

Longevity Rave for Health, Wellbeing & Longevity Experiment

Summary

Chronic loneliness and social isolation elevate inflammation, accelerate biological aging, erode cognition, and increase all-cause mortality. As AI and digital platforms mediate more of our lives, we risk dehumanisation. Longevity Rave directly targets this risk by engineering synchrony-rich, embodied social rituals.

We frame Longevity Rave within the <u>human exposome</u> framework: the totality of environmental, social, and behavioral exposures that shape healthspan. By intentionally designing the social-sensory environment (sound, light, space, touch norms) we train the collective nervous system toward safety, synchrony, and recovery. The intervention is sober, inclusive, and accessible.

Longevity Rave reframes immersive group dance as a synchrony-first intervention for healthspan and longevity. Raves are living laboratories where music, movement, light, and touch align physiology, brain activity, emotion, and belonging. In an age of Al-driven techno-isolation, we position raves as counter-technology that restores human connection and preserves what makes us human. Longevity Rave is a structured, evidence-based approach to health and wellbeing, where rhythmic synchrony acts as a biological mechanism for connection, stress recovery, and long-term resilience.

Research shows that synchronised dance increases bonding and endorphin-linked pain tolerance, music engagement supports emotion and social neurobiology, and dance interventions enhance neuroplasticity including hippocampal volume in older adults. Loneliness predicts mortality and stress shortens telomeres.

Informed by the evidence and our scientific study described in this proposal, we're exploring a tiered tempo architecture grounded in entrainment science:

- ≈60 BPM relaxation/alpha entrainment, trust-building and intimacy blocks.
- 100–120 BPM natural gait range; maximizes inclusive group synchrony and ease of movement (walking pace).
- 120–130 BPM rave sweet spot; sustains energy and collective synchrony, linked to endorphin/oxytocin bonding.
- 130–140 BPM peak-energy blocks, used sparingly to avoid crowd fragmentation.

This aligns with studies showing that movement synchronizes most easily around walking cadence (~100–120 BPM) with measurable effects on social closeness, and that synchronized group dance (commonly ~120 BPM in electronic genres) elevates bonding and pain thresholds.

Informed by our study, as a next step we are keen to develop a proprietary, research-aligned catalogue engineered for connection, resilience and recovery — usable at raves and licensable across wellness and media.

Catalogue pillars could be structured as follows:

- CONNECT (120–130 BPM): group synchrony & euphoria for raves/group classes.
- FLOW (100–115 BPM): inclusive movement, warm-up and between-peak recovery.
- CALM (60–80 BPM): recovery, trust-building, breath entrainment and closing rituals.
- PEAK (130–135 BPM): short, high-energy climaxes that retain synchrony.

Commercialization channels could encompass:

- Direct event use
- B2B licensing (retreats, studios, gyms)
- Streaming (Spotify/Apple) under the Longevity Rave label
- Bespoke scores for breathwork/meditation/clinics; data-informed iteration using MIR features tied to synchrony outcomes.

Scientific & Medical Advisers

Dr Michael Sagner is the <u>Ageing Research at King's</u> (ARK) Clinical Advisor in longevity and preventive medicine. He is a clinician and researcher specialising in sports medicine and preventive medicine. He is a Certified Nutritionist and completed his MD at Technical University Munich. He specialises in Sports Medicine, Endocrinology and Preventive Medicine, and had an affiliation with the College of Applied Health Sciences, University of Illinois at Chicago. He is the Editor-in-Chief of <u>Longevity</u>, Lead Editor of <u>Lifestyle Medicine</u>, Fellow of the Royal Society of Medicine and Fellow of the <u>European</u> Society of Preventative Medicine.

Toni Castells is an independent artist and composer known for his eclectic and transcendental music that defies traditional boundaries and genres. His innovative approach has led to collaborations with renowned artists and performances at prestigious venues worldwide. In addition to his musical career, Castells is a PhD candidate in biomedical engineering, exploring the therapeutic potential of music. His research focuses on the effects of sound on heart rate variability and chronic stress, with a particular interest in music's role in psychedelic therapy for treating chronic depression. He also shares his expertise as a lecturer on Music Technology at the London College of Music and Imperial College London.

Aleksandra Wiskert, PhD candidate, Clinical Trials Coordinator, Centre for Psychedelic Research, Imperial College London. Background in clinical neuroscience.

Christin Rauter and Leon Jean-Marie, known collectively as The Sound Nutritionist, have spent the past 15 years exploring the profound effects of sound and music on human physiology and psychology. Their work explores the massive impact of frequencies, vibrations, and spatial acoustics on the nervous system, cognitive function, and emotional well-being. By blending principles from neuroscience and holistic healing, they have developed innovative sonic experiences that support relaxation, mental clarity, and personal transformation. Through research, practical application, and collaborations with leading wellness and corporate organizations, they continue to refine their understanding of sound's potential to enhance both physical and mental health.

Scientific Evidence

Scientific studies consistently show that high-energy dancing significantly boosts mood, reduces stress, and enhances emotional wellbeing. Dancing triggers the release of endorphins, dopamine, oxytocin, and serotonin, which are associated with feelings of pleasure, social bonding, and stress relief. Dance interventions have been proven to reduce symptoms of depression and anxiety, enhance quality of life, and build psychological resilience.

Dance is a powerful form of aerobic exercise, improving cardiovascular fitness, metabolic health, and overall physical resilience. Studies have linked regular dancing with lower resting heart rate, improved blood pressure, and decreased levels of inflammatory markers like CRP. Longitudinal studies suggest that frequent dance activity can reduce all-cause mortality, particularly cardiovascular death.

The reference list in the Appendix backs up our concept.

Overall Methodology

Mechanisms of Action (Synchrony → Recovery → Flourishing)

- Movement synchrony: Phase-Locking Value/PLV (a measure used to quantify the synchrony or "phase coupling" between two signals, often used in neuroscience to study brain activity) from IMUs (Inertial Measurement Unit) during dance.
- Cardiac co-regulation: Heart-rate cross-correlation (not HRV) from Polar H10 chest ECG during dance.
- Neural synchrony: Inter-Subject Correlation (ISC) and Inter-Trial Phase Coherence (ITPC) from AWEAR single-ear EEG (theta/alpha).
- Recovery: HRV (RMSSD) measured only at rest seated Polar H10 baselines and next-morning sleep wearable readings.

Study Design & Conditions

Within-subject crossover (n=20 feasibility pilot). Each participant attends both nights separated by 48–72 hours:

 Rave (synchrony-enhancing): BPM arc as above; dynamic but non-periodic lighting; typical density; brief formation prompts; sober protocol.

- Active Control (non-synchrony): same duration and SPL, but avoid contiguous 120–130 BPM
 >5 minutes; static lighting (~200 lux, 4000–4500 K); looser spacing (≥1.5–2.0 m²/person); no mirroring or call-and-response; sober protocol identical.
- Substance policy: no alcohol, recreational drugs, or caffeine from T-24 h to T+48 h around each night; deviations logged via EMA.

Lighting Safety (SSVEP/Photic Driving Controls)

To prevent visually evoked EEG confounds, we forbid periodic luminance modulation in 3–30 Hz (especially 8–12 Hz). We prefer continuous movers and slow colour fades (\leq 0.5 Hz). Fixtures use high-frequency PWM (\geq 2 kHz). A flicker sensor logs luminance; any EEG windows with 3–30 Hz luminance power are excluded. CALM windows are eyes-closed at \leq 50 lux.

Measurement Overview

Domain	Measure	Method / Device	Window	Expected Direction	Interpretation
Movement Synchrony	Phase-Locki ng Value (PLV)	IMUs (wrist/ankle/phone)	During dance	Rave > Control	Primary synchrony metric
Cardiac Coupling	HR cross-correl ation	Polar H10 chest ECG	During dance	Rave > Control	Cardiac co-regulation; not HRV
Neural Synchrony	ISC / ITPC (θ/α)	AWEAR single-ear EEG	CONNECT window	Rave > Control	Exclude epochs with 3–30 Hz flicker
Autonomic Recovery	HRV (RMSSD, rest-only)	Polar seated + sleep wearable	Next-day & 7-day slope	Overshoot then normalize	Recovery trajectory

Biomarkers

Biomarker	Matrix	Timing	Expected Direction (↑↓ ↔)	Meaning	Notes
BDNF	Blood (DBS/serum)	+24 h, +72 h	↑	Neuroplasticity	Training-like adaptive response

CRP	Blood (DBS/serum)	+72 h, +7 d	↓ or ↔	Inflammation / recovery	Avoid immediate post-exercise draw
GDF15	Saliva (pilot) / DBS (scale)	Baseline, +24 h, +72 h, +7 d	Acute ↑ then ↓	Mitochondrial stress → recovery	Picard lab assays emerging
Oxytocin	Saliva (HS assay)	Pre-event, +24 h	Exploratory	Bonding signal (interpret cautiously)	Pair with connectedness scales
Resting HR	Wearable / Polar seated	Baseline, +1–7 d	↓ over days	Improved autonomic efficiency	Substance-free compliance matters
Sleep architecture	Wearable	Night of + next nights	↑ deep sleep (↔)	Recovery quality	Interpret with caffeine control

EMA (Ecological Momentary Assessment)

We replace daily journaling with EMA (Qualtrics SMS): three micro-surveys per day (wake, mid-day, evening) capturing mood (PANAS-PA short), POMS energy/fatigue, connectedness (IOS slider), stress thermometer, sleep duration/quality, and substance intake (alcohol, drugs, caffeine). EMA improves data quality and enables mixed-effects modelling with random slopes.

Hypotheses & Statistical Models (Directional, Testable)

H1 (Primary): Rave > Control for synchrony — PLV (movement), HR coupling (ECG cross-corr), EEG ISC/ITPC.

Model (per outcome): $Imer(Outcome \sim Condition + LAeq + Lighting + Order + (1 | Participant))$. Directional contrast: Rave - Control > 0.

H2 (Tempo Moderator): Within Rave, 120–130 BPM yields the highest synchrony and connectedness vs ≤110, 100–115, and ≥135 BPM, controlling for loudness and lighting.

Model: Imer(Outcome ~ BPMbin + LAeq + Lighting + (1|Participant)); planned contrasts: 120–130 > each other bin.

H3 (Recovery): HRV (RMSSD) overshoot at +1-2 days after Rave vs Control; sustained slope over +1 to +7 days.

Model: Imer(RMSSD ~ Condition * Day + SleepDuration + Caffeine + Alcohol + (1|Participant)).

H4 (Exploratory Mediation): Synchrony \rightarrow Connectedness \rightarrow \triangle BDNF / \triangle CRP / \triangle GDF15 / HRV. Multilevel mediation with bootstrap CIs; FDR within biomarker family

Phase 0 \rightarrow Phase 1 Pathway

The Phase 0 feasibility pilot (n=20) establishes signal detection, operational feasibility, and parameter stability. Findings will inform Phase 1 (n=40–80) with refined block timing, larger EEG subgroup, and expanded biomarker schedule. The goal is a publishable scientific study and a scalable blueprint for venue partners and community health programs.

OSF Registration Snapshot

This one-page summary captures the core elements of pre-registration for quick reference.

Category	Summary
Study Title	Longevity Rave: Synchrony, BPM Architecture, and Biomarkers of Healthspan
Design	Randomized within-subject crossover (Rave vs Active Control); N=20 (Pilot)
Primary Outcomes	Synchrony (IMU phase-locking, HRV coherence, EEG ISC/ITPC).
Secondary Outcomes	HRV (RMSSD), wellbeing (WHO-5, PANAS, AWE-S), sleep quality.
Exploratory Outcomes	BDNF, CRP, cortisol, endocannabinoids, telomere/epigenetic age.
Independent Variables	Condition (Rave vs Control), BPM bins (≤110, 120–130, ≥135).
Measurement Tools	Wearables (Oura/WHOOP), EEG (Awear/Muse), fNIRS (Kernel), surveys, biomarkers, MIR logging.
Hypotheses	H1: Rave > Control for synchrony. H2: 120–130 BPM maximises synchrony. H3: Rave > Control for wellbeing & HRV. H4: Synchrony mediates biomarker effects.

Analysis Plan	Mixed-effects models; BPM moderator;
	mediation tests; FDR correction.
Timeline	Baseline (−72 to −24h), Event (2−3h), Post
	(0–2h), Next morning (+12–18h), Follow-up
	(+48–72h).
Ethics	Informed consent, GDPR-compliant, sound/light
	safety, medical support, right to withdraw.
Dissemination	Open-access publication; OSF archive of code,
	logs, anonymised data.

Appendix

List of references

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