knew how to make fire, which, combined with indications of when the Northern Aché split from the Southern Aché, raises the possibility that such knowledge was lost relatively recently, potentially in the nineteenth century.

These observations suggest that a Tupi-speaking population ancestral to all modern Aché communities experienced a bottleneck during which they lost lullabies and other aspects of complex culture, including horticulture and shamanism. Indeed, lullabies (and dance) have been observed among speakers of other Tupi languages, such as the Araweté²¹ and Guarani,²² consistent with their presence among proto Tupi. Later, coinciding with or following their split from the Southern Aché, the ancestors of the Northern Aché seem to have experienced one or more additional bottlenecks, resulting in a further loss of genetic variation and cultural complexity, including the disappearance of dancing.

Our observations challenge the conclusion that dance and lullabies are absolute universals. Insofar as fire-making is not considered an absolute universal (as Brown⁵ determined), lullabies and dance would not qualify either. Nevertheless, our observations are consistent with a universal psychological capacity to produce and respond to these behaviors. The recent ancestors of the Northern Aché likely engaged in both behaviors, and their absence plausibly reflects dramatic cultural decline resulting from population bottlenecks rather than, for example, a biologically embedded inability to engage in such behaviors.

Our results also help clarify the respective roles of biology and cultural transmission in producing dance and lullabies. Behaviors vary in the extent to which cultural transmission is required to sustain them. Smiling and fire-making are both ubiquitous, for example, yet smiling does not need to be learned,²³ whereas fire-making apparently does. Our observations suggest that dance and lullabies are more like fire-making than smiling: individuals do not spontaneously engage in them but must invent, tweak, and culturally transmit them. This does not refute the possibility that humans have genetically evolved cognitive adaptations to dance songs and lullabies; we are adapted to fire, after all.²⁴ It does underscore, however, that any complete

evolutionary account of music must accommodate culture, as several recent proposals do.^{3,4,25} Moreover, our observations suggest that the cross-culturally stereotyped forms of dance songs and lullabies result not from fixed action patterns (people instinctively producing them) but from convergent cultural evolution (as people around the world craft and tweak them to best serve similar behavioral functions).²⁶

The growing availability of large comparative corpora facilitates the investigation of psychological and behavioral universals more than ever before, exemplified in recent projects not just on music^{1,6} but also on morality,²⁷ language,²⁸ and emotion.²⁹ Our observations of the Northern Aché illustrate the importance of testing claims of universality in remote, minimally acculturated communities, whose unique and sometimes traumatic histories can result in behavioral repertoires that differ from those of larger, more interconnected populations.

RESOURCE AVAILABILITY

Lead contact

Requests for further information and resources should be directed to, and will be fulfilled by, the lead contact, Manvir Singh (mvrisingh@ucdavis.edu).

Materials availability

This study did not generate new unique reagents.

Data and code availability

- This study did not generate any unique datasets.
- This study did not generate any original code.
- Any additional information required to reanalyze the data reported in this paper is available from the [lead contact](#) upon request.

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AUTHOR CONTRIBUTIONS

Conceptualization, M.S. and K.H.; investigation, K.H.; writing – original draft, M.S.; writing – review and editing, M.S. and K.H.

DECLARATION OF INTERESTS

The authors declare no competing interests.

STAR★METHODS

Detailed methods are provided in the online version of this paper and include the following:

- [EXPERIMENTAL MODEL AND STUDY PARTICIPANT DETAILS](#)
- [METHOD DETAILS](#)

SUPPLEMENTAL INFORMATION

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STAR★METHODS

EXPERIMENTAL MODEL AND STUDY PARTICIPANT DETAILS

The Northern Aché inhabit neotropical forests of eastern Paraguay. From their split with the Yvytyruzu in the 1930s until first peaceful contact in 1971, the Northern Aché constituted a closed breeding population.¹² The year before contact, the Aché numbered around 547 individuals. Contact brought demographic turmoil: Virgin soil epidemics reduced Northern Aché numbers to about 338 individuals between 1970 and 1976, while “outmigration” (often forcible removal of children and adolescents by Paraguayans) reduced the Northern Aché population by another 11%.¹² By the time K.H. began fieldwork, in 1977, much of the turmoil has subsided, and some of the children who had lived with Paraguayans had returned. By 1989, 538 Northern Aché lived at Aché settlements. When last censused by K.H., in 2010, the Northern Aché population had grown to about 800 individuals. For demographic information, including age-sex pyramids reconstructed for 1960 and 1970 and collected in 1980 and 1989, see chapter 4 of Hill and Hurtado.¹²

METHOD DETAILS

K.H. conducted fieldwork among the Northern Aché from November 1977 to January 2020 for a total of 122 months, or 10.2 years. In the early years, he lived with Aché families in their huts, and ate, slept, and worked with Aché families every day. In later years, he maintained a research tent about 100 m from the nearest Aché family and, starting in 1996, stayed mostly in a brick research station approximately 5 km from the nearest Aché village. He was allowed constant access to all Aché residential and community spaces, and formed extremely close friendships, akin to adoptive family relationships, during the entire period. He has participated in all ritual activities and observed dozens of births, deaths, puberty ceremonies, and other typical celebrations. Much of the fieldwork was conducted with his wife and fellow anthropologist, A. M. Hurtado; their children occasionally accompanied them.

As a part of fieldwork, K.H. spent more than 250 nights living in foraging camps in the forest, during which Aché bands would leave the village settlement and trek in the forest to hunt and gather for subsistence. Forest bands sometimes moved more than 50 kilometers away from village settlements for periods of about one to two weeks. On one foraging trek, K.H. remained isolated in the forest for 47 days with an Aché group and with no interaction with any outsiders. According to data collected during nine foraging trips between October 1981 and April 1982, forest bands contained, on average, 6.5 adult women and 2.89 infants.¹³ Infants spent “close to 100% of their time with their mothers.” While living in forest camps, K.H. often collected data during daylight hours and ate evening meals in the camp and participated in conversation for several hours each evening before sleeping at a fire with a family.

Such fieldwork occasionally involved intensive and constant observation of women and their infants. During the foraging trips between October 1981 and April 1982, for example, K.H. and three other anthropologists collected data on 461 woman-days of food production, which involved either following a woman throughout the day (trips 1–5) or following the largest group of band members (mainly women) and recording each individual’s activities every ten minutes (trips 6–9); women were observed, on average, for 722 minutes per day (roughly between 6:30 AM and 7 PM).¹³ Focal data collection finished at sundown, yet the close physical proximity entailed during such foraging trips meant that K.H. slept within meters of other Aché, including women and their infants. Close observation also occurred at settlements. Between November 1981 and April 1982, K.H. and three other anthropologists spent twelve hours a day for fifty days recording the activities of 22 men and 23 women, at least 15 of whom nursed (at least 11 nursed for the entirety of the period; 4 started or stopped during data collection).³⁰ Although such instances of data collection represented particularly thorough behavioral studies, K.H. observed parents and infants interacting privately and publicly on a daily basis over the 122 months of fieldwork, including numerous hours of infant-directed speech and play.

K.H. recorded songs on a small portable cassette tape player between 1978 and the mid-1980s (see [Audio S1](#) and [S2](#) for examples). In the early 1980s, most of the recorded songs were transcribed by K.H. working with an Aché translator. Later, K.H. translated transcriptions into English with the assistance of Aché friends, who clarified and discussed vocabulary, metaphors, and stylistic elements that appeared in Aché singing but did not often feature in daily speech.