

1 Abstract

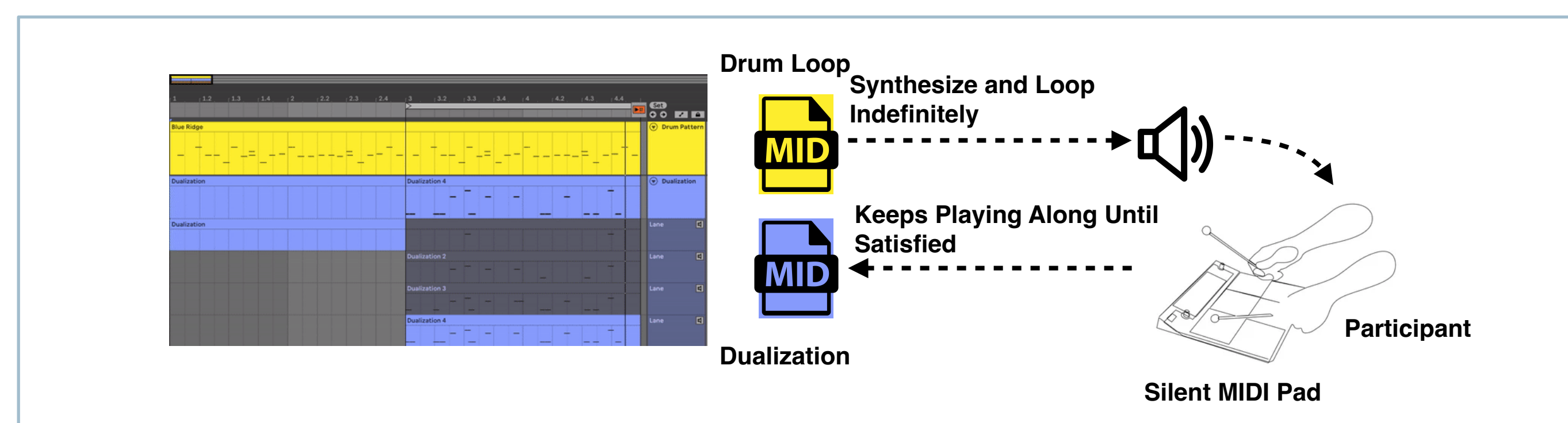
- In this paper, we investigate whether experienced drummers can consistently represent and reproduce the rhythmic essence of a given drum pattern using only their two hands.
- To this end, we present TapTamDrum: a novel dataset of repeated dualizations from four drummers, along with preliminary analysis and tools for further exploration of the data.

2 Motivation

- Synchronization of movement to a musical pulse happens automatically, whether of the hand movements [1, 2], walking [3], or dancing [4], all involving two limbs!
- The ability to coordinate two limbs in a synchronised and precise manner is essential for playing musical instruments and dancing to music [5]
- Many complex rhythms in West African music can be represented with a bell pattern, which could usually be played with two-voiced percussion instruments [6]
- Subjective rhythmization [7]: perceiving a monotonous auditory stimuli as two streams: “tick-tock-tick-tock” instead of “tick-tick-tick-tick”
- Addition of a single instrumental component to a monotonic rhythmic pattern can greatly influence its perceived rhythm, while adding more has discernible impact only in certain instrumentation contexts. [8]
- Lartillot and Bruford argue that any rhythm can be reduced to an oscillation between two states: high and low [9]

3 Data Collection Sessions

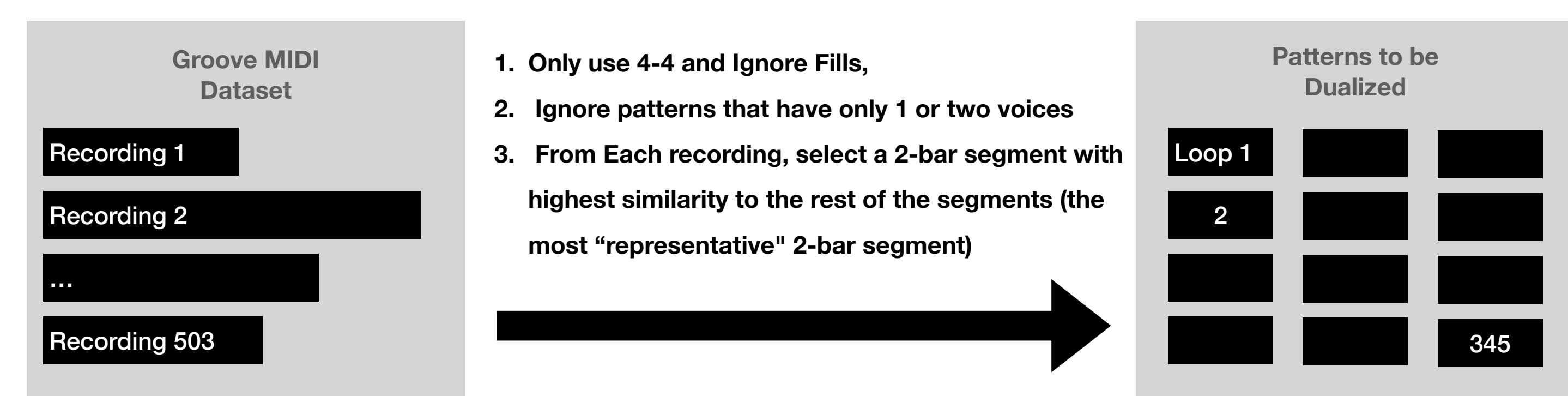
	Participant 1	Participant 2	Participant 3	Participant 4
Age	41	20	24	22
Experience	25 (Years)	11	10	9
Dominant Hand	Left	Left	Right	Right



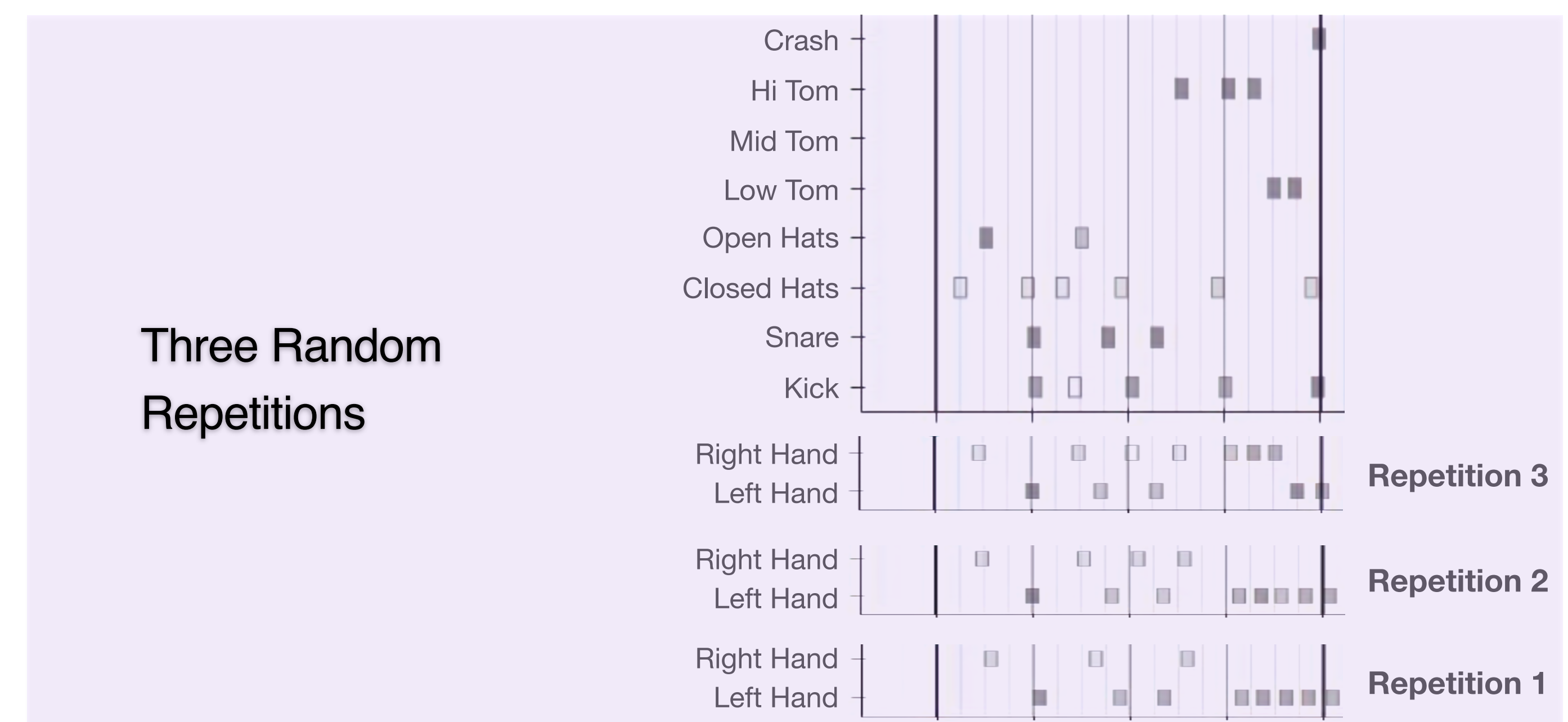
Repeated 1116 Times between the Four Participants

The participants were allowed to continue their dualizations indefinitely until they felt confident in the accuracy of the dualization. All the drum patterns in all of the sessions were synthesized using a single sound source. Moreover, no auditory feedback from the dualized pattern was provided to the participants

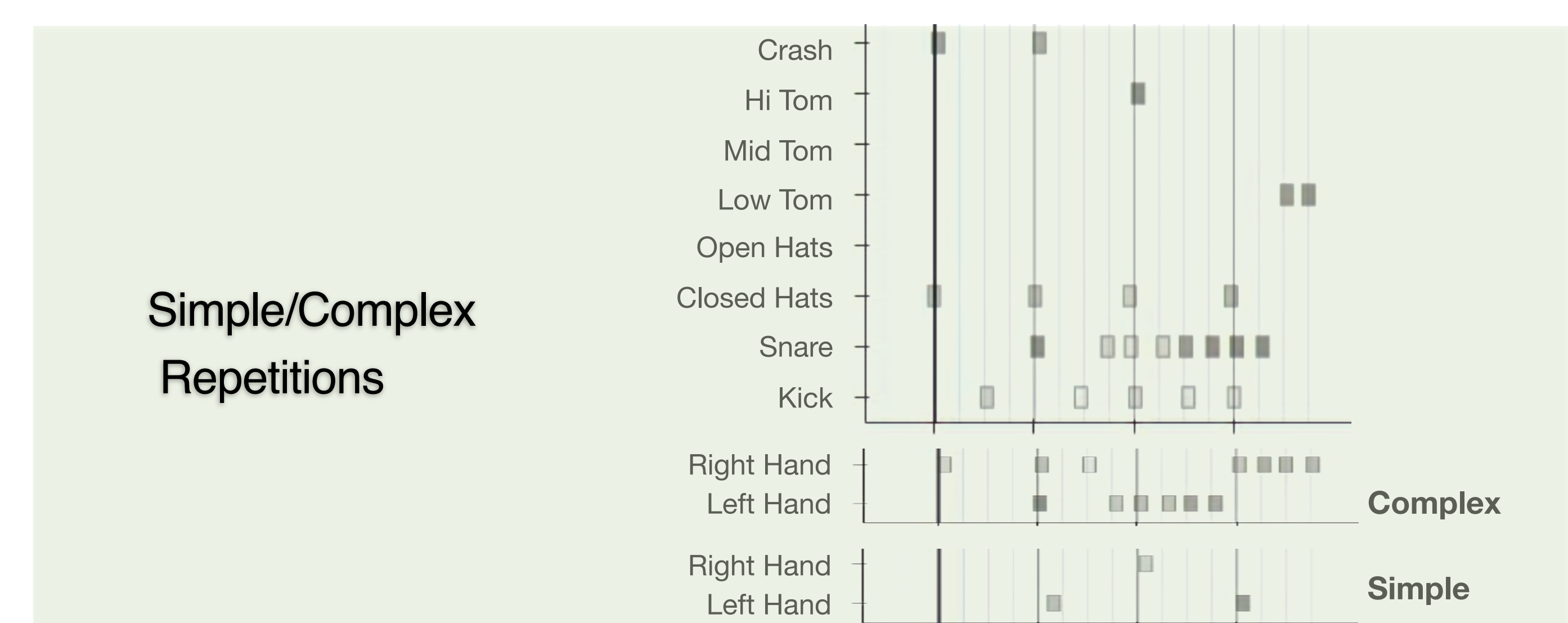
4 Source Drum Patterns



5 Subset A



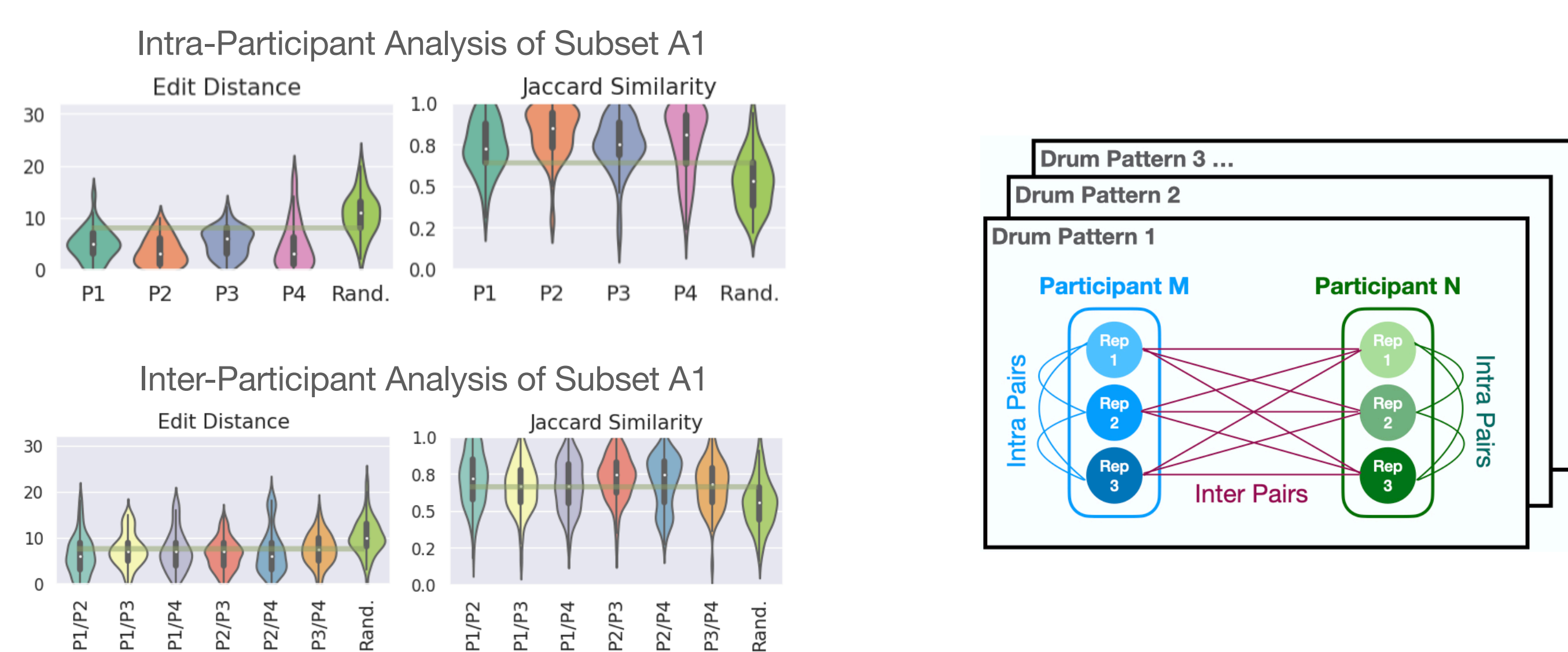
Subset B



6 Summary of Dataset

Subset	Tested Drum Patterns	Repetitions Per Test				Total Dualizations
		Participant 1	Participant 2	Participant 3	Participant 4	
Three Repetitions (A)	Multi-Participant (A1)	24	3	3	3	288 (24x3x4)
	Single Participant	48	3	-	-	144 (48x3x1)
Simple/Complex Repetitions (B)	Multi-Participant (B1)	69	2	2	-	276 (69x2x2)
	Single Participant	204	2	-	-	408 (204x2x1)
Total	345	762	210	72	72	1116

7 Preliminary Analysis



Main Speculations that require further validation:

- Experienced drummers have a consistent dualized interpretation of rhythms, however, these interpretations vary to some extent compared to other drummers.
- Complex dualizations are generally more active than the simple dualizations.
- Unless restricted, the drummers default to more active dualizations

[1] Repp, Bruno H., and Amandine Penel. “Auditory dominance in temporal processing: new evidence from synchronization with simultaneous visual and auditory sequences.” (2002).
 [2] Treffner, Paul J., and M. T. Turvey. “Handedness and the asymmetric dynamics of bimanual rhythmic coordination.” (1995).
 [3] Leow, Li-Ann, et al. . “Familiarity with music increases walking speed in rhythmic auditory cuing.” (2015).
 [4] Leman, Marc, et al. “Activating and relaxing music entrains the speed of beat synchronized walking.” (2013).

[5] Patel, Aniruddh D., and John R. Iversen. “The evolutionary neuroscience of musical beat perception” (2014).
 [6] Agawu, Kofi. “The African imagination in music”. (2016).
 [7] Bååth, Rasmus. “Subjective rhythmization: A replication and an assessment of two theoretical explanations.” (2015).
 [8] Witek, Maria AG, et al. “Effects of polyphonic context, instrumentation, and metrical location on syncopation in music.” (2014).
 [9] Lartillot, Olivier, and Bruford, Fred. “Bistate reduction and comparison of drum patterns” (2020).

