JoyScore Experiment

Scientific & Medical Advisers

Tina Woods is overall strategic lead of the JoyScore Experiment. Tina Woods is a mission-driven social entrepreneur and system architect bringing diverse stakeholders together in shared endeavours to improve health, working at the cross section of science, technology, investment and policy/government. She is Founder and CEO of Collider Health and Business for Health and with Yukari Takehisa, co-founded Longevity Rave, a collective of entrepreneurs, scientists, DJs and artists using the power of music, joy and connection to bring the generations together and celebrate humanity. She is Executive Director of the International Institute of Longevity, combining her interest in taking the latest science and technology of longevity into the 'next frontier' of the Human Exposome to understand what drives human healthspan, resilience and flourishing. She is on the Steering Committee and Global Ambassador for Partnerships for the Exposome Moonshot - see here background on the Human Exposome Project linking human and planetary health.

Tina is working with the following experts:

Prof Dr Michael Sagner is the Ageing Research at King's (ARK) Clinical Advisor in longevity and preventive medicine. He is a clinician and researcher specialising in sports medicine and preventive medicine, affiliated with Southeastern University Florida, Department of Health and Human Performance. He is a Certified Nutritionist and completed his MD at Technical University Munich. He specialises in Sports Medicine, Endocrinology and Preventive Medicine, and is. He is the Editor-in-Chief of *Longevity,* Lead Editor of *Lifestyle Medicine,* Fellow of the Royal Society of Medicine and Fellow of the European Society of Preventative Medicine. He is medical advisor to Enhanced Games.

Dr Evelyne Bischof: Professor of medicine, MD,PhD, MPH, FEFIM; specialist in internal medicine. Longevity physician leading elite executives as longevity patients, integrating precision diagnostics of HLI, AI-based monitoring with deep aging analysis and individualized therapies towards healthy longevity, reversing biological age and achieving optimal performance. Clinician with over a decade of clinical practice experience in Switzerland, the USA and China. Professor of medicine with a research focus on healthy longevity, geroncology, precision medicine. Deeply passionate about next-generation medical technology, and the applications of AI for biomedical research and practice, digital health and innovative technology. A Harvard- and Columbia-trained physician, author of over 80 peer-reviewed papers and a frequent speaker at scientific and medical conferences.

Dr Tamsin Lewis: Dr. Tam is a physician and longevity specialist with over two decades of clinical experience across hospital medicine, integrative health, and personalised prevention. Trained in both conventional and functional medicine, she brings a pioneering lens of bioharmony — recognising that physiology, psychology, and environment interact as one dynamic system. With a profound understanding of the nervous system and emotional health, she leads with curiosity, compassion, and conviction. Her approach is trauma-informed and motivational by design, grounded in the belief that vitality is not simply the absence of illness but the presence of energy, resilience, and joy in living.

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 Wingert, 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 collaboration with leading wellness and corporate organizations, they continue to refine their understanding of sound's potential to enhance both physical and mental health.

Dr Shama Rahman is a neuroscientist, neurodesigner and AI practitioner with an expertise in AI/human collaborative systems, creative strategist and technologist, artist and entrepreneur. She is currently an Innovation Fellow at the University of Edinburgh, within Design Informatics and Edinburgh Futures Institute. Her R&D interests and expertise are at the confluence of designing AI tools, interventions and experiences for impact in enhanced innovation, cognitive augmentation, and healthy ageing with the lens of ethical neurodesign and responsible AI.

Dr Carina Kern is the CEO of LinkGevity an AI-powered biotech company driving innovation in drug discovery for aging and resilience loss. She is renowned for her pioneering work on aging mechanisms and lifespan extension, including a new Blueprint Theory of Aging, which takes an integrative approach to understanding aging, combining evolutionary theory, genetics, molecular mechanisms and medicine, and is used to structure LinkGevity's AI. Her research has led to the development of a first-in-class necrosis inhibitor targeting cellular degeneration (Anti-Necrotic™), with exciting potential as a breakthrough treatment for aging.

Prof Fenna Sillé, PhD, MS, is an immunologist studying the exposome, assessing how a lifetime of physical, chemical, biological, and psychosocial factors interact with the genome and impact human health. Guided by the motto " a healthy environment = healthy people," Dr. Sillé investigates how the exposome shapes immunity and disease across the life course. Focusing on early-life and chronic exposures—especially arsenic and heavy metal mixtures—her work examines impacts on vaccine responses, infection and cancer risk, and neuroinflammatory pathways tied to neurodevelopmental and neurodegenerative outcomes. She also leads a study characterizing the exposome in relation to childhood asthma in Baltimore City.

Community & Tech Partners

The following community partners and technology companies are supporting the JoyScore Experiment:

Frontier Tower, San Francisco (December 2025 MVP): Longevity lead. Laurence Ion
Frontier Tower is a self-governed community lab in frontier tech space with a constellation of longevity and biotech pioneers and innovative arts & music artists.

Infinita, Roatan, Honduras (February/March 2026 study): Community Lead Macsue Jacques
A community that brings together researchers, entrepreneurs, and citizens for a living experiment in how societies can advance health and human potential through freedom to innovate. The JoyScore Experiment is being scaled up as part of the longevity community convening for the Longevity Biomarkers Competition (see here).

Playa.ai/Burning Man: Project Lead Alex Azzi
The JoyScore Experiment forms part of the plans of the Playa AI Foundation to build on an open-source, community-governed foundation model that utilises data ethically gathered from the unique environment of Burning Man to capture human insights and emotional presence that are missing from current AI. This effort forms a critical 'peak experience' cohort for the JoyScore Experiment, researching how we can encode the human spirit and dignity into the next generation of intelligence.

AWEAR: Founder & CEO Antonio Forenza
Creators of single-ear neurotechnology that makes real-world EEG feasible for synchrony, emotion and cognitive state measurement.

Bleo: Co-founders Richard Skaife and Toby Sorabjee
A new wearable tracking health, sleep & activity in style with smart rings and bands, seamlessly connected to The Longevity AI.

Humanity Health: Co-founders Peter Ward and Michael Geer
A leading biological age and healthspan platform with millions of data points from real users.

Rejuve.ai: CEO Jasmine Smith and Data Scientist Macsue Jacques
A decentralised AI-driven wellbeing app supporting emotional tracking and EMA research.

OpenCures: CEO Kevin Perrott
Citizen scientist lab geared to create preventive and personalized medicine, supporting human trials and real world evidence data to achieve this.

The Sound Nutritionist: Co-founders Christin Rauter and Leon Jean-Marie
Specialists in psychoacoustics, sound texture, and sensory nourishment.

Neurocreate: Founder & CEO Dr Shama Rahman
A pioneering neurodesign agency that bridges neuroscience and creativity through an inclusive approach to unlocking peak human potential and fostering creativity and well-being.

All advisers and partners have signed up to the multi-stakeholder open science collaboration agreement here.

Scientific Rationale
The JoyScore is a new scientific measure designed to quantify how joy, connection, synchrony, and emotional uplift affect our brains, bodies, and long-term health. It is being developed because the science is now unequivocal: human connection is one of the strongest predictors of longevity — with loneliness increasing mortality risk as much as smoking 15 cigarettes a day.

It is being designed as the world's first open-science study to build this new metric — one intended to become as mainstream and actionable as step count, sleep score, or heart-rate variability.

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 increasing social disconnection and dehumanisation.

We are designing JoyScore within the human exposome framework: the totality of environmental, social, and behavioral exposures that shape healthspan. Recent advances in aging biology, including the Blueprint Theory and necrosis-centered frameworks[1] [2], emphasise that healthspan loss arises from cascades triggered by environmental, behavioral, and psychosocial exposures. Chronic social disconnection and stress act as upstream triggers that amplify inflammatory, mitochondrial, and autonomic dysregulation, increasing vulnerability to degenerative pathways.

The JoyScore Experiment is designed to quantify and intentionally reshape the 'social exposome'—a modifiable exposure layer that may buffer or attenuate these cascades. An abstract (see here) has been submitted for the Global Exposome Summit in April 2026.

Longevity Rave is the first use case being tested in the JoyScore Experiment, and reframes immersive group dance as an intervention for healthspan and longevity. By intentionally designing the social-sensory environment (sound, light, space, touch norms) through a Longevity Rave intervention we aim to train the collective nervous system toward safety, synchrony, and recovery.

Raves are living laboratories where music, movement, light, and touch align physiology, brain activity, emotion, and belonging. In an age of AI-driven techno-isolation, we position raves as counter-technology that restores human connection and preserves what makes us human.

Longevity Rave is being designed as 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.

Commercial Rationale

While the longevity industry has poured billions into molecules, wearables, scans, and biological age clocks, one truth has been overlooked: the experiences that make us feel alive — movement, dance, synchrony, community, joy — are not "soft" factors. They are measurable biological regulators. The JoyScore aims to bring these human experiences into the centre of health science.

The experiment will generate early models for how JoyScore could be applied. Imagine if…

- 20 minutes of group dancing improved your emotional state and physiological recovery *more* than an hour of solitary cardio on a stationary bike?
- Wellness studios, spas, retreats, hotels and music venues used JoyScore to design experiences that measurably improve your health and wellbeing
- Big Tech starts to build "joy-optimised" content backed by biomarkers and informed with JoyScores
- A new category, 'JoyTech', emerges with evidence-based experiences, environments and tools reimbursable by insurers if they produce high JoyScores

See here the commercial application of JoyScore across industry verticals.

Conceptual Framework

This study adopts an exposome framework to healthspan research, informed by emerging necrosis-centered and Blueprint theories of aging, which emphasise that cumulative environmental, behavioural, and psychosocial exposures act as upstream triggers for biological cascades of undesirable pathways (ie pathological pathways or patho-pathways for short) associated with inflammation, mitochondrial stress, and neuroendocrine dysregulation, amongst others , that ultimately functional decline.

Within this framework, the JoyScore Experiment is designed to quantify the *s*ocial and psychosocial exposome and its proximal biological correlates, focusing on mechanisms that plausibly influence recovery, resilience, and vulnerability to degenerative processes.

Measures are organised across three linked domains:

<u>1. Exposure Layer (Social Exposome Inputs)</u>

JoyScore quantifies psychosocial exposures that are typically under-measured in aging and exposome research, including:

- Social connection and belonging
- Rhythmic synchrony and shared movement
- Positive affect and emotional uplift
- Perceived stress and recovery capacity

These measures function as *modifiable exposures* that can be incorporated alongside chemical, physical, and biological exposures.

2. Mechanistic Mediator Layer (General Degenerative Pathway Proxies)

The study prioritizes mediators that plausibly link psychosocial exposures to necrosis-associated degeneration, including:

- Inflammatory tone (e.g., hsCRP, cytokine panels in extended studies)
- Mitochondrial stress and recover**y** (e.g., GDF15 trajectories)
- Neuroendocrine and autonomic dynamics (e.g., cortisol, HR/HRV recovery metrics)
- Neural state and synchrony signatures (EEG band dynamics; inter-subject synchrony where applicable)

These mediators correspond to the general degenerative pathways described in contemporary systems-level aging frameworks.

3. Outcome Proxies (Downstream Degenerative Load)

While the JoyScore MVP is not powered to assess long-term degeneration, it captures feasible downstream proxies, including:

- Recovery dynamics following acute exposures
- Sleep architecture and physiological restoration
- Composite biological age or recovery indices (where available)

Longevity Rave as the first Use Case

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.

In alignment with necrosis-centered and Blueprint models of aging, we treat synchrony-related measures as *proximal mediators* linking psychosocial exposure to downstream healthspan-relevant pathways, rather than as endpoints in themselves.

Informed by the evidence, 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.

Music catalogue pillars are 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.

Data Collection Protocol

Phase 0 MVP Hypothesis (Frontier Tower)

The Phase 0 San Francisco feasibility pilot (n=20) conducted in December 2025 established signal detection, operational feasibility, and parameter stability. Study volunteers had to meet strict eligibility criteria and sign the consent form here.

The MVP assessed:

- EEG state shifts / neural entrainment to music
- EMA affect and connection changes
- GDF15 pre/post trajectories
- NO strip change pre/post
- Changes in metabolites/metabolomics

See the piece written up by Longevity Technology in Joy Gets Measured.

Phase 1 Longitudinal Cohort (Roatan, Honduras)

Findings from Phase 0 will inform Phase 1 study in Roatan Honduras (n=40–80) in February/March 2026 with in key areas such as effect size estimation, assay validation, protocol refinement, refined block timing, larger EEG subgroup, and expanded biomarker schedule. The goal is a publishable scientific study and a scalable blueprint.

In addition to Phase 0 data capture we will also measure:

- IMU-based movement synchrony (PLV)
- Cardiac coupling via ECG
- HRV recovery slopes
  Inter-brain synchrony (ISC/ITPC)

Phase 1 will extend the design to a longitudinal framework, enabling repeated exposure measurement, recovery slope analysis, and attribution modeling.

Data Collection Matrix

Psychosocial Exposure Measures

Psychosocial exposures are captured using brief, repeated ecological momentary assessments (EMA) to characterize real-time variation in social experience and emotional state. Core domains include:

- Connection and belonging
- Positive affect and emotional uplift
- Perceived stress and calm
- Recovery capacity following stimulation

EMA prompts are administered at baseline, immediately following structured music exposure, and post-event, with optional repeated sampling in extended cohorts. These measures form the core JoyScore exposure variables, representing modifiable social and emotional conditions that may influence biological stress pathways.

Confounding behavioral exposures—including caffeine intake, sleep duration, hydration, and acute illness—are logged to support interpretability and downstream modeling.

Neural and Physiological Mediators

Neural State and Entrainment

Neural activity is recorded using wearable single-ear EEG (Awear device) during structured music exposure blocks.

Analyses focus on:

- Spectral power changes (alpha, beta, theta bands
- Beat- and rhythm-related neural entrainment
- Within-subject phase consistency across exposure conditions

Precise timestamping is used to align EEG data with musical stimuli, enabling state-specific analysis of neural responses to curated auditory environments.

Autonomic and Vascular Proxies

Where available, resting heart rate and recovery dynamics are collected to assess autonomic regulation. Nitric oxide bioavailability is assessed using saliva-based test strips before and after the intervention as an exploratory proxy for vascular responsiveness and stress-related endothelial signaling.

Blood and Saliva Biomarkers

Low-volume dried blood microsamples (Neoteryx Mitra®, 20 µL) are collected at baseline and immediately following structured music exposure. Biomarker selection prioritizes analytes with demonstrated feasibility in microsampled blood and relevance to acute stress and recovery physiology:

- GDF15: a marker of mitochondrial stress and systemic load, analyzed as a pre- to post-exposure trajectory
- Inflammatory markers (e.g., hsCRP where feasible): included primarily to characterize baseline distributions and longer-term recovery in extended cohorts

Saliva samples may be collected for exploratory analysis of neuroendocrine markers, including cortisol and oxytocin, interpreted cautiously due to known assay variability.

Downstream Functional Proxies

Downstream proxies relevant to healthspan include:

- Sleep architecture and recovery metrics (where wearable data are available)
- Brief mood and energy scales (e.g., POMS subscales)
- Composite physiological or recovery indices generated by partnered platforms

These measures are not treated as direct indicators of degeneration but as functional outputs reflecting short-term recovery and system-level responsiveness.

Analytical Strategy

Analyses emphasize within-subject change and recovery trajectories rather than absolute biomarker values. Primary models examine associations between psychosocial exposure intensity (JoyScore variables), neural and physiological mediators, and short-term functional outcomes, adjusting for key confounders. Extended cohorts enable modeling of exposure–response relationships and recovery slopes over time.

Other considerations

A general medical checkup and assessment of disease load could be warranted in certain situations (for example, bereavement, divorce, work burnout), noting that psychological stress can be a major factor in conditions like cardiovascular disease, stroke, etc that is often underestimated - but the literature shows strong trends.

Detailed Measurement Matrix

Phase 1 is explicitly designed to produce a dataset enabling attribution modeling of how psychosocial exposures interact with biological pathways across time.

Blueprint layer	Domain	Measure	Method / Device	Timing over 4–6 weeks	What it supports in Necrostat terms	Notes / interpretation
Exposure	Social exposome	JoyScore core EMA (3–5 prompts/day): connection, joy/meaning, stress, recovery	Rejuve.ai EMA	Daily across study	Quantifies **time-varying psychosocial exposure**	This becomes the key “protective exposure” variable

Exposure	Social network / belonging	Weekly connectedness scale (brief validated) + participation logs	Survey + attendance	Weekly	Measures "dose" of community participation	Attribute variance to exposure intensity
Exposure	Physical environment	Heat index, humidity, light-at-night, noise; air quality if feasible	Sensors + weather APIs	Continuous / daily	Environmental triggers that amplify cascades	Especially relevant in island context
Exposure	Lifestyle	Sleep timing, exercise load, nutrition patterns, alcohol/drug/caffeine	Wearables + diary	Continuous + daily log	Confound control + exposure attribution	Needed for credible causal narratives
Mediator	Inflammation	hsCRP + cytokine panel (IL-6/TNF/IL-1β ideally)	Blood (Mitra DBS or venous)	Baseline + weekly/biweekly + post-event windows	Core GDP mediator feeding necrosis vulnerability	These are "Degeneration Pathway" staples
Mediator	Mitochondrial stress / resilience	GDF15 (primary), +/- metabolomics stress signatures	DBS/venous; omics optional	Baseline + weekly + 24–48h post key events	Captures **stress–recovery slope**	This is a great bridge between psychosocial exposure and systemic load
Mediator	Neuroendocrine stress	Salivary cortisol (AM/PM)	Saliva	2–3 days/week	HPA-axis embedding of stress	Often more robust than oxytocin for stress biology
Mediator	Bonding / affiliation	Salivary oxytocin (exploratory) + paired social scales	Saliva	Baseline + post key synchrony events	Social-bonding pathway readout	Keep exploratory and methodologically cautious
Mediator	Neural state + synchrony	EEG: alpha/beta state shifts + **ISC/ITPC** during synchrony blocks	AWEAR EEG	Repeated "synchrony sessions" weekly + event nights	A mechanistic signature for "collective exposure"	In Roatán can standardize synchrony protocols (unlike SF)

Mediator	Autonomic recovery	Resting HR, night HRV (rest-only), recovery dynamics	Wearable	Daily	Recovery capacity as resilience buffer	Keep HRV to rest/sleep; avoid during vigorous movement
Outcome proxy (systems-level)	Biological age / systemic deterioration	Biological age / recovery composite (Humanity + optional epigenetic clock)	App + periodic blood	Baseline + end + optional midpoint	Downstream proxy outcome for Necrostat models	Use as *proxy*, not definitive necrosis outcome
Outcome proxy (organ/function)	Cognitive/affective function	Brief cognitive tasks + mood (POMS)	App-based	Weekly	Organ/system functional effects	Helps link exposures → function
Necrostat integration	Attribution scoring	Build "Necrostat-ready dataset": exposures,mediators, outcomes	Data pipeline	Ongoing	Enables exposure-attribution modeling across scales	This is where you explicitly compute/estimate attribution fractions

Appendix

List of references

Synchrony, Dance, and Social Bonding

- Tarr, B., Launay, J., & Dunbar, R. (2016). Synchrony and exertion during dance independently raise pain threshold and encourage social bonding. Biology Letters, 12(10).
- Vicary, S., Sperling, M., von Zimmermann, J., Richardson, D., & Orgs, G. (2017). Joint action aesthetics. PLoS One, 12(7).
- Von Zimmermann, J., Vicary, S., Sperling, M., Orgs, G., & Richardson, D. (2018). The choreography of group affiliation. Topics in Cognitive Science, 10(1), 80–94.

Music Tempo, BPM, and Synchrony Effects

- Janata, P., Tomic, S., & Haberman, J.M. (2012). Sensorimotor coupling in music and the psychology of the groove. Journal of Experimental Psychology: General, 141(1), 54–75.
- Müller, V., & Lindenberger, U. (2011). Cardiac and respiratory patterns synchronize between persons during choir singing. PLoS ONE, 6(9).
- Stupacher, J., Witek, M.A.G., Vuust, P., Schroeder, N., & Keller, P.E. (2017). Dance music increases interpersonal closeness. Frontiers in Psychology, 8: 1906.

- Zamm, A., Debener, S., & Sebanz, N. (2021). The sound of synchronization: Tempo tuning and social connection. Psychological Science, 32(6), 942–954.

Neurobiology of Music & Synchrony

- Koelsch, S. (2014). Brain correlates of music-evoked emotions. Nature Reviews Neuroscience, 15, 170–180.
- Dikker, S., Silbert, L.J., Hasson, U., & Zevin, J.D. (2014). Synchrony in brain activity predicts group interaction quality. Current Biology, 24(23), 2843–2848.
- Bevilacqua, D., Davidesco, I., Wan, L. et al. (2019). Brain-to-brain synchrony and learning outcomes vary by student–teacher dynamics. Journal of Cognitive Neuroscience, 31(3), 401–411.

Dance, Neuroplasticity, and Biomarkers

- Rehfeld, K., Müller, P., Aye, N. et al. (2017). Dancing or fitness sport? The effects of two training programs on hippocampal plasticity and balance abilities in healthy seniors. Frontiers in Human Neuroscience, 11, 305.
- Kattenstroth, J.-C., Kalisch, T., Holt, S., Tegenthoff, M., & Dinse, H. (2013). Six months of dance intervention enhances postural, sensorimotor, and cognitive performance in elderly without affecting cardio-respiratory functions. Frontiers in Aging Neuroscience, 5, 5.

Social Connection, Healthspan, and Longevity

- Holt-Lunstad, J., Smith, T.B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: A meta-analytic review. Perspectives on Psychological Science, 10(2), 227–237.
- Haslam, C., Cruwys, T., & Haslam, S.A. (2014). The we's have it: Evidence for the distinctive benefits of group engagement in enhancing cognitive health in aging. Social Science & Medicine, 120, 57–66.
- Epel, E., & Blackburn, E.H. (2017). The Telomere Effect: A revolutionary approach to living younger, healthier, longer. Grand Central Publishing.
- Launay et al. (2016). 'Group Music-Making Increases Social Bonding'. Scientific Reports.
- Durkheim (1912/2008). 'The Elementary Forms of Religious Life'—concept of collective effervescence as a health-promoting state.

Techno-Isolation, AI, and Cultural Risks

- Turkle, S. (2017). Alone Together: Why we expect more from technology and less from each other. Basic Books.

- Cacioppo, J.T., & Cacioppo, S. (2018). Loneliness in the modern age: An evolutionary theory of loneliness (ETL). Advances in Experimental Social Psychology, 58, 127–197.

Mental Health & Wellbeing Benefits

- Koch et al. (2019). 'Effects of Dance Movement Therapy and Dance on Health-related Psychological Outcomes'. Frontiers in Psychology.
- Fong Yan et al. (2024). 'Effectiveness of Dance Interventions Compared with Other Physical Activity'. Sports Medicine.
- Quiroga Murcia et al. (2010). 'Emotions Associated with Dance Movement'. International Journal of Psychology.

Physical Health & Longevity Benefits

- Merom et al. (2016). 'Dancing and Cardiovascular Risk in Older Adults'. American Journal of Preventive Medicine.
- Rehfeld et al. (2018). 'Dance training improves brain structure and balance'. Frontiers in Human Neuroscience.
- Keogh & Kilding (2021). 'Physical and Functional Benefits of Dance for Healthy Adults'. Journal of Aging and Physical Activity.

---

[1] Kern C, Bonventre JV, Justin AW, Kashani K, Reynolds E, Siew K, Davis B, Karakoy H, Grzesiak N, Bailey DM. Necrosis as a fundamental driver of loss of resilience and biological decline: what if we could intervene? Oncogene. 2025 Jul;44(24):1893-1904. doi: 10.1038/s41388-025-03431-y. Epub 2025 May 29. PMID: 40437182.

[2] Kern, C.; Faragher, R.; Woods, T.; Bonventre, J.; Jenkins, A.; Stebbing, J. The Architecture of Aging: How Ageing Drives Disease (Blueprint Theory). Preprints 2023, 2023101387. https://doi.org/10.20944/preprints202310.1387.v4