1. ABSTRACT

Contextual plasticity (CP) is a form of plasticity in sound localization induced by preceding stimuli. It is observed in the middle of the run, such that task trials following an SOA context trial are interfered by a distractor click. Here we study aspects of CP, such as CP buildup, CP buildup sensitivity to spatiotemporal distribution of distractor stimuli, and CP buildup sensitivity to environmental factors.

2. INTRO

Kopčo et al. (2007) examined the effect of immediately preceding distractor on target localization, for 2-m noise burst targets, preceded on most trials by identical distractors coming from front or lateral sound source (fixed within block). They varied SOA trial-by-trial, no distractor on 16.6% of trials.

3. Vision, motor control, and top-down factors (Kopčo et al., 2015)

- **Goal**: examine influence of vision, response method / motor transformation, and top-down factors on CP; examine spatial and temporal properties of CP w.r.t. actual baseline.

**Methods**

- Same as Kopčo et al. (2007) except: only frontal distractor used, baseline run w/o distractor.
- Context rate (prop. of distr. trials) 75%.
- Exp. 1 varied response method (fixed within run): closed eyes & pointer, open eyes & pointer, keyboard.
- Exp. 2 varied contextual task difficulty: SOA = 400 ms (easy), SOA > 600 ms and distractor presented after target.

**Results**

- **Target-click-only baseline run**:
  - performance depends on availability of vision and motor response.
- **CP** (computed as difference between frontal and lateral context trials):
  - independent of vision, motor control, task difficulty, strongest near distractor, even when target precedes distractor.

4. 1-click vs. 8-click vs. no distractor (Hládek et al., 2016)

- **Goal**: examine influence of temporal distribution of context stimuli on CP; examine influence of distractor-target similarity on CP.

**Methods**

- Same as Kopčo et al. (2007) except:
  - only frontal distractor used, baseline run, Exp. 1 varied:
    - context rate (prop. of distr. trials) 50, 75, 90%.
  - Exp. 2 varied temporal structure and type of distr.:
    - 1-click, 8-click with GX of 100 ms, noise with same duration and energy in 8-click, context rate 75%, SOA (effectively) 25 ms.

**Results**

- **CP** (computed as baseline):
  - independent of SOA on context trials, grows slightly with context rate 75%, 90%, grows dramatically for 8-click distractor (i.e., when effective context rate 600%)
  - almost no effect for noise with equal energy.

**CP build-up (for frontal targets)**:

- Fast with 8-click distractor, equally fast, but continues to grow with 8-click distractor.

5. CP with 1 & 8-click distractor mixed (Andrejková et al., 2015)

**Goal**: Examine build-up for FrontDist vs. LatDist, anec. vs. mixed room, and 1-click vs. 8-click distractor.

**Methods**

- Same as Kopčo et al. (2007), except:
  - 1-click & 8-click distractor interleaved (effective rate 360%), distractor-trial data converted to CP by subtracting the effect of distractor (same for Kopčo et al., 2007 data).

**Results**

- **CP build-up** (FrontDist – LatDist – Exp. 4):
  - depends both on entertainment and number of distractor clicks (top right), interaction p < 0.01,
  - continues to grow even after 5 mins with mix of 1-click and 8-click data.
  - difference larger in Room than in LatDist (left column), depends on distractor type and room: seems larger for targets at 56–70° (and near 21°) than 1–21° (bottom row).

6. CONCLUSIONS AND DISCUSSION

**CONTEXTUAL PLASTICITY**

Contextual bias is sensitive to spatiotemporal distribution of distractor stimuli (CP induced by an 8-click distractor is stronger than that induced by a 1-click distractor), is stronger for lateral than frontal targets, and is larger in a classroom than in an anechoic room. Also, it is sensitive to similarity between stimuli, not just acoustic distribution.

**CONTEXTUAL PLASTICITY BUILDUP**

CP buildup takes longer to asymptote for a lateral distractor than for a frontal distractor, and for contexts containing 8-click distractors than for 1-click-only distractor contexts. The buildup duration varies between less than 1–2 mins and 4 minutes. Despite that, it is visible even on trial-by-trial basis (the time scale of seconds).

**POSSIBLE MECHANISMS**

These effects are consistent with a low-level adaptation mechanism sensitive to the spatiotemporal distribution of stimuli (Dahmen et al. 2003). Additionally, the mechanism might be related to precedence-buildup since the stimuli consist of lead-out stimuli (Dahmen et al., 2003). Finally, it might be related to high-level mechanisms underlying streaming or the effects of expectation (Weitkamp et al., 2014). Incorporating a successful candidate mechanism must be able explain why the 8-click stimulus is always away from the distractor and why the frontal and lateral distractors have different effects.

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