Rhythm in communication, the fundamental basis of music therapy.

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1 We’ve got rhythm.

“Rhythm [plays a role] in linking people, by providing a common framework of identification. Rhythm is, after all, a prime mover in social relations. Rhythmic patterns facilitate the co-activity of groups and aid their members in coordinating energies and resources in work, nurturance, defence, social discourse, rites of passage, interchange of information, and, above all, expressive acts. (Lomax, 1982; 149-150)

Whether we are running for a bus, laughing with friends, talking or sharing a game of peekaboo with a child, human rhythm pervades every aspect of our physical lives and provides the neural substrate of motivated psychological time that is the very basis for communication both verbal and non.

The critical nature of rhythm in human activity has long since been recognised in academic circles but has proved far more elusive to study. Rhythm in human behaviour was traditionally viewed from a physiological viewpoint considering the cycles of life, endogenous bodily rhythms (internal bodily processes) such as, nervous activity, muscle activity, waking and sleeping, the menstrual cycle, bone growth and reabsorption; ranging from ultradian cycles shorter than 24 hours (from milliseconds to hours), circadian repeating over 24 hours, to infradian with periodicities greater than 24 hours (Chapple, 1970). A broad review of rhythmicity in relation to entrainment or engaging with rhythms can be found in Clayton, Sager and Will’s review of entrainment (2004) or Warner (1988). As cognitive operations and communicative interaction has come under closer and closer scrutiny, ultradian rhythms principally those overtly enacted by our bodies musculature, have become the focus of wide ranging scientific enquiry.

With advances in mathematics and computing and the ‘predictable’ or cyclical nature of rhythms science has attempted to model human rhythmic activity. However, as the need for statistics as a tool in the measurement of human behaviour dictates, variability is the key to human communicative rhythms, where the patterns of speech and music cannot be reduced to simple mathematical relationships (Jones & Boltz, 1989). In fact, precise synchrony, rigid entrainment or strictly regimented rhythmic behaviour are not generally associated with health or positive effect (Clayton, Sager & Will, 2004; Wigram, 2002). Indeed what is crucial to rhythm in human behaviour is its dynamic nature and our ability manipulate it, to mould it to our own ends in collaboration with others. We are not “slaves to the rhythm” But from infants in dialogue with their caregivers to virtuoso musicians we are masters of it (Trevarthen, 1999).
2 The human capacity for rhythm.

2.1 Rhythm as an active process

Naturally occurring human rhythm is not something construed or constructed through behaviour but is a natural property of human activity, in particular serially ordered motor behaviour (Lashley, 1951).

It is important to make the distinction between human rhythm or rhythmus and more complex specified cultural, social or musical rhythms. Rhythmus is the enacted perceivable quality of movement that affords interaction with that activity and is rooted in prospective control (Lee, 1998). The natural rhythmicity of human activity is what makes sympathetic time sharing possible, it is the neurological substrate for “synrhythmia”, the dynamic and sympathetic coordination of behaviour with another (Trevarthen, 2007). It is neither metric nor predictable by some form of algorithm, hierarchy, or oscillator but readily perceivable through engagement with it. Rhythm is an active process, it is something born out of what we do, and when we do things with others we combine our individual rhythms together to create dyadic dynamic patterns of action.

When perturbed either through neurological, physical or psychological damage the effects can be crippling in both a physical and social context. Sensitivity to this most basic of human facets is the starting point for many therapists who are, perhaps without realising it, true experts in human rhythm. The overt focus on human rhythmic activity in music therapy is conceivably one of the reasons for its success in reaching such a variety of individuals with differing needs.

2.2 The body’s unit of time.

The human capacity and competence in sharing time constructively, is based in our bodies’ fundamental system of control (Trevarthen & Schögler, 2007). As such it is not simply limited to sound and the manipulation of it, but is a fundamental component of all purposeful behaviour. Consequently the positive effect of engaging in rhythm can be achieved out with sound and can reach all disability, and the debilitating impacts of problems in rhythm can be far reaching.

“All gestures and intentional vocalisations are ultimately actions of the musculature” (Donald, 1999, p. 41).

The building blocks for rhythm in behaviour are the actions themselves. The purposeful control of our bodies produces action that is prospectively guided (forward looking), the nervous system controls not just where an action arrives but when it will arrive, and as healthy human beings with the same basic neurological underpinnings (Rizzolatti, & Craighero, 2004) we are able to perceive ‘when’ that is. This “action-time” is given mathematical, experimental and biological description in “General τ Theory” (Lee, 1998). General τ theory provides our muscles and perceptual system with information about ‘when’ we are in the course of an action. The information is amodal, not specific to particular sensory or control modality, and consequently rhythm pervades all outward purposeful human activity not just the creation of sounds.
2.3 From pulse to phrase, *action time to rhythm*.

As we move our actions follow each other, our many effectors (hand, gaze, voice etc.) overlapping in time and space, creating overlapping sequences of behaviour. In order to move with purpose and efficiency in a manner at once sensitive to our surroundings and to our effect on them, a human being is sensitive and receptive ahead in time. Bernstein called this aspect of co-ordination and control of movement the 'Sollwert'. Such a foundation for prospective control requires both the sensitivity to and appreciation of the temporal relation between sensory events, and an integrating plan, a motor image or engram anticipating a goal (Bernstein, 1957).

Bernstein, by demonstrating our propensity for ‘forward thinking’ in action, broke away from an S-R paradigm according to which, successive events in a sequence of action rely on excitation by reflex chains. Lashley's famous work on serial order in skilled motor activity stressed the need for predictive organisation to be imposed upon skilled motor activity in order to achieve the complex patterning and co-ordination evident in behaviours such as piano playing or speech (Lashley, 1951). The rhythmic nature of well co-ordinated skilled movements results from the coherent generation and implementation of a temporally structured plan, a ‘motor image’ (Jeanerod, 1999) requiring ‘time in the mind’ (Pöppel, 1994).

This serially ordering of behaviour, with actions occurring as part of a series of events, each of these physical events produces a readily perceivable unit of time as part of series of units or pulses produces natural bodily rhythm or phrase, with which we can choose to interact, to coordinate our behaviour around, or not. This *choice* to coordinate is an important element, and reiterates the crucial element that we are not simple oscillators entraining mechanically. Our capacity to entrain, or be in time, to varying degrees is a natural result of skilled purposeful action, if we can coordinate our body’s many effectors, such as the exquisite synchronisation of hands and voice in conversational exchanges (Condon, 1976), then we have the necessary perceptual, neural and motor control to co ordinate our behaviour with others. As the complexity of our behaviour builds so these singular units of *action-time* are weaved into the social and cultural rhythms of human communicative behaviour such as music, conversation, dance, and comedy. When enacted by a human body these provide a wealthy source of interactive possibilities. Created by our bodies, they are malleable or adaptable by them, at both the micro and macro levels. In short rhythm is not imposed upon us, but generated through our own activity and as such is accessible to us. The view of rhythm as a special skill or talent is damaging and quite untrue for the majority of human beings, in fact without our acute sense of time and how to play with it a task as simple as walking would be impossible. Music is a special case, where we take time to overtly focus on the rhythms we make and share together, but the essential building blocks are part of our basic neural infrastructure.
2.4 The impact of impairment.

When our bodies and/or brains are damaged encumbered or handicapped in some way overcoming the impact to our communicative abilities is one of the primary goals of therapeutic processes, both physical and psychological. Impairment in both our production and perception of rhythm in human action can be the result of physical (ataxia, cerebal palsy, parkinson’s disease or psychological perturbation (autism, depression, borderline personality disorder). The reality of most situations is a combination of both mental and physical to varying degrees and this effects an individuals ability to co-ordinate their rhythm/action with others; either in production, perception or in the ability to engage with others rhythms, commonly called “entrainment” (Clayton, Sager & Will, 2004). A recent survey of children in America identified communication disorders and co occurring mental health problems to be of major educational and public health concern (Pinborough-Zimmerman et al, 2007). The aesthetic properties of neonates’ limb movements are used by paediatric neurologists to assess neurological integrity and well being, illustrating this fundamental link between healthy bodies and healthy brains (Prechtl, 2001).

Figure 1. shows a simple illustration of how our bodies capacity to create temporally structured/rhythmic/predictable behaviour is effected by disability, and how music can provide a supportive environment and therapeutic aid to coordinating behaviour. The figure shows data gathered using 3 dimensional motion capture equipment recording the movement of the limbs in mm in the simple task of touching your nose with your index finger. The graphs A., B. and C. show the movement and corresponding velocity of the hand against time in the vertical axis:

**Fig. 1: The effect of music on simple motion dynamics in human action.**
A. shows typical data for a healthy adult reaching their hand to their nose and back down again. The velocity graph shows a smooth acceleration and deceleration of a well-controlled action whose time course is perceivable and predictable from its form.

B. shows the typical data for an individual with severe learning difficulties, they are not registered as physically disabled, note the slower, jerky and unpredictable nature of the movement. They are able to reach their nose but it is not a fluid motion and the lack of temporal structure is immediately evident when graphically represented in this format.

C. shows the same individual performing the same movement from waist to head whilst dancing to music. The structuring effect of the music (a piece of bhangra - lively dance music originating in the Punjab region of southeast Asia) is immediately evident as the motion reflects/mirrors that of a healthy individual.

Boucher (2001) has shown that individuals with Autism suffer timing deficiencies, principally in perceiving the rhythms of others, making communication so difficult in traditional contexts. Their production of rhythm remains intact evident in restrictive repetitive behaviours. This mechanical stereotype illustrates that the problem lies in managing and negotiating rhythm with others, they are able to produce controlled action but are unable to dynamically share those rhythms with others in everyday contexts. There may be sensory bases to this crippling impact of autism and other communicative disorders. Everyday communicative interaction is an intricately choreographed ballet of gesture, voice, gaze and body, it is a multimodal coordination of streams of bodily rhythms. Musical situations presented in a sensitive manner provide a framework to share rhythms safely within a single modality, relieving the pressure of standard face-to-face contact.

3 A focus on therapy.

Each and every therapeutic process/situation is rooted in communication. This varies from the complex linguistic analytical exchanges of psychoanalyses to the more visceral non-verbal situations of the music or play therapist, and more often than not both parties engage on a variety of levels in their communicative repertoire. The ability of human beings to share time constructively is the substrate for these interactions, and this ability is rooted in the central nervous system’s control of voluntary behaviour. Music therapy exists in a variety of forms from improvised engagement, playing in groups and solo to simply listening to music. What is crucial to note is that music therapy is just one example of rhythm in therapy and behaviour, and that this temporal skill underpins all therapeutic and indeed any communicative exchanges.

Music therapy does provide a safe platform to explore rhythmic capacity; it is defined by the American music therapy association as “the prescribed use of music by a qualified person to effect positive
changes in the psychological, physical, cognitive or social functioning of individuals with health or educational problems”. [we will add here the German definition] A key element is the therapist’s skill or strength in providing supportive and sensitive rhythm, human rhythm, in synrhythmia, the act of sharing time constructively (Trevarthen, 2007). As musicians we focus on manipulating rhythm in sound, making it overt, available to others and crucially inviting/pleasing or engaging. The importance of human rhythmus in communicative behaviour is borne out by the positive impacts music therapy has for individuals with linguistic or communicative deficits when combined with more traditional speech and language therapies (Brotons and Koger, 2000; Wigram, 2002). The music therapist provides a safe environment for individuals to explore the rhythms of their own and of those around them, the therapist can help manage the emotional contagion, complexity and risk, and over time, following a vgoskian style scaffolding (Berk, & Winsler, 1995), help the individual grow in skill and confidence and rebuild what so many of us take for granted from birth. The ability to control our bodies, and to be sensitive to others. As Vygotsky stated "what a child can do with assistance today she will be able to do by herself tomorrow." (Vygotsky, 1978, p.87)

4 We’ve got rhythm (reprise).

Voluntary behaviour is both plastic and purposeful, and is a result of the prospective control of action. Prospective control incorporates information from outside the body with guiding information from within the body to produce well-formed skilled movements. Our bodies’ ability to coordinate different streams of information together to control behaviour provides a plastic system that can lead or be lead, both elements being crucial in the therapeutic process. Music therapy can be thought of as a ‘soft play area’ (kindergarten play park) for exploring communicative skills, with rhythm providing the various apparatus/structure on which to play, the textures, colours and games come from melody, harmony, timbre and the myriad of sonic possibilities music affords. The therapist acts as the kindergarten teacher, guiding us to area’s suited to our abilities and holding our hand when we wish to climb higher or jump further, keeping us safe and helping us grow in confidence. In the words of George Gershwin “who could ask for anything more”.

References:


