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Social meaning of ambiguous sounds influences retrospective duration judgments

Srinivasan, N.<sup>1</sup>, Hopkins, N.P.<sup>2</sup>, Reicher, S.D.<sup>3</sup>, Khan, S.S.<sup>2</sup>, Singh, T.<sup>1</sup>, & Levine, M.<sup>4</sup>

<sup>1</sup> Centre of Behavioural and Cognitive Sciences, University of Allahabad, India

<sup>2</sup> School of Psychology, University of Dundee, UK

<sup>3</sup> School of Psychology, University of St. Andrews, UK

<sup>4</sup> Department of Psychology, University of Exeter, UK

Corresponding Author: Prof. Narayanan Srinivasan, Centre of Behavioural and Cognitive Sciences, University of Allahabad, Allahabad 211002, India.

Email: nsrini@cbcs.ac.in

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## Social meaning of ambiguous sounds influences retrospective duration judgments

Social scientists have described noise as “sound out of place” (Bailey 1996: 50). This implies our experience of a stimulus is not simply a reflection of its intrinsic properties but depends on the social-contextual meanings attributed to it. Following Bruner (Bruner, 1957; Bruner & Goodman, 1947), psychology has confirmed the importance of social meaning for perception – especially visual information processing (Balcetis & Lassiter, 2010). Here we extend this perspective to time perception, and ask if an identical ambiguous auditory stimulus is processed differently as a function of its social meaning.

Asked to reproduce a sound’s duration, participants typically underestimate. The extent of such under-estimation is affected by the complexity, familiarity and valence of the stimulus, and the participants’ characteristics (Block & Zakay, 1997; Brown, 2010; Kowal, 1987; Ornstein, 1969; Phillips & Cross, 2011; Tobin, Bisson, & Grondin, 2010). These effects have been explained through reference to attentional and memory-related processes, with the latter being particularly relevant in retrospective paradigms (where participants are not aware they will be asked to make duration estimates: see Block, Hancock, & Zakay, 2010).

Our research was conducted with pilgrims attending a Hindu festival (Mela) in India. Such pilgrims live (in their thousands) by the Ganges for a month in a tented encampment and renounce the everyday concerns that inhibit a focus on spiritual matters. Yet, the simple life pursued at the Mela is far from tranquil: pilgrims are surrounded by multiple loudspeaker broadcasts of different songs, religious speeches and announcements, and this multiplicity often makes it difficult to discern these broadcasts’ contents. The result is a loud cacophony (85-90 *dB*) that often resembles the sound of a busy city street. However, despite this, as this

sound has religious connotations, pilgrims describe it as non-intrusive and meaningful (Cassidy, Hopkins, Levine, Pandey, Reicher, & Singh, 2007).

We prepared a sound clip that contained very little recognisable material such that it could be labelled as coming either from the religious festival itself or from the everyday secular setting of busy city streets. Using a design in which participants knew in advance they would be asked about the sound, but not that they would be asked to estimate its duration (i.e., a 'retrospective' paradigm), we predicted longer durations when the sound-clip was attributed to the Mela. In this condition it is likely the various snippets of sound comprising the sound-clip would (because of priming due to their imagined religious associations) capture participants' attention resulting in a richer encoding of the stimulus. In turn this richer encoding should facilitate the remembering of the material, resulting in longer duration estimates (for evidence of the role of memory-related processes in retrospective paradigms, see Block et al. 2010). In contrast, when the sound-clip was attributed to everyday city streets, the same constellations of sounds should have less symbolic significance, attract less encoding, and result in shorter duration estimates.

We also manipulated when participants were informed of the sound's source (either pre- or post-stimulus exposure) and reasoned that if this labelling only impacts duration estimates when conveyed pre-exposure, we would show social meaning impacts encoding (rather than retrieval)

### *Method*

Sixty nine male pilgrims ( $M$  age = 65,  $SD$  = 5) participated in a retrospective time-duration experiment conducted in a tent in the Mela. Participants listened to a 20 seconds noisy sound-clip (90 *dB*) through headphones (capable of blocking out any extraneous

noises). The sound-clip (identical across conditions) included elements recorded at the Mela, on city streets, and also white noise (making it impossible to identify specific sounds). Pilot-testing confirmed its contents to be unclear and ambiguous.

Participants were told the clip comprised several sounds. Half were told *'we have jumbled together various sounds from the city – for example, from markets, from railway stations, from bus station, from various places in the city. OK? So now you are going to listen to the sounds of the city.'* Half were told *'we have jumbled together various sounds from the Mela – for example, religious broadcasts over the loudspeaker system, from the Ghats on the Ganges, from the Sangam, from various places in the Mela. OK? So, now you are going to listen to the sounds of the Mela.'* Half received this source information before stimulus-exposure, half after.

After listening, they reproduced its duration (an experimenter said 'start' and the participant said 'stop' when they thought the sound would have stopped). This interval (during which the participant wore headphones, yet heard no sound) was timed.

### *Results*

Two participants were excluded because (asked at the end of the study) they misremembered the sound's ostensible origins. Four were excluded because their duration estimates were more than three standard deviations from the mean (Cell sizes: Mela Pre-exposure = 17; City Pre-exposure = 18; Mela Post-exposure = 14; City Post-exposure = 14). Participants' time-duration estimates were inspected in a 2 (Notification Stage: Pre-Stimulus Exposure/Post-Stimulus Exposure) X 2 (Source Attribution: Mela/City) ANOVA. The main effects were marginal (Notification Stage,  $F(1, 59) = 3.78, p = .057, \eta_p^2 = .06$ ; Source Attribution,  $F(1, 59) = 2.73, p = .10, \eta_p^2 = .04$ ) and qualified by the predicted interaction,  $F(1,$

59) = 5.63,  $p = .021$ ,  $\eta_p^2 = .09$  (see Figure 1). With pre-exposure labelling of the sound's source, duration estimates were longer in the Mela ( $M = 14.85$ ,  $SE = .85$ ) than City condition ( $M = 11.26$ ,  $SE = .83$ ),  $t(33) = 2.69$ ,  $p = .011$ ,  $d = .91$ . With post-exposure notification, the Mela and City condition means did not differ (Mela  $M = 11.00$ ,  $SE = .94$ ; City  $M = 11.64$ ,  $SE = .94$ ),  $t(26) = -.59$ ,  $p = .56$ ,  $d = .22$ . As expected, when the sound was attributed to the Mela, duration judgements were longer when the attribution occurred pre-exposure,  $t(29) = 3.19$ ,  $p = .003$ ,  $d = 1.16$ .

Insert Figure 1 here

### *Discussion*

Consistent with other studies, sound duration was underestimated (Eisler, 1995). More importantly, the labelling of the sound's origins impacted duration estimates, but only if this information came pre-exposure (indicating the effect occurs during encoding). Specifically, a (pre-exposure) attribution of the sound to the religious Mela produced longer estimates. As the stimulus was constant across all conditions, this effect of the sound's labelling is evidence for the impact of social meaning on stimulus processing. It is likely that pilgrims attending the Mela and told to expect a Mela-related sound-clip interpreted the sounds (in spite of their ambiguity) as having religious associations such that some snippets captured attention allowing a richer encoding of the stimulus material. Such a logic is congruent with studies using retrospective paradigms (Block & Zakay, 1997; Block, et al., 2010) in which longer duration estimates reflect memory-related processes associated with better encoding.

While further studies are needed to identify the exact mechanisms involved, these data show the social meaning of sound matters. Moreover, our data suggest that psychologists can help social scientists explore just how the same auditory stimulus can be experienced differently depending on its contextual associations and symbolic significance (Bailey 1996).

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*List of Figures*

*Figure 1.* Sound-duration estimates as a function of the sound's (attributed) origin and the stage of notification

