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Causal inference and temporal predictions in audiovisual perception of speech and music

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To form a coherent percept of the environment, the brain must integrate sensory signals emanating from a common source but segregate those from different sources. Temporal regularities are prominent cues for multisensory integration, particularly for speech and music perception. In line with models of predictive coding, we suggest that the brain adapts an internal model to the statistical regularities in its environment. This internal model enables cross-sensory and sensorimotor temporal predictions as a mechanism to arbitrate between integration and segregation of signals from different senses.

Per formare una percezione coerente dell'ambiente, il cervello deve integrare i segnali sensoriali emanati da una sorgente comune, ma poi separarli da quelli che originano da sorgenti differenti. Le regolarità temporali sono indicazioni importanti per l'integrazione multisensoriale, in particolar modo per il linguaggio e la percezione della musica. In linea con i modelli di codifica predittiva, gli Autori suggeriscono che il cervello adatti un modello interno alle regolarità statistiche nel suo ambiente naturale. Questo modello interno abilita le predizioni cross sensoriali e sensimotorie come meccanismo per decidere tra integrazione e separazione dei segnali provenienti da sensi diversi.

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The neural underpinnings of music listening under different attention conditions

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Most studies examining the neural underpinnings of music listening have no specific instruction on how to process the presented musical pieces. In this study, we explicitly manipulated the participants' focus of attention while they listened to the musical pieces. We used an ecologically valid experimental setting by presenting the musical stimuli simultaneously with naturalistic film sequences. In one condition, the participants were instructed to focus their attention on the musical piece (attentive listening), whereas in the second condition, the participants directed their attention to the film sequence (passive listening). We used two instrumental musical pieces: an electronic pop song, which was a major hit at the time of testing, and a classical musical piece. During music presentation, we measured electroencephalographic oscillations and responses from the autonomic nervous system (heart rate and high-frequency heart rate variability). During passive listening to the pop song, we found strong event-related synchronizations in all analyzed frequency bands (theta, lower alpha, upper alpha, lower beta, and upper beta). The neurophysiological responses during attentive listening to the pop song were similar to those of the classical musical piece during both listening conditions. Thus, the focus of attention had a strong influence on the neurophysiological responses to the pop song, but not on the responses to the classical musical piece. The electroencephalographic responses during passive listening to the pop song are interpreted as a neurophysiological and psychological state typically observed when the participants are 'drawn into the music'.

La maggior parte degli studi che esaminano i substrati neurali dell'ascolto musicale non hanno alcuna specifica istruzione sul modo in cui si devono elaborare i pezzi musicali presentati. In questo studio gli Autori manipolano in modo esplicito il focus attentivo dei partecipanti mentre ascoltano i pezzi musicali. È stato usato un protocollo sperimentale ecologicamente valido, presentando lo stimolo musicale insieme a sequenze di film naturalistici. In una condizione, veniva data l'istruzione di focalizzare l'attenzione sul pezzo musicale (ascolto attentivo), mentre nella seconda condizione i partecipanti dovevano dirigere la loro attenzione sulla sequenza del film (ascolto passivo). Gli Autori hanno usato due pezzi di musica strumentale: una canzone di pop elettronico e un pezzo musicale classico. Durante la presentazione gli Autori hanno misurato le oscillazioni elettroencefalografiche e le risposte del sistema nervoso autonomo (ritmo cardiaco e variabilità del ritmo). Durante l'ascolto passivo della canzone pop, gli Autori hanno osservato una forte sincronizzazione evento-correlata in tutte le bande di frequenza osservate (teta, alfa basse, alfa alte, beta basse e beta basse). Le risposte neurofisiologiche alla canzone pop nella condizione di ascolto attivo erano simili a quelle del pezzo classico durante entrambe le condizioni. Pertanto, il focus dell'attenzione aveva un'influenza importante durante l'ascolto della canzone pop, ma non sulle risposte del pezzo musicale classico. Le risposte elettroencefalografiche durante l'ascolto passivo della canzone pop vengono interpretate come uno stato neuropsicologico e psicologico tipicamente osservato quando i partecipanti sono "coinvolti nella musica".

Psychol Sci 2018 Mar 1

Musical preferences predict personality: evidence from active listening and Facebook Likes

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Research over the past decade has shown that various personality traits are communicated through musical preferences. One limitation of that research is external validity, as most studies have

assessed individual differences in musical preferences using self-reports of music-genre preferences. Are personality traits communicated through behavioral manifestations of musical preferences? We addressed this question in two large-scale online studies with demographically diverse populations. Study 1 (N = 22,252) shows that reactions to unfamiliar musical excerpts predicted individual differences in personality—most notably, openness and extraversion—above and beyond demographic characteristics. Moreover, these personality traits were differentially associated with particular music-preference dimensions. The results from Study 2 (N = 21,929) replicated and extended these findings by showing that an active measure of naturally occurring behavior, Facebook Likes for musical artists, also predicted individual differences in personality. In general, our findings establish the robustness and external validity of the links between musical preferences and personality.

Le ricerche dell'ultimo decennio dimostrano che vari tratti della personalità vengono comunicati tramite le preferenze musicali. Una limitazione di questa ricerca è la validità esterna, dal momento che la maggior parte degli studi hanno osservato le differenze individuali basandosi su interviste auto-somministrate sulle preferenze di genere musicale. Gli Autori si chiedono invece se i tratti della personalità siano comunicati attraverso le manifestazioni comportamentali della preferenza musicale, e utilizzano come metodo due indagini online su larga scala con popolazioni demograficamente diverse. Lo Studio 1 (n=22252) mostra che le reazioni a brani musicali non familiari era predittivo delle differenze nella personalità – in particolare apertura ed estroversione – al di là delle differenze demografiche. Inoltre, queste differenze nei tratti di personalità erano associate in modo diverso con alcune dimensioni di preferenza musicale. I risultati dallo Studio 2 (n=21929) replicavano ed estendevano queste osservazioni, mostrando che una misura attiva dei comportamenti naturali come i "Like" di Facebook per i musicisti era predittiva anche per le differenze individuali di personalità. In generale questi risultati stabiliscono la solidità e validità esterna degli studi che legano le preferenze musicali alla personalità.

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Rhythmic abilities and musical training in Parkinson's disease: do they help?

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Rhythmic auditory cues can immediately improve gait in Parkinson's disease. However, this effect varies considerably across patients. The factors associated with this individual variability are not known to date. Patients' rhythmic abilities and musicality (e.g., perceptual and singing abilities, emotional response to music, and musical training) may foster a positive response to rhythmic cues. To examine this hypothesis, we measured gait at baseline and with rhythmic cues in 39 non-demented patients with Parkinson's disease and 39 matched healthy controls. Cognition, rhythmic abilities and general musicality were assessed. A response to cueing was qualified as positive when the stimulation led to a clinically meaningful increase in gait speed. We observed that patients with positive response to cueing ($n = 17$) were more musically trained, aligned more often their steps to the rhythmic cues while walking, and showed better music perception as well as poorer cognitive flexibility than patients with non-positive response ($n = 22$). Gait performance with rhythmic cues worsened in six patients. We concluded that rhythmic and musical skills, which can be modulated by musical training, may increase beneficial effects of rhythmic auditory cueing in Parkinson's disease. Screening patients in terms of musical/rhythmic abilities and musical training may allow teasing apart patients who are likely to benefit from cueing from those who may worsen their performance due to the stimulation.

I segnali uditivi ritmici possono migliorare immediatamente la marcia nella malattia di Parkinson.

Tuttavia, questo effetto varia considerevolmente tra i pazienti. Non si conoscono ancora i fattori associati con questa variabilità individuale. Le abilità ritmiche dei pazienti, come le abilità percettive e la capacità di cantare, la risposta emotiva alla musica e il training musicale, possono aumentare la risposta positiva agli stimoli musicali. Per vagliare questa ipotesi, gli Autori esaminano la marcia di base e con segnali ritmici in 39 pazienti Parkinsoniani senza demenza e 39 soggetti di controllo sani. La risposta al segnale ritmico (cueing) si considerava positiva quando lo stimolo uditivo provocava un miglioramento clinicamente significativo della marcia. Gli Autori osservano che i 17 pazienti che hanno avuto la risposta più positiva allo stimolo erano quelli con istruzione musicale: allineavano più di frequente i loro passi con il ritmo e mostravano una migliore percezione della musica e una più scarsa flessibilità cognitiva rispetto ai pazienti senza risposta. La capacità della marcia peggiorava in 6 pazienti sottoposti al cueing musicale. Gli Autori concludono che le abilità musicali e ritmiche, che possono essere modulate dal training musicale, possono migliorare la risposta dei pazienti Parkinsoniani agli stimoli musicali. Uno screening preliminare dei pazienti potrebbe aiutare a distinguere quelli che potrebbero beneficiare di questo intervento da quelli che potrebbero peggiorare.

The Pierfranco and Luisa Mariani Foundation

Since its beginnings in 1985, the Mariani Foundation has established itself as a leading organization in the field of pediatric neurology by organizing a variety of advanced courses, providing research grants, and supporting specialized care. The Foundation works in close cooperation with major public healthcare institutions, complementing their scientific programs and other activities. In 2009 it became the first private entity in Italy to join the founding members of the Neurologic Institute "Carlo Besta" in Milan. In addition to its services, the Foundation aims, through its continuing medical education courses and its publishing program, to transmit the latest discoveries in the field of paediatric neurology so that they can be applied most effectively in treating or mitigating a large number of pediatric neurologic disorders.

In 2000, the Mariani Foundation has added a new and important dimension to its activities: fostering the study of the multiple links between the neurosciences and music, including music education and early intervention. The results of this commitment are shown first and foremost in "The Neurosciences and Music" conferences, held in Venice (2002), Leipzig (2005), Montreal (2008), Edinburgh (2011), and Dijon (2014). The last congress was held in June 2017 in Boston, in partnership with the Harvard Medical School and Beth Israel Deaconess Medical Center. All these meetings have led to the publication of major volumes in the Annals of the New York Academy of Sciences. By providing the most recent information in these rapidly advancing neurologic fields, the Mariani Foundation intends to be a reliable and informative source for specialists and journalists in this new area of the developmental neurosciences.

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