OCEANIA

Oceania, Vol. 83, Issue 2 (2013): 63–87
DOI:10.1002/ocea.5012

The Sound of a Person
A Music-Cognitive Study in the Finisterre Range in Papua New Guinea

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ABSTRACT

Konggap*, sung melodic motifs that last only a few seconds embody the acoustic representation of a person among the Yupno people of Papua New Guinea and are a unique phenomenon in the Pacific. The* konggap *forms a very complex system of personal identification and expression of social relationships; at the same time it connects the singer to the ancestral world. Every person in Yupno society possesses his or her own* konggap, *and Yupno people are able to identify a large number of* konggap*, some men even up to three hundred. Nobody would sing his or her own* konggap *during the day. When crossing Yupno land, a person has to sing the* konggap *of the respective landowner to identify himself as an insider, a local person – unlike strangers (and possible enemies) who remain silent. But at nightly dances each dancer sings his own* konggap *and during mourning at funerals groups of women simultaneously sing the* konggap *of the deceased person. An interdisciplinary ethnographic-musicological-cognitive fieldwork study was conducted in order to find out how it is possible that the Yupno are able to identify and distinguish between this staggering amount of very short sung motifs.*

Keywords: person, ethnomusicology, memory, cognition, Papua New Guinea.

KONGGAP: THE SOUND OF A PERSON

The Yupno of the Finisterre Range on the border between Madang and Morobe provinces in Papua New Guinea use the vernacular term *konggap* to refer to a very short, vocally expressed musical motif that serves as an acoustic representation of a person. *Konggap* stands for 'voice of the ancestor spirit' (*kong*: ghost of a dead person, *gap* or *kap*: dancing feast, *singsing* [Tok Pisin]). In the same way that a personal name belongs to a person so does the *konggap* – the *konggap*, however, is of more significance for the person's identification than the personal name. The short musical motif, *konggap*, stands for the person and his or her identity; at the same time it serves to integrate the person into the community of the living and of the deceased ancestors.

The acoustic presentation of ancestral voices is an integral and important part of many traditional ceremonies and rites of various peoples in Papua New Guinea as well as in many parts of Melanesia in general (Ammann 2012). But in Yupno society each individual possesses his or her own 'voice of the ancestor spirit'. How is this to be explained? For the Yupno, human beings consist of several physical and spiritual components (cf. Keck 2005; Wassmann n.d.): (a) the body itself, (b) two spiritual aspects, *wopm*, shadow soul, also referred to as image or shadow (that transforms after death into the soul of a dead person, *kongwop*, which, over time, is perceived increasingly as an impersonal spirit), and *mongan*, breath spirit, signified by the morning mist that rises when the sun heats up the ground still wet with dew, or human breath.

Everybody also possesses *tevantok*, vital energy, a kind of impersonal energy contained in the breath spirit; the amount of *tevantok* fluctuates and determines whether an individual is considered metaphorically hot (a dangerous, non-controllable state; the same word also signifies illness), cold (associated with immobility and speechlessness), or cool. Only the cool state is desirable since only then does the individual take on the ideal physical stance: a slightly bent posture. In this position, he or she 'can' actively listen to others and thereby become a knowing 'human being'. For the verb 'to listen' the Yupno use the term *nandak*, for the verb 'to know' *nandak nandak*. While a person's shadow soul – many years after death – becomes more of an impersonal spirit, his *konggap* will, after being remembered for many years by the living, become part of the unheard soundscape.

Shortly after birth, the mother composes a *konggap* for her newborn, singing it gently to calm the baby. Years later, as an adolescent, he or she will replace this motif with a self-created *konggap*. There are several ways to acquire one's own *konggap*. Some Yupno say they heard their *konggap* in a dream, others remember sitting together with some peers and searching for their *konggap* by playfully inventing fantasy *konggap* and short melodies until they found theirs. In such a case the *konggap* needs approval by the respective group of peers. Each *konggap* is a unique, very individual and a creatively invented part of each person that belongs to him/her for the rest of life. The *konggap* cannot be inherited nor is it transferable, it remains inseparably connected with the personality of the owner.[1]

The *konggap* are neither intoned with sense-making text nor with names,[2] instead vocables are chosen that enable singing in the loudest mode possible. As the aim is to convey the *konggap* over as far a distance as possible, the Yupno sing with much pressure and an open throat. For this purpose they use the vowel 'a' (as in 'art') for the higher sounds, 'o' (as in 'over') for the lower tones, and the vowels 'e' (as in 'energy') or 'u' (as in 'you') for those in between. These vocal sounds are pronounced in the same way as English vowels.

The two anthropologists Verena Keck and Jürg Wassmann began their study on *konggap* during their first fieldtrip to the Finisterre Range in 1986 and introduced them to the anthropological and ethnomusicological literature (Keck 2005; Wassmann 1992). Keck's main interest was focused on the *konggap* as part of Yupno personhood, Wassmann studied the use of the *konggap* in daily life and its significance in social relationships. The first ethnomusicological approach to *konggap* was undertaken by Don Niles together with Keck und Wassmann in 1987 (Niles 1992). In this study Niles focused on the position of the *konggap* in the general music culture of the Yupno and the neighbouring language groups. He concluded that the 'distinctiveness [of the musical expression and practices] of the Yupno/Nankina area in relation to its neighbours is striking' (1992:150, for Nankina *cf.* Keck 1992). The musical and choreographic repertoire of this region is dominated by two types of song/dance forms, *konggap* and *kap*, each accompanied by a drum, *kel* (*kundu*[3]). *Konggap* is the principal traditional type of vocal music. Only since the establishment of the Lutheran mission has the song/dance *kap* emerged. '. . . older people readily acknowledge that it was introduced by evangelists from the Finschhafen area, perhaps fifty years ago' (Niles 1992:173).

In daily life today *konggap* singing is absolutely essential for the social network of the Yupno. When walking across garden lands, one hears *konggap* from all directions; in this land of steep hills and valleys they form a distinctive part of the soundscape. In general, the *konggap* are more important for men than for women because men are more likely to hold public office in village life and because they get to see – and hear – more people in social interactions. Men sing *konggap* more often than women and the *konggap* of male persons are heard more often than those of women. It would not be appropriate – and a cause for gossip – for a man to sing publicly the *konggap* of a woman who does not belong to his kin group.

Normally men and women sing the *konggap* of the respective landowner when they cross his garden and bush land. When passing close by a house, they sing the *konggap* of the owner

of the house. In this way a singer presents himself as an insider and friend and shows his good intentions – only strangers are without sound because they have no *konggap*. As a rule, Yupno, both male and female, know the *konggap* of most of the people of their own village and many of people from neighbouring villages. If a man is walking to his garden and sees another person on the opposite side of the valley, he will sing this person's *konggap* as a means of saying hello. Women would only sing the *konggap* so strongly and loudly that it could be heard on the other side of the valley if they are in danger or difficulty. When a child remembers his deceased father or mother he/she might feel sorrow and sing this parent's *konggap*, and when somebody thinks of another person, he or she, too, may spontaneously sing this person's *konggap*. Thus the singing of a *konggap* obviously seems to have a very emotional side to it.[4]

For anyone living in the Yupno area, *konggap* constitute a constant acoustic background, especially in the morning and evening when the people are going to or coming from their gardens. Sitting in the village at about five o'clock in the evening one hears *konggap* sounding from all around. People might even sing *konggap* or – on a musical basis – play them for mere joy and amusement.

In these mountain ranges the only sounds to be heard are those of birds and insects and the sounds created by wind and weather. The sonic complexity of the *konggap* adds a unique acoustic human touch to the region's soundscape. On a few occasions *konggap* are allowed to be sung in group performances. In one such group performance (*nsaguo konggap*) each man (women do not participate) sings his own *konggap*– which is normally against the moral rules. *Nsaguo konggap* takes place at night and in spiritual connection with the ancestor spirits, *kong*, and with the land of the *kong*, Nomsa (Long Island), an island in Astrolabe Bay (see below).

KONGGAP IN GROUP PERFORMANCE: THE SOUND FROM THE ANCESTOR SPIRITS

Group performances of *konggap* are of two kinds: those performed at night including dance and decorations, and those following the death of a Yupno person, performed at night and during the day. *Nsaguo konggap* belongs to the former; this performance is only held in the cold darkness of night and must go on until dawn (for the Yupno, the time when the ancestor spirits, *kong*, are present in the world of the living). Protected by the darkness, each one of the dancers (all of them male) sings his own *konggap*, again and again and all night long until he falls into a trancelike state, bringing him close to the ancestors.

Dancers move counter-clockwise in a circle, bending alternating knees to each beat of the *kundu* (drum). Decorations for this dance performance are elaborate and require several days of preparation. At least one man, but preferably as many as possible, wears a large umbrella-like decoration called *nsaguo*. The name refers to the precious red and black feathers of the *nsaguo* bird as well as to the feather wheel (umbrella construction) itself. The dancer wears a basket-type structure on his head, and a roughly five-metre long bamboo stick attached to his back, holding the wheel of feathers fixed to the pole with a bamboo cross. According to senior Yupno men, this bamboo pole represents the world tree (*kwombu*) that supports the sky and keeps it from not falling onto the earth. The dancer with the *nsaguo*-wheel also wears a bark cloth painted with clan-specific mythological designs (*kuval kalda, kuval*: bark cloth; *kalda*: pattern); furthermore, the man is decorated with ferns and cordylines that veil his face.[5]

The participants of these nightly dance feasts sound their *konggap* in time to the regular beat of the large *kel konggap duwang* (large *kundu*), thus making it appear like a coordinated choir singing, or like 'a multipart mass of asynchronous vocal sound, unified by a common kundu rhythm and synchronous dance steps' (Niles 1992:155). A *nsaguo konggap* group

performance starts with a short introductory section; all participants sing the same melody for approximately ten seconds, followed by the main section, where '. . . men sing their individual melodies [*konggap*] asynchronously, and play their 'kundus' and dance in synchrony' (Niles 1992:164). Women silently dance clock-wise around the performing group of men.

Traditionally such a group performance would indicate: a) that a young man is about to marry, b) that a new house has been built, c) that a couple is celebrating its first pregnancy. In earlier times group performances of *konggap* preceded raids or followed a successful battle.

The second instance that group performances of *konggap* take place is after a person has died. Here, the scenario is altered: it is now the women who, as an expression of sorrow and remembrance, sing the *konggap* of the deceased person and his or her relatives, and in this way accompany the *kongwop* (soul of the dead person) down the Yupno River to the island of Nomsa (Long Island). This island lies in the Astrolabe Bay and represents, according to traditional Yupno belief, the afterworld where the spirits of the deceased go to reside.[6]

The burial ceremony of a Yupno person depends on the social status of the deceased person. The older and the more significant a person used to be and the wider the person's network of social relationships was, the more comprehensive and elaborate the burial. The deceased is laid down in his or her house or, if it is too small to hold the number of expected visitors, in another, larger house. The body is wrapped in a new piece of cloth, leaving the head free. Relatives and friends in neighbouring and more distant villages are informed, for example, by singing the dead person's *konggap* as a death notice and transmitting it across the valleys. Then the funeral preparations begin. Relatives bring large amounts of food and pile it up in one spot, pigs may be killed, and betel nuts are procured. When the people from the other villages have arrived with their food, communal mourning begins. It is mainly the women who conduct this mourning ceremony. They enter the house in groups (each made up of women from the same village) and then rhythmically dance towards the deceased, singing his or her *konggap* as well as those of his male relatives, living or dead. From time to time the women interrupt the singing and weep and cry. After several hours of performing these *konggap* all the participants are invited to a communal meal. Later on, or on the following day, the body is laid in a coffin, and, with only few people present, it is carried to the cemetery. An evangelist or pastor will recite a few prayers before the coffin is lowered to the ground. Later a small wooden cross is placed on the grave (Keck 2005).[7]

Sitting around the fire in the evening, the people tell stories in memory of the deceased person. These might tell about social events he was involved in, transactions such as bridewealth paid by his family, and other shared experiences such as working together or hunting trips or anecdotic stories, interspersed with many deep sighs of "Oh Jowage, oh Danda". Then someone will start gently whistling the deceased person's *konggap*. Over time, the memory fades, and to the living, the dead person gradually takes on the quality of an anonymous 'spirit'. But the dead people's *konggap* are memorized over a very long period of time (*cf.* Keck 2005; Keck and Wassmann 2010).

MEMORIZATION OF *KONGGAP*

Each *konggap* researcher applied his or her particular approach; still, all of them agree that the large number of *konggap* that each Yupno (men and women) is able to memorize and recall at any time is staggering. Each man interviewed maintained that he could assign more than three hundred *konggap* to their specific owners (women, in general, mention smaller but still impressive numbers). Accordingly, Wassmann, Keck, and Niles assumed that a pre-existing system of person-affiliation in Yupno society, for example, family-lines or the clan system, served as a model and that one or several formal parts of each *konggap* possibly identified the

konggap owner's affiliation with the family or the clan. Similar systems are used in other cultures to call individual persons by means of musical instruments: signalling boards, conches, flutes, ocarinas, and wooden or bamboo trumpets. For example, the *garamut*[8] on the Middle Sepik River in Papua New Guinea (Ammann 1989; Patocchi 1990; Spearritt 1979; Wassmann 1991:243) used to call individual persons on the basis of parental or clan association.[9] However, beside the various types of signals and calls by slit drums, conch shells, etc., Niles notes that individual *konggap* melodies must also be considered as a speech surrogate (Niles 1992:179). '. . . *konggap* is further distinctive in the ready composition of new *konggap* and the multitude known to each individual. In contrast, most instrumental systems in Papua New Guinea utilize a fairly fixed corpus of a small number of signals. For example, Eilers (1977:253) reports no more than thirty *garamut* messages identifiable in any one village in the Sepik. . . . From present knowledge, it appears that there are no other areas in Papua New Guinea where such sonic surrogates exist' (Niles 1992:180).

Although musicians across the world might state, truthfully, that they have more than 250 songs in their repertoire, retrievable at any time, the uniqueness of the *konggap* lies in their extremely short duration of only a few seconds. Consequently a *konggap* includes a very limited amount of musical information and makes identification all the more difficult. The memorization might be the same as for longer pieces of music, but due to the shortness and the absence of words they contain less distinct micro-musical elements that could provide identification of the *konggap* owner.

NEW *KONGGAP* RESEARCH

In a joint field study in 2007, Ammann, Keck, and Wassmann concentrated on the memory capacity of the Yupno with regard to *konggap*, and especially on finding out whether there might be some kind of mnemonic device. Prior to fieldwork some fifty *konggap* selected from the 150 that had been recorded by Keck, Wassmann, and Niles in 1987 were transcribed and compared.

Transcribing a *konggap* in Western musical notation obviously does not produce accurate results. It is hardly possible to notate the rhythmical structure of such a short musical signal, and the pitches are never clearly definable, as they tend to slide up and down. This is especially pointless in the case of *konggap* composed of only a few intervals and lasting only a few seconds. Another way to notate *konggap* and one which displays the musical event more comprehensively in its overall form, is the simple drawing of a melodic line with the indication of the time elapsed. The 'piano' and 'forte' levels can be indicated by the thickness of the line (the thicker the line, the louder the sound), the five-line staff stays the same and so do the accidentals. For an easy way of comparing the *konggap* in this article, we transposed them all in such a way that the same nuclei always end on the same pitch (nucleus in relation to *konggap* will be explained further on in this article). The short musical motif (Figure 1a) would correspond to the following transcription (Figure 1b). The first example gives a tempo of 120 quarters per minute, which corresponds to one second for a measure in 2/4. In the second example the 'bar-line' is simply set at intervals of seconds to show the tempo which in this case is the same. For this transcription a recorded *konggap* was imported in a sound-editing program. Thus it was possible to exactly define its time structure. On the other hand, the determination of pitch and loudness – which in this transcription are connected – was done by ear.

The owners of the fifty *konggap* analysed were all well known and we could expect that these *konggap* were among the best known in Yupno culture. As Keck and Wassmann had previously recorded the genealogies of the entire population of the village of Gua, where they had conducted fieldwork, we were able to spot similarities in the form of the *konggap* and

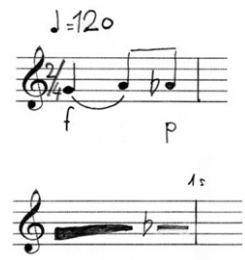


Figure 1: Musical notation of a *konggap*.

compare them with kinship affiliation. Among the fifty *konggap* a few similarities in rhythmical form, accentuation, melodic line, and pitch were evident. And – remarkably enough – these *konggap* belonged to persons of the same family line, especially father and son. However, these similarities were rather the exception than the rule, yet we believed it could still be a hint that a family or clan affiliation lay hidden somewhere in the form of the *konggap*. Further on in this article we will comment on the results and explain whether there is a family affiliation that determines the form of a *konggap*. However, it is also important to understand what is happening on the cognitive side when listening to sounds and which process is responsible for recognizing a musical form.

COGNITIVE PROCESSES WHEN HEARING A *KONGGAP*

Bigand (1993:231) refers to music as 'an agglomeration of atmospheric vibrations that strike the eardrums.' He goes on to state: 'The question, then, is how listeners manage to transform these vibrations into a set of sound signals having specific auditory qualities and coherence.' As music is a complex sequential organization of vibrations that can be perceived by the human ear, it is the listener who needs to detect a sensible structure of the temporal order and to differentiate the sound quality to make out the music.

To study the perceptibility and the emotional significance of music and sound, Bigand and his team cut sounds into very short snippets and their test persons could still feel the emotional significance. 'The gating paradigm was used to measure how much perceptual information extracted from musical excerpts needs to be heard in order to provide judgements of familiarity or emotionality' (Filipic et al. 2010: 335).[10] For the *konggap* research, the judgement of familiarity might seem to be of more importance, however, the emotional side is significant as well, especially for judging the emotions felt when hearing or singing a *konggap* of a beloved deceased person.

We have this same experience every day when listening to the radio. Within a second or even less we feel the emotion that the music transmits; sometimes the music culture, the composer, or even the piece itself can be identified within a split second. Humans are able to recognize not only music in a very short time, but also visual stimuli. 'It has been shown previously that cognitive and emotional processes can occur rapidly for faces, voices, and words. Our study provides congruent findings with musical stimuli: A small amount of perceptual information . . . is sufficient for the brain to interpret the signal as music and to influence familiarity and judgement of emotionality' (Filipic et al. 2010: 340; see also Bigand et al. 2005). Feelings of familiarity can be induced in 0.5 seconds, emotional judgment in 0.25 seconds. The cognitive and emotional processes are thus also extremely immediate. 'When a person recognizes a clap of thunder as such, the tune of the national anthem, or when he or she understands the statement "You have a double chin", auditory memory is being used, without any question' (Crowder 1993:113). Thus, the faculty of recognition is not present from birth but is information retrieved from memory.

In the very short lapse of music recognition, several processes take place. When listening, for example, to a *konggap* which is, as mentioned above, a very short musical event, different processes in the human ear and brain are involved in processing the perceived sound. Pribram (1991) distinguishes between: a) psychophysical configuration, b) a cognitive aspect and c) a central control. Although these three moulding processes are mutually presupposing, they occur simultaneously ('. . . brains are parallel processing machines, rather than serial processors' [Levitin 2006:86]).

On a psychophysiological level, sounds are not processed consciously. In the case of *konggap*, this configuration processes the timbre, the short melodic line with the corresponding musical interval, and the micro-rhythmical structure. This configuration occurs already in the neural pathways to the brainstem. During this process the knowledge acquired and the knowledge of the repertoire play a minor role, because the main task (of this configuration) is to determine whether the sound can be identified as a *konggap* or not. The experiences made in childhood and adolescent years within this culture facilitate this process. In our empirical research with the prepared *konggap*, the Yupno listeners knew that they were going to hear *konggap*, however, this first sound identification, which takes place in the neural pathways to the brainstem, must have occurred unconsciously. Of the three configurations described by Pribram only this first (a), the psychophysical configuration, is assumed to be culturally independent and to have an effect on the brain stem.[11]

According to Pribram, all the further processes when listening to sounds, that is, (b) the cognitive aspect and (c) the central control, are more or less learned, cultural-specific, and even shaped by personal experiences. Here the term auditory knowledge (Crowder 1993:114) comes in handy: the knowledge of what had to be learned first. 'However our main attention will go to cases in which a specific auditory experience was retained in memory for a measurable time delay, and then retrieved afterwards. This is the auditory version of what Tulving (1995) has called *episodic memory*' (Crowder 1993:114). This type of remembering is part of the long-term memory that recalls when and in which context a certain event happened; it differs from the short-term, or working, memory that remembers information for only a brief period of time.

Working memory enables us to manipulate information, allowing for the integration of percept and memory, on the one hand, and for the uncoupling of thought and percept, on the other. It has been called 'the black board of the mind' by Goldman-Rakic (1996) and this expression well captures its nature as a buffer holding the current content of a cognitive operation. Content that is in the working memory can – depending on the individual's intentions, the salience or relevance of the information, and many other factors – be consolidated into long-term memory.[12]

On the psychophysiological level, acoustic signals are not processed consciously – sound is without any significance. It will be interpreted on the basis of culturally acquired knowledge or based on personal experiences. Acoustic reorganization is not predetermined, but its significance needs to be concluded on the basis of memory. Acquired knowledge interacts with the current sensory data and in this way gains significance. This means we need to distinguish between sound and sound-significance.

If acoustic material has to be processed in a matter of four to five seconds, it is done in the working memory. Here the phonological and visuo-spatial information is processed. Berz (1995: 361) proposed adding a third system, a music memory component or loop, "that is used to store and process musical information." Especially interesting are those acoustic experiences that are stored over a longer period of time as episodic memory in the long-term memory from which they are retrievable. This recalls the context in which an event has taken place. It is stored in the form of mental schemata and proto-typical forms, not as a direct copy.

We need to be aware that the memory is not the direct image of the remembered object or event; rather, it is a library of sensory moments. For each expression related to the same memory, a new image needs to be created in our brain. For music and *konggap* this means that each musical performance needs to be shaped and, when listened to, identified anew. However, the experience and repetition or training in expressing a musical image will help here. It is as if the body memory 'knows' the position of the lips, the pressure and position of the vocal cords.

The relation between concept formation and working memory is clearly interdependent: without concept, the working memory would be empty (Wassmann et al. 2011), and without working memory, concepts could not be abstracted (or constructed) from recurring sensory input. Furthermore, memory in general allows taxonomies to become broader and more elaborate over time. Together, both allow for rule and regularity learning (both in explicit as well as in implicit memory forms) and form an absolute sine qua non for inter-individual communication.[13]

According to Strauss and Quinn (1997) people all over the world store knowledge in their long-term memory in form of a lexicon of mental schemata in proto-typical forms. The same is correct for music; however, here music knowledge is classified into parameters defined by the music culture in question. For example, in many cultures music and singing is strongly related to body movements (dancing). Memorizing certain sounds and rhythmical patterns together with the corresponding body movement might even help the memorization and recall of the complete information (sound and movement).

When immediately available sensory data are found to be insufficient, the perceptual system analyses the situation by taking into consideration knowledge of the surrounding sound world – or, as mentioned above, body movements, for instance. Acquired knowledge interacts with the current sensory data to interpret the auditory stimulation.

Imagine for an instant that you are being guided through the Amazonian rainforest; you would hear exactly the same sounds as the indigenous person guiding you. For you the sounds of the forest might not have a deeper meaning, for your guide, who has spent all his life in this rainforest, each sound would include certain information. The same is true for music; to understand all parameters of a certain kind of music, it is necessary to know the music culture. Thus our perception of the sound worlds greatly surpasses the quality of the sensory information available at each instant: it results from mental processing (*cf.* see Marr 1982; Pinker 1984). Furthermore, it is '. . . not only an act of memorization, but also a constant effort to link past to present in a relationship that is ultimately of an intellectual rather than perceptual order' (Imberty 1969:115 in Bigand 1993:231). And, finally, for recognizing music the physical properties such as spatial location or voice quality (e.g. male versus female) are equally important (Berz 1995:118).

We assume a process of abstraction in hearing and remembering music and music-evident mental schemata. In this case the long-term memory is of specific interest. As Baddeley et al. (2009) point out with their ideas of the 'simplified worlds' in prototypical schemata, these are shared – at least partly – by members of the same culture and from these – if needed – complex and comprehensive knowledge can be reconstructed. Without a certain technique it is impossible to memorize long mythological texts, thousands of names in the right order, or flute melodies and songs (Wassmann 2011). For the transmission of verbal or oral knowledge, the localization could be the basic medium of the mnemotechnique – the 'method of loci' visualizes objects, and actions at locally different spots will allow finding these spots and objects or actions with the help of a mental walk (Brockmole 2009; Kondo et al. 2005; Zimmer and Engelkamp 1996). Maguire et al. (2003) state that better memory capacities are not the result of outstanding intellectual skills, but of the implementation of the spatial learning strategy that activates brain regions which are crucial for the spatial memory – even the correlated emotions enhance memory skills (LaBar and Cabeza 2006; cf. Altenmüller 2005).[14]

Some recent works in the field of cognition (Gibbs 2005) assume that certain concepts in our memory system are represented in the same way as they were originally encoded – on the basis of the senso-motoric system that is in direct interaction with the environment. This admission stands for a new development in the community of cognition scholars, who – on the basis of neuro-scientific perception – not only see cognition as a collection of abstract presentations of knowledge, but actually place it much closer to apperception and behaviour. According to this view, cognition is anchored in our embodied cognition (De Vega, Glenberg and Graesser 2008; Klatzky et al. 2008). The memory develops and works on this senso-motoric basis and is related to behaviours (Fuchs 2008; Koch 2007; for memory and music *cf.* Koelsch et al. 2009).

If we apply this explication to the identification of many *konggap*, we may argue with a sentence from Sloboda: 'Somehow the human mind endows these sounds with significance. They become symbols of something other than pure sound' (Sloboda 1985:10 in Bigand 1993:232). And Bigand adds: 'The acoustic complexity of music is ultimately only a medium for expressing a meaning that should not be confused with the sounds themselves' (Bigand 1993:232). Not only language can send out precise meanings, music can do the same. Koelsch et al. (2009:850) write that music is a medium of non-verbal communication. However, it must be added that understanding the messages of communication based on music requires excellent cultural knowledge.

Because the working memory demands an underlying listening experience and an acquired listening knowledge, Pribram (1991) divides this configuration of listening into 'comprehension', where the respective objects of reception are identified and put in relation to each other, and 'familiarization and valuation', where the objects of reception are analysed as to their newness and valuated. This level of processing takes place in the pre-attention phase, a cognitive process that does not take place consciously. If, for example, it has been recognized that a sound is in fact a *konggap*, the acoustic signal of this *konggap* will be compared with memorized signals on levels such as timbre, rhythm, and intervals. This phase may take place on a conscious level if the listener has declarative structures available, based on a vocabulary with which it is possible to describe *konggap*. As mentioned above, no such vocabulary was found among the Yupno; a classification system for *konggap* according to form does not exist. If it did, a consciously analytical phase could be assumed. This would allow us to differentiate and name singularities of rhythmical and melodical nature. However, many music cultures do not possess such a vocabulary and theory, but use metaphors to refer to similarities in music, for example, by referring to the ways and movements of a river for describing melodic lines (Yamada 1997). A special study that we carried out as part of our field research in 2007 should show whether the vocabulary with which the Yupno refer to various sounds and techniques related to singing and especially the *konggap* results in naming such singularities.

On a first level we can divide between *kap*, dancing feast, *singsing* and *gen*, speech, talk, language. *Geilqua* actually means sign, for example, the grass bending in the wind is a sign that the wind is blowing. Another example given by a Yupno man is the pattern on a *bilum* (the typical string bag of Papua New Guinea) and *kap queïlqua*, signifying sound or voice. This stands in contrast to *galta*, which describes noises. For the birdsong a different term is preferred: *minam genjisok* (*minam:* bird, *genjisok:* to sing), *taek genjisok*, on the other hand, stands for speaking with a soft voice (whisper). Whereas *taek* means voice (also neck, throat, gorge) in general, *taek madep* (*madep*: big, large) refers to aloud speaking or singing voice, and *taek monjisok (monjisok*: small) to the soft voice in the speaking register; *taek game* refers to the high voice in contrast to *taek pilin (pilin:* dark), the bass voice. Finally, *genjisok monjisok* refers to the voice in the middle of the register, the normal and not loud voice used in singing and speaking. This voice is so soft that only the singer/speaker and the people closely around him can hear it. These terms relating to voice and singing mainly differentiate between loud and soft voices and

between high and deep pitch, while the vernacular term *taek game* refers to the same sound quality – namely the higher pitch – as in the European vocabulary.

With regard to discussing music and *konggap*, would these Yupno terms be detailed enough for the valuation of newness and familiarization, as proposed by Pribram?

The concept of 'hierarchically organized chunks' as aids to musical memory as explained by Levitin (2006:215) seems to work better for mode-based musics (such as European, Indian, Arabian music, etc.). Jourdain (1997:137), when referring to memory and anticipation in music, argues equally that it is based on the European music style with its hierarchical organization of tones. We will show further on in this article that a *konggap* can be divided into at least two separate elements, an introduction part and a nucleus, and to a lesser degree maybe by syllables. Whereas the nucleus is of more importance for the identification of the *konggap* than the introduction part, this separation can hardly be compared with the hierarchical organization of tones as we have in European music.

On the last level of the cognitive process, 'irrelevance and innovation', the object of perception is examined as to its significance for immediate action. Therefore the situation will be analysed and a corresponding emotional reaction will be checked. What does the listener feel when he or she hears a *konggap*? Is he/she happy when recognizing a friend, and will he/she be afraid when hearing a *konggap* identified as an enemy one?

Strong musical experiences – and we may assume that hearing a *konggap* of a deceased close relative or of a frightening enemy is such an experience – may result in tears, goose bumps, or shivers. When listening to a *konggap* biographical factors are of importance and might cause the 'goose bumps' (Altenmüller pers. com. 16/09/ 2010; *cf.* Grewe et al. 2009a, 2009b). However, a neutral acoustic event can also induce emotions owing to basic universalities in music (*cf.* Fritz et al. 2009) as SEM (Strong Emotions in Music) which are of evolutionary origin (Gabrielson 2001; Grewe et al. 2009a, 2009b; Panksepp 1995).

A conscious processing action takes place after a combination of all the above-mentioned operations in a central control system. If a person hears a *konggap* he will first have to ascertain whether he recognizes the singer or not; if yes, he will answer with a *konggap* of his own; if not, or if he recognizes the *konggap* as being that of an enemy, he will prefer to remain silent and ignore the call.

Having provided this basic information on cognitive processes important to our study on *konggap* identification, it is now time to present our empirical study in the village of Gua. Our research confirms that Yupno individuals know an incredibly large number of *konggap*, but it also shows that the situation is even more complex than specialists believed up to now, and difficult to understand from the point of view of cognition.

THE EMPIRICAL RESEARCH IN GUA VILLAGE

During our stay in the village of Gua, we invited Yupno people to our house to listen to *konggap* recordings on a battery-operated CD player with small loud speakers. We took care that there were people of different ages present and that there was an even ratio of men and women as well as socially active and inactive persons. Equally, it was essential for us that the people did not feel any pressure to recognize a *konggap* and to answer 'correctly'. We spoke to the persons before they listened to the recordings and tried to explain our interest and how we would like to proceed.

For this study we prepared a CD with altogether twenty-two tracks (see table 1 below). The first eleven tracks (tracks 1–11) were unmodified *konggap* of socially active and well-known Yupno men.[15] The first sets of *konggap* were used to familiarize the listeners with our study-method and provide a general idea of the listeners' ability to recognize *konggap*.

Konggap of:	Old men n = 8	Old women n = 5	Middle-age men n = 10	Young men n = 4	Young women n = 10	School children, male n = 10	School children, female n = 8	Children, male, no schooling n = 9	Children, female, no schooling n = 9	Middle-age men/women from neighbouring villages n = 6	Identified:
1 Faiu, middle-age, pastor, Kapmbaga clan	8 i	5 i	10 i	4 i	10 i	10 i	8 i	9 i	9 i	6 i	100%
2 Sibik, old, highly respected, Talon clan	8 i	5 i	10 i	4 i	10 i	10 i	7 i	9 i	8 i	6 i	97.4%
							1 n-i				
									1 –		
3 Jowage, grand old man, died 1993, Talon clan	5 i	2 i	9 i	2 i	3 i			1 i		1 i	29.1%
								1 n-i			
	3 –	3 –	1 –	2 –	7 –	10 –	8 –	7 –	9 –	5 –	
4 Njangwen/Nanjangne, died before 1986, Tuval clan	8 i	4 i	9 i	2 i	2 i					2 i	34.1%
						1 n-i			1 n-i		
		1 –	1 –	2 –	8 –	9 –	8 –	9 –	8 –	4 –	
5 Kamake/Taranuwe, middle-age, ‘loner’, lived in his sister’s house, now in Madang, Umban clan	6 i	4 i	9 i	3 i	1 i				1 i	2 i	32.9%
			1 n-i				1 n-i				
	2 –	1 –		1 –	9 –	10 –	7 –	9 –	8 –	4 –	
6 Gua/Wuate, middle age, large family, Ngandum clan	7 i	5 i	9 i	4 i	10 i	9 i	8 i	9 i	9 i	5 i	94.9%
			1 n-i			1 n-i					
	1 –									1 –	

Table 1: Results of the *konggap* study.

Konggap of:	Old men n = 8	Old women n = 5	Middle-age men n = 10	Young men n = 4	Young women n = 10	School children, male n = 10	School children, female n = 8	Children, male, no schooling n = 9	Children, female, no schooling n = 9	Middle-age men/women from neighbouring villages n = 6	Identi-fied:
7 Merat/Megau, old, opinion leader, Ngandum clan	8 i	5 i	10 i	4 i	9 i	6 i	5 i	6 i	4 i	6 i	79.7%
					1 n-i	4 n-i	1n-i				
							2 –	3 –	5 –		
8 Ongane, old, big family, well-known	3 i	3 i	4 i	1 i	1 i	8 i	5 i	8 i	5 i	4 i	53.1%
	4 n-i	2 n-i	6 n-i	2 n-i	7 n-i						
	1 –			1 –	2 –	2 –	3 –	1 –	4 –	2 –	
9 Gwego, died 6 years ago (2001), large family, well-known, Mambap clan	7 i	5 i	9 i	4 i	10 i	9 i	8 i	9 i	8 i	5 i	94.9%
			1 n-i								
	1 –					1 –			1 –	1 –	
10 Nanguot/Tanuwe, middle-age, well- known, Tuval clan	8 i	5 i	10 i	4 i	9 i	6 i	6 i	3 i	2 i	2 i	69.6%
								1 n-i	7 –	1 n-i	
					1 –	4 –	2 –	5 –		3 –	
11 Epemu, middle-age, often in town, village councillor, Ngangalbuk clan	8 i	5 i	10 i	4 i	10 i	8 i	7 i	3 i	7 i	6 i	86.0%
						1 n-i		1 n-i	2 –		
						1 –	1 –	5 –			

The same *konggap* (1-11) modified:											
12 Gwego-Kamake (1. part. Gwego, 2. part. Kamake)	3 i	3 i	5 i	2 i	8 i	3 i	4 i	7 i	8 i	3 i	58.2%
			1 –		1 –	4 –	2 –	1 –	1 –	2 –	
	50.5	20.5	40.5	20.5	10.5	30.5	20.5	10.5		10.5	
13 Faiu (20% slower)	8 i	5 i	10 i	4 i	10 i	10 i	8 i	9 i	9 i	4 i	97.4%
										2 –	
14 Epemu-Njangwen (1.part. Epemu, 2.part. Njangwen)	8 i	3 i	9 i	1 i	4 i		2 i	3 i	7 i	5 i	53.1%
		2 –	1 –	1 –	1 –	9 –	3 –	6 –	2 –	1 –	
				2 0.5	5 0.5	10.5	30.5				
15 Faiu (3 semitones lower)	8 i	4 i	10 i	4 i	9 i	10 i	8 i	9 i	9 i	5 i	96.2%
		1 –			1 –					1 –	
16 Sibik modified: (second part first, first part follows)	8 i	4 i	9 i	4 i	10 i	9 i	8 i	9 i	8 i	6 i	94.6%
						1 n-i					
		1 –							1 –		
			1 0.5								
17 Nanguot (25% slower)	7 i	5 i	9 i	4 i	9 i	6 i	4 i	1 i	2 i	4 i	64.5%
						4 n-i	1 n-i		1 n-i		
	1 –		1 –		1 –		3 –	8 –	6 –	2 –	
18 Kamake (only first part of his *konggap*)	5 i	3 i	9 i		1 i						27.8%
	2 n-i		1 n-i	2 n-i	1 n-i	1 n-i	2 n-i		1 n-i	4 i	
	1 –	2 –		2 –	8 –	9 –	6 –	9 –	8 –	2 –	

Table 1: *Continued*

Konggap of:	Old men n = 8	Old women n = 5	Middle-age men n = 10	Young men n = 4	Young women n = 10	School children, male n = 10	School children, female n = 8	Children, male, no schooling n = 9	Children, female, no schooling n = 9	Middle- age men/women from neighbouring villages n = 6	Identi-fied:
19 Faiu (3 semi-tones (300 cent) higher)	6 i	4 i	10 i	4 i	10 i	10 i	8 i	9 i	7 i	5 i	92.4%
	2 –	1 –							2 –	1 –	
20 Nanguot (4 semi-tones (400 cent) lower)	7 i	4 i	10 i	3 i	9 i	6 i	5 i	1 i	2 i	4 i	64.%
						1 n-i			1 n-i		
	1 –	1 –		1 –	1 –	3 –	3 –	8 –	6 –	2 –	
21 Ongane (only second part of the *konggap*)	7 i									1 i	10.1%
		2 n-i	8 n-1	3 n-i	2 n-i	2 n-i	1 n-i		1 n-i	1 n-i	
	1 –	3 –	2 –	1 –	8 –	8 –	7 –	9 –	8 –	4 –	
22 Nanguot (50% faster)	7 i	4 i	10 i	3 i	9 i	7 i	5 i	1 i	2 n-i	4 i	63.2%
							1 n-i				
	1 –	1 –		1 –	1 –	3 –	2 –	8 –	7 –	2 –	
23 Nanguot (5 semi-tones (500 cent) lower)	7 i	4 i	10 i	3 i	9 i	7 i	5 i	1 i		4 i	63.2%
						1 n-i	1 n-i		2 n-i		
	1 –	1 –		1 –	1 –	2 –	2 –	8 –	7 –	2 –	
Identified:	85.3%	79.1%	86.0%	73.1%	70.8%	59.1%	60.3%	51.6%	50.7%	68.7%	

Explanation
1. i = identified, n-i = not-identified, – = no answer, don't know, 0,5 = partial answer (cf 12, 14)

Table 1: *Continued*

Therefore we selected for this set only *konggap* of well-known men and no women. Women are in general less active in public life and therefore their *konggap* are less known (see above).

For tracks 12 to 23 we used the same set of *konggap* but modified them with the help of a music-editing program and in a changed order, according to our specific study scheme. Track 12: an artificial *konggap* containing the first and second parts of the *konggap* of different persons, first part (Gwego) and second part (Kamake); track 13: Faiu's *konggap* played 20 % slower; track 14: an artificial *konggap* created with the first part of Epemu's *konggap* and the second part of Njangwen's *konggap*; track 15: Faiu's *konggap*, but this time 300 cents lower in pitch.[16] Track 16: Sibik's *konggap* modified in such a way that the second half was set at the beginning and followed by the first half; track 17: Nanguot's *konggap*, 25 % slower; track 18: only the first half of Kamake's *konggap*; track 19: Faiu's *konggap*, 300 cents higher; track 20: Nanguot's *konggap*, 400 cents lower; track 21: only the second half of Ongane's *konggap*; 22: Nanguot's *konggap*, 50% faster; and track 23: Nanguot's *konggap*, 500 cents lower.

The *konggap* where the first and second halves were made up of two halves of different persons (12 and 14), or where first and second halves had been swapped (16), or the second part (18) or the first part (21) deleted, consisted of only two very short motifs, thus it was possible to modify them in this way. The idea of the experiment was to show whether a *konggap* is heard and analysed as an inseparable unit, that is, on an unconscious psychophysiological level, or whether the *konggap* is considered to contain several parts that need to be detected before being able to identify the person in question. The tempo changes in the *konggap* should show the tempo tolerance with which the listeners were able to identify a *konggap*; changing the pitch of the entire *konggap* followed a similar idea. Here we aimed to find out at which level the pitch change would make it impossible for the Yupno to identify a *konggap*.

During a period of ten days we played the CD to eight people each day and discussed their answers with them. In this way we received answers from a total of seventy-nine persons: men, women, and children of different ages, people who were socially active, and people with only little social contact. To each listener we first played the unmodified *konggap* and then asked them to name the person whose *konggap* he or she had heard. If the listener already had difficulty in identifying an unmodified *konggap* (track 1–11) it was obvious that this had to be considered when the same person was asked to identify the modified *konggap.*[17]

INTERPRETATION OF THE RESULTS

The table (see above, pages 73–76) shows the result for each *konggap* as it was identified (i) or not identified (n-i) by the test persons (including the results in percentage). Additionally, a short reference to the owner of each *konggap* provides information on his social status.

The results of the empirical study actually do not allow us to say how the Yupno are able to differentiate between hundreds of *konggap* and how they remember the corresponding person. But it provides interesting new insight that helps to better understand the *konggap* 'enigma'. The main conclusions reached are the following.

1. **No difference in identifying *konggap* between men and women.** There is hardly a difference between men and women in their rate of successful identification of the *konggap* and its owner. 71.0% of the men and boys and 65.5% of the women and girls identified the modified and unmodified *konggap*.
2. **The older the person, the more *konggap* he/she can identify.** In general, older Yupno identified more *konggap* than younger persons. However, we need to differentiate here: the group of older men identified 85.3% and the group of middle-aged men identified

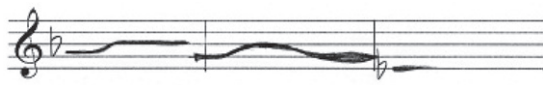
86.0% of the *konggap*. This stands in contrast to the group of young people (male and female 71.9%, the group of school girls and boys, 59.7%) and the children without schooling (51.1%). From one group to the next the percentage of those recognizing a *konggap* diminishes by approximately 10%. However, it is surprising that those children who regularly go to school identify more *konggap* than children who do not go to school. This might be explained by the fact that school children spend more time 'out in the public' and interact with more people (the way to school in Teptep is about a thirty minutes' walk for the children).

3. **The *konggap* of older men are more easily identified.** Especially well identified were the *konggap* of older men who had been socially active for many years in the village (for example pastor Faiu [1]). The well-respected *bigman* Megau (7) had lived in town for many years and had returned only recently to his village in the mountain range – 79.7% identified his *konggap*. However, to sum up, it becomes evident that the *konggap* of people who are active in social life are identified more easily than the *konggap* of people who lead a more isolated life; and people belonging to the closer social environment (family, clan, neighbourhood) are also identified quite easily.
4. **Deceased persons are still remembered by senior Yupno, but – for obvious reasons – not by children.** Jowage (3) has been dead for thirteen years; his *konggap* was identified by 69% of the senior people but only by 5.5% of the children. Njangwen (4) died more than twenty years ago; his *konggap* is remembered by 91% of the older people but by none of the children. Although the people are dead, their *konggap* is still performed in memory of them. It appears that the questioned children were able to memorize Jowage's *konggap* from such 'silent' performances.
5. **Neither tempo nor absolute pitch is significant for identification.** With regard to the modified *konggap,* neither the overall tempo nor the changes in pitch (up or down) of the entire *konggap* melody are significant for identification, as long as the melodic line and intervals stay the same. The people who identified the unmodified *konggap* also identified it with modified tempo and pitch.
6. **Artificially created konggap and the consequences.** The artificially created *konggap* consisting of parts from separate *konggap* did – as was to be expected – cause difficulties in recognition for some participants. Nevertheless, some identified the *konggap* but said it sounded strange, while others recognized it with ease and could even identify the two parts of the *konggap*. All the persons asked were able to identify Sibik's *konggap*, where the second half had been placed before the 'normally' opening part. Track 18, containing only the first part of Kamake's *konggap*, was for most people hard to identify (27.8%), so was track 21 featuring only the second part of Ongane's *konggap*. This fact implied that the *konggap* – although it is extremely short – must have some parts or elements that are more important as far as recognition is concerned, than others.

THE COMPLEXITY OF THE *KONGGAP* SYSTEM

Our empirical study made it clear that there is – in general – no connection between the musical form of the *konggap* and the family- or clan affiliation of their bearers.

Similarities between *konggap* of close relatives – as mentioned above – can be explained as follows: Teenagers of the same kin group may have a spontaneous idea – possibly when sitting together – and decide to create their personal *konggap* close in form to that of a friend, cousin, brother, or the father for the purpose of underlining the strong bond and eternalizing it. For example, Figures 2 and 3 show the *konggap* of the two cousins Sibik and Ongane. For our study we played both *konggap* with no modifications and, although most listeners were able to distinguish between the two, there was still a large number of people who confused them.



E---E--O--O OU--A--O----U E

Figure 2: Zaka sings Sibik.

O---U--A--O-----A-----A OU--A--O--U

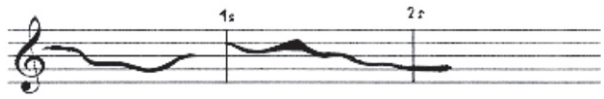
Figure 3: Zaka sings Ongane.

In Sibik's *konggap* (sung by Zaka), it is easy to recognize that the *konggap* consists of two halves. The first half (approximately the first second) is the introduction part that is followed by a second part (seconds 1–2) which we call the nucleus (see below). In this version, Zaka sings a very low E-flat following the nucleus.

Ongane's *konggap*, also sung by Zaka, is a bit longer (2.6 seconds) but also comprises two halves. The introduction part is slightly longer (1.7 seconds) than in Sibik's *konggap*, but the second part, the nucleus, is very similar. The introduction part is intoned with different vowels but for both nuclei the same vowels in the same order are sung. Ongane's *konggap* ends immediately after the nucleus, without the low sound on E flat following. The fact that many people confused the two *konggap* suggests that the endnote of Sibik's *konggap* does not have a special significance and could be left out – we discuss this finding further on in the article.

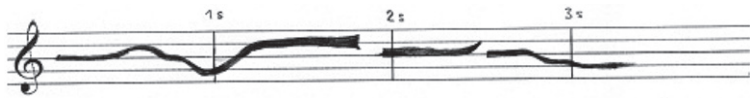
Although the *konggap* are of very short duration and contain little musical information, there are various ways to perform the same *konggap*.

The fact that the test persons were able to identify each part of the artificially created *konggap* consisting of two elements from different persons, means that each *konggap* must consist of distinct parts, or elements, and that it is not identified as an undividable musical unit. Our study made clear that each *konggap* includes a nucleus in which the musical information is concentrated. We call the sounds or musical elements that immediately precede the nucleus the introduction part; it appears that they are of less importance for recognizing the owner of the *konggap*. Still, the introduction must contain some significant information because, in the test, only 10 % recognized Ongane's *konggap* without the introduction part. We found out that the introduction part helps the listener to identify the singer because these parts can be sung in a very personal style, suggesting that the people who could not identify Ongane's nucleus without the introduction part might have been confused. In the introduction part the singer is free to play out his personal style or present mood. It can be performed playfully to indicate the happy mood of the singer, or two friends might even perform the introduction always in the same way for the purpose of revealing their identity to the *konggap* owner, apart from recognition by means of voice. Besides including information about the singer, the introduction part of a *konggap* also has the function of calling for attention from the listeners. Although the introduction part can be performed relatively freely in style, it has to be formally in accordance with the nucleus, for example, it cannot be too long in relation to the nucleus. On the other hand, as far as the nucleus is concerned only minimal modification is possible. The nucleus constitutes the second element of a *konggap*; some *konggap* have a third part to end the piece, or – as in Sibik's *konggap* mentioned above – a final note can be sung. However, a *konggap* never commences with the nucleus.



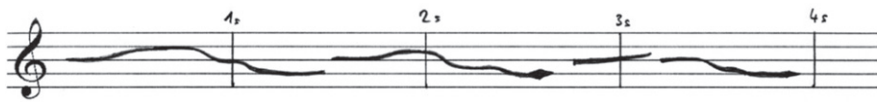
O---U-----E--E O------U E-----E----E

Figure 4: Children sing Faiu.



A------U------A-----E-------E O------U E------E----E

Figure 5: Zaka sings Faiu.



A------U------A-----E----E E----O-----U-------E O------U E------E----E

Figure 6: Zaka sings Faiu – long version.

Using relative pitch, notated examples 4 to 9 present the *konggap* of one and the same person (Faiu) as performed by various people. The first example (Figure 4) features Faiu's *konggap* sung by several children between the age of ten and fourteen. It is a simple interpretation, with an introduction part that has the function of asking for attention and of introducing the following nucleus, which, in this case, is also performed in a very straightforward way.

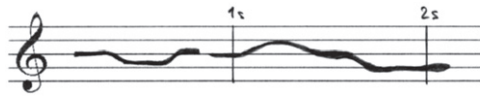
The next example (Figure 5) is Zaka singing the *konggap* of Faiu. Zaka is the village magistrate – a well-known and respected man. Zaka is one of the people with the largest repertoire of *konggap* and he sings them with a special form of virtuosity. Zaka and Faiu are friends who have known each other since childhood.

In this case Zaka sings Faiu's *konggap* in its common version. The entire *konggap* lasts for more than three seconds and is divided into two parts. The introduction part lasts nearly two seconds and ends on a strong D5 with the vowel E. The nucleus (approximately 1.3 seconds in duration, starting at about the two-second mark) is performed with the vowels O – U – E in a downward interval of a major third. The nucleus also differs from the one performed by the children because Zaka sings it with a very short break, displaying his ability to 'play' with a *konggap*.

Another interpretation of the same *konggap* sung by Zaka (Figure 6) shows how differently the same *konggap* can be performed, even by the same person. In this interpretation, the first part is longer but the nucleus is sung in a very similar way to the other interpretation of Zaka.

In the same way, two versions of Faiu's *konggap* were sung by Erap (Figure 7). The first example is quite close to the basic form (the one sung by the children) except that Erap does make a very short break between the introduction part and the nucleus. In the second interpretation (Figure 8), Erap sings the nucleus longer and more elaborately in terms of rhythm, but the introduction part consists of a simple movement.

The transcriptions below of the children singing the *konggap* of Faiu are performed by boys from ten to fourteen years of age (Figure 9). Children over fourteen are free to develop

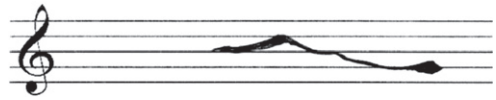


A-----U----A O-------U--E--U--E--E

Figure 7: Erap sings Faiu.

A--------E O-------E--E--U--E--U----E

Figure 8: Erap sings Faiu – long nucleus.



F A I U A O----U-----E---------E

Figure 9: Children sing Faiu.

their personal way of interpreting a *konggap*. But children between five and, say, eleven use a simple learning method for the *konggap*. They only sing the nucleus of the *konggap* in a very simple way and, in place of the introduction part, they call the name of the *konggap* owner after which the nucleus follows without a break (Figure 9).

INTRODUCTION PART AND NUCLEUS

Each *konggap* consists of two parts: the introduction part and the nucleus. The introduction part gives the singer the freedom to include his/her personal note, while the nucleus identifies the *konggap* owner. The nucleus offers less freedom to the singer to play with its form, and in many of the cases we recorded the vowels applied to sing the intervals are the same. The nucleus does not need to be separated from the introduction part by a short break (Figure 8), as the *konggap* transcriptions go to show. For all the nuclei of Faiu's *konggap* the vowels O, U, E are used. Likewise, Sibik and Ongane's *konggap*, which left many people confused, featured identical vowels (OU, A, O, U). However, we were told that there is no fixed rule for this either, though, of course, this might help to identify the *konggap* owner. Moreover, it was pointed out to us that people from different villages or different clans might sing the same *konggap* in different ways and might pronounce the vowels in different ways.

When a person hears a *konggap* he must a) search his memory for one or several familiar *konggap* and b) decide with which *konggap* the one just heard is identical, or at least very similar. This second step where the structure and sounds are compared with memorized *konggap* is the tricky part because there are various ways to sing the *konggap* of one and the same person. It is important that the listener is able to intellectually compare, judge, and decide which stored *konggap* is identical, or at least comparable, to the one heard. Important here is the ability to divide a *konggap* into its introductory element and its nucleus. This demands a fair amount of experience and using the working memory and its concept even without a detailed theory and terminology to describe a *konggap*. Crowder's 'auditory

knowledge' (as mentioned above) is based on experience and memory and – in the case of *konggap* – on a person's intellectual and musical ability, albeit without theory and detailed vocabulary to back it up. Comparing a perceived *konggap* with the hundreds of *konggap* stored in the long-term memory is an astonishing feature that is accomplished in an instant.[18]

It seems evident that the key to the ability of recognizing a *konggap* lies in the Yupno soundscape of which the *konggap* are a major part. Just as Richmann (2000:303) states that music making is 'entirely built and organized around the principle of repetition', the same applies to the Yupno who encounter *konggap* on daily basis. Richmann continues that a) 'formulaicness', the storehouse of preexisting formulas (riffs, themes etc.) and b) the high sense of expectancy on the musical continuation are of importance as well (Richmann 2000:304). Both points might be correct for European music, but are of less importance in the case of the *konggap*. There is no fixed structural order for a *konggap* – except the division into introduction part and nucleus – and in this case neither musical expectancy nor formulaicness – as mentioned by Richmann and which he connects with European music – play a role. Thus, the compilation of a collection of *konggap* is based exclusively on repetitive listening and singing of *konggap*.

Prior to our empirical study of 2007, the great number of *konggap* that the Yupno could memorize and identify surprised us, and it left us looking for explanations. Due to our study we know that the system is even more complex than expected, but we still have no conclusive explanation as to how the Yupno are able to handle such a large number of *konggap*. As the answer does not appear to lie in the music of the *konggap,* it must be sought in the social field. As mentioned above, the Yupno lead quite an isolated life in their mountain valleys (the plane arrives once a week). They are in ongoing contact with one another, moreover, most of the adults have lived there 'all their lives' and are closely linked through family ties. This means, the Yupno know each other on a very intimate level. Not only do they recognize the voices of most of the people of their surroundings, they also know each other's personal style of singing a *konggap* and can even 'hear' in what mood the singer is.

For recognizing the singer of a *konggap*, voice recognition and knowledge of the singer's interpretive style play a crucial role. For example: when walking in the garden area one day, Wuli sang the *konggap* of the landowner, Paul, his brother, as we crossed his land. Paul was in his house about 100 metres below. Next we heard in answer the *konggap* of Wuli sang by Paul, from which we gathered that Paul had recognized the singer of his *konggap*. Voice recognition is an extremely complex human skill. With regard to people who have not met or talked to each other for many years, the chance is greater that they recognize each other by their voices than by sight.[19] In a society in which people live in very close contact and meet almost on a daily basis, the potential of voice recognition is even greater. Paul had also another indication of knowing that the *konggap* was sung by Wuli. Friends often develop a unique personal style of singing their friend's *konggap*, with which they are, of course, familiar.

Taking a further example to show how familiar Yupno are with the personal habits and practices of people of their closer social environment, we would like to refer to their particular counting system (Wassmann and Dasen 1994). They use a body-part counting system. A Yupno counts first the fingers of the left hand (numbers 1 to 5), then the fingers of the right hand (6–10), followed by the toes of the left foot, 11 to 15, and then the right foot, 16 to 20; the right ear stands for 21, the left one for 22, followed by the subsequent order of body parts: left eye (23), right eye (24), nose (25), left nostril (26), right nostril (27), left breast (28), right breast (29), the navel is 30, finally the numbers for 31, 32 are left and right testicles, and penis for 33 – women also count in this way. This counting system is the one generally used and seems to work very well; it is generally communicable and intersubjective.

And yet, the variability in using the system is surprisingly large. The impact, however, is minimal since in daily life counting is done publicly, meaning the procedure takes place on in front of everybody's eyes, so that everyone knows how the sum is arrived at. With regard to

the counting system, observing the counting process is of importance, while for the *konggap* it is the recognition of the singer on the basis of his voice and his personal style of interpretation. What is crucial is that, in both cases, the actor is known and each observer is familiar with the personal variation applied by the specific actor. Again, owing to the socially tight bonds each Yupno knows the other's personal style of counting or singing a *konggap* and is able to translate the interpretation from one system into the other.

CONCLUSION

The musical facts

Even though *konggap* are only short melodies, they are divided into even smaller parts (introduction part, nucleus, occasionally a third part) with no fixed rules as to how such a division has to be made. There are various personal styles of performing *konggap*. Participation in a shared social life means the Yupno are constantly confronted with *konggap*. As a result, a 'collection' of *konggap* is stored in long-term memory, but of equal importance is the intellectual effort (working memory) it requires to identify a *konggap* in its rendered form. It is the two competences 'memory' and 'intellect' (the musical ability to read a *konggap*) in combination that allow a person to become an experienced *konggap* connoisseur.

For music as for visual recognition, grouping ('what goes with what') is the key process — an automatic one that happens rapidly in the brain and without conscious awareness (Levitin 2006:75). When listening to a *konggap,* comparison with all the stored *konggap* is an automatic and unconscious process, similar to the mode of visual comparison. Standing on a mountaintop and looking out over the forests, fields, lakes, and so on, all the trees and all the fields look very much alike. It is only when walking through the forest that we detect the differences between the various trees. Translating this notion into the field of *konggap*, one could say that first instant of hearing a *konggap*, requiring a decision whether the musical event heard is a *konggap* or not, is like observing the forest from far away. Excluding a whole range of *konggap* with obviously different forms in the nucleus is like taking a step closer to the forest, field, etc. – to remain with the picture of the forest. And so the listener successively excludes more and more of the stored *konggap*, finally concentrating on the details of musical information perceived and deciding on what kind of *konggap* it is and who the owner is; evidently personal experience, memory, and musical intellect are of primary importance.

The lack of a specific, indigenous theory and detailed vocabulary to refer to *konggap*, facilitating a consciously analytical phase (see page 68, Cognitive processes when hearing a *konggap*), is compensated by the ubiquitousness of and daily confrontation with *konggap*. The lack of a vocabulary posed quite a problem for our research because it was difficult to discuss the *konggap* in musical analytical terms with the people, but for the Yupno the vocabulary they have is sufficient. Each *konggap* contains a lot of information, and by means of constant confrontation with and repetition of *konggap* the Yupno develop their musical ability to identify a few hundred of these very short musical motives and identify the owner. This brings us to Borofsky's (1994) distinction of 'knowledge' and 'knowing' ('how to do'). Applied to the Yupno, this means they 'know' how to perform and identify *konggap* without reverting to declarative 'knowledge'.

Although the *konggap* include very little musical information, they contain sufficient hints for identification on a social basis as to who sings a *konggap*, where, when, and why.

The social facts

Konggap are an important part of the soundscape, and when living in a Yupno village one hears *konggap* being sung all day, especially in the morning and in the evening when the people are on the way to or from their gardens. In the research on the origins of music – which

has received renewed attention and interest over the last decade – scholars have identified 'social bonding' as one of the early functions of music (Freeman 2000; Mithen 2006). Social bonding in the form of singing and dancing together had the function of creating a feeling of togetherness and collective responsibility. Although they are seldom performed in groups (see page 65), *konggap* seem to be important to the Yupno in terms of creating social bonds and distinguishing themselves from foreigners who do not understand *konggap*. Only the Yupno can identify *konggap* and know their meanings. In this sense, a *konggap* is a kind of identity marker, not just of its bearer but also of its singer. *Konggap* is not just a personal music but also music to identify with. Although the Yupno share a socio-centric concept of personhood with many other ethnic groups in Melanesia, they express their individuality with the *konggap* – an individuality that can continue for decades after death.

Yupno people living outside their mountainous homeland do not continuously hear and sing *konggap*. *Konggap* is not part of their habitual soundscape and the singing of the *konggap* might even be an embarrassment. On the outskirts of Madang, in a place called Sakalau, lives a community of Yupno people. Most of the men in Sakalau we talked to had come down from the mountains when they had gone to high school in Madang and had never gone back. Most of them now work in Madang and have their family in Sakalau. The Yupno of Sakalau do not traditionally possess land there and thus there is no need to sing *konggap* when walking through Sakalau. *Konggap* singing is not part of daily life in Sakalau, and it brings the Yupno living there no advantage. Moreover, people from other regions – not Yupno – living in Sakalau might even make fun of the Yupno if they were to sing their *konggap.*[20] It seems that the Yupno in Sakalau have abandoned the *konggap* as an identity marker and adopted the general urban or semi-urban culture common to towns in Papua New Guinea.

Impressed by the incredible amount of *konggap* that the Yupno are able to memorize, we wished to find out whether a *konggap* is heard and analysed as an inseparable unit and identified on an unconscious psychophysiological level, or whether the *konggap* contains a structure that allows inference to a specific person. The lesson we learned is that musical and social facts combined are necessary on the basis of the intellectual processing of working memory to long term memory. Human beings have a huge mental und auditory capacity. When living in close relationship day in day out for their entire life, they are able to differentiate the slightest particularities of their fellow men. At the same time, the auditory capacity can be developed to hear details that humans who are not part of the same culture and society are unable to.

ACKNOWLEDGEMENTS

We thank the two anonymous reviewers of this article; their critics and constructive suggestions helped to shape this article in its actual form. We also thank Tom Fritz of the Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany, for openly sharing his opinions with us on an earlier draft of this paper, and Nigel Stephenson for his editorial work. Our warmest thanks, *bigpela tenk yu,* are going to Zaka and the villagers of Gua for their cooperation in our *konggap* study and their hospitality, generosity and warmth.

NOTES

1. Personal songs exist in many music cultures, for example, the *joik* of the Sami (Arnberg et al. 1969) or the Chukchi Shaman who composed songs for his children (www.opos.unibas.ch), but a single vocal expression as an acoustic representation and, at the same time, signaling a call for the same person is unique.
2. During the learning period children call the name of a person followed by this person's *konggap* without a break.
3. *Kundu*: hourglass-shaped membranophone common to many parts of Papua New Guinea, with one drumhead.
4. Sami might '*joik* a person' when thinking of him or her, but a *joik* is not such a strong acoustic representation of a person as a *konggap* for the Yupno; furthermore, a *joik* is a song whereas a *konggap* is a vocalized musical motif.

5. For a detailed description see Niles (1992), a short description is given by Wassmann (in Love et al. 1998:303–304).
6. The majority of Yupno probably migrated many generations ago from this island to the mountain ranges after the eruption of a volcano, and – according to traditional belief – they will return there after death (Wassmann 1992).
7. In earlier times, the funeral rites included the display of the corpse on a tree or a rock. Despite several attempts by the pastor and church leaders to forbid the women to sing these *konggap* – arguing that it is 'unhealthy' since a dead person is in the house and that it is God who gives and takes life and that therefore singing *konggap* is not appropriate, in contrast to singing church songs – the women still hold on to this tradition (Keck unpublished fieldnotes 2004).
8. A *garamut* is a slit-drum up to four metres long, partially carved, and set horizontally on wooden blocks.
9. Similar systems are common in other parts of Melanesia (Ammann 2012).
10. In Bigand's study, only instrumental music (piano solo) was involved – words would make the identification easier.
11. Extensive research on the neurophysiological basis of these fundamental cognitive capacities has been carried out especially for concept formation, revealing a variety of biological mechanisms (reviewed in Mahon and Caramazza 2009; Smith 2008). 'Specifically, depending on whether the processes involved rely on rule-based or similarity-based reasoning, the network implicated comprises different sub-regions of the frontal lobe as well as the thalamus and parietal cortical regions (Grossman et al. 2002; Koenig et al. 2005)' (Wassmann et al. 2011:57).
12. Working memory, an influential model that Baddeley (1990) studied in great detail, both in the perceptive as well as in the cognitive domain (reviewed in Goldman-Rakic 1996; Pasternak and Greenlee 2005; Linden 2007; Baddeley et al. 2009), includes a 'central executive controller along with two slave systems: the phonological loop and the visuospatial sketch pad' (Berz 1995:353). Berz (1995) proposes a third system for musical experiences that does not fit into Baddeley's theory. Many psychologists accept a dual memory system with components, a model that is based on short and long-term storage components that goes back to Atkinson and Shiffrin (1968).
13. Individuals without a fully developed working memory, such as young children, act as if 'out of sight' is 'out of mind'; Jean Piaget fittingly coined the term sensomotoric stadium for this stage in human ontogenesis (Wassmann et al. 2011; *cf.* Gazzaniga et al. 2008).
14. The 'Tchamba' songs from the Grande Terre of New Caledonia consist of five verses. Each contains only one name, the rest are syllables without meaning in reference to the song's content. The order of places refers to the mythological migrations of the clan founders of the Duy and Bai people (Ammann 1997:129). Lindstrom (in Kaeppler et al 1998:707) gives a similar example from the island of Tanna in southern Vanuatu, and Wassmann (1991) refers to a system of mythical migrations sung in song cycles by the Iatmul of the Middle Sepik River in Papua New Guinea.
15. 1. Faiu (middle-age, influential man and Lutheran pastor), 2. Sibik (elderly, highly respected man), 3. Jowage (grand old big man, died in 1993), 4. Njangwen/Nanjangne (big man, died before 1986), 5. Kamake/Taranuwe ('loner', lived reclusively with his sister, now in Madang), 6. Gua/Wuate (middle-aged man with large family), 7. Merat/Megau (elderly man, respected opinion leader), 8. Ongane (old, well-known man), 9. Gwego (died in 2001, member of an extended family, well-known person), 10. Nanguot/Tanuwe (middle-aged man, well-known person), 11. Epemu (middle-aged man, village councillor, often absent in Madang).
16. 100 cents correspond to a half tone in the tempered scale.
17. If a person was unable to identify one of the unmodified *konggap*, the same but modified *konggap* was not taken into consideration.
18. The psychologist Carl Stumpf (1890) (the founder of the Berliner Vergleichende Musikwissenschaft that later became ethnomusicology) was already interested in the question of why humans when listening to a melody performed at different pitches can declare it to be the same, although it might consist of totally different tones. In addition to his research on music, Stumpf was an important figure in Gestalt psychology and worked on an aural and visual approach.
19. I (Ammann) might refer here to a personal experience: about twenty-five years ago I used to play in a band with three other players. After moving away I lost contact to my former band colleagues. Two years ago I learnt that one of them had died, and I went to his funeral. I was surprised not to see the other band members (a couple) there, so I called one of them that same evening. The husband answered the phone and when I asked: 'Is this you' [followed by his name], he answered, 'Oh, hello Raymond' and I learnt that they both had been at the funeral but that we had not recognized each other. Notably, after hearing only a few words, my former band colleague had been able to identify my voice, and that after twenty-five years!
20. A few men around thirty were able to identify three of the eleven *konggap*. They still remembered these from the time when they had been young and lived in the Yupno region. The teenagers and children born in Sakalau do not know any *konggap*.

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