Using LENA to assess the linguistic environment of infants in rural Gambia and UK

Maria M. Crespo-Llado[1,2], Lena Acolatse[3], Sam McCann[4], Omar Njie[5], Mariama Saidykhan[5], Sophie E. Moore[4], Clare E. Elwell[6], Sarah Lloyd-Fox[1] & The BRIGHT project team

[1]Department of Psychology, University of Cambridge, [2]Centre for Brain and Cognitive Development, Birkbeck, University of London, [3] Nutrition Innovation Centre for Food and Health, Ulster University, [4]Department of Women and Children's Health, Kings College London, [5]MRC Unit The Gambia at the London School of Hygiene and Tropical Medicine, Banjul, [6]Department of Medical Physics and Biomedical Engineering, UCL

Background

- The quantity and quality of language produced by caregivers early in life predict toddler's linguistic skills[1]

- Quality of caregivers' words becomes a better predictor of language growth by age 2[1,2]

- Children from lower-SES backgrounds hear fewer and less complex words, on average, than their more advantages peers[3,4]

- Verbal engagement with infants is much less common[5] and even seen as a negative practice[6] in certain rural societies in low-to-middle income countries (LMIC)

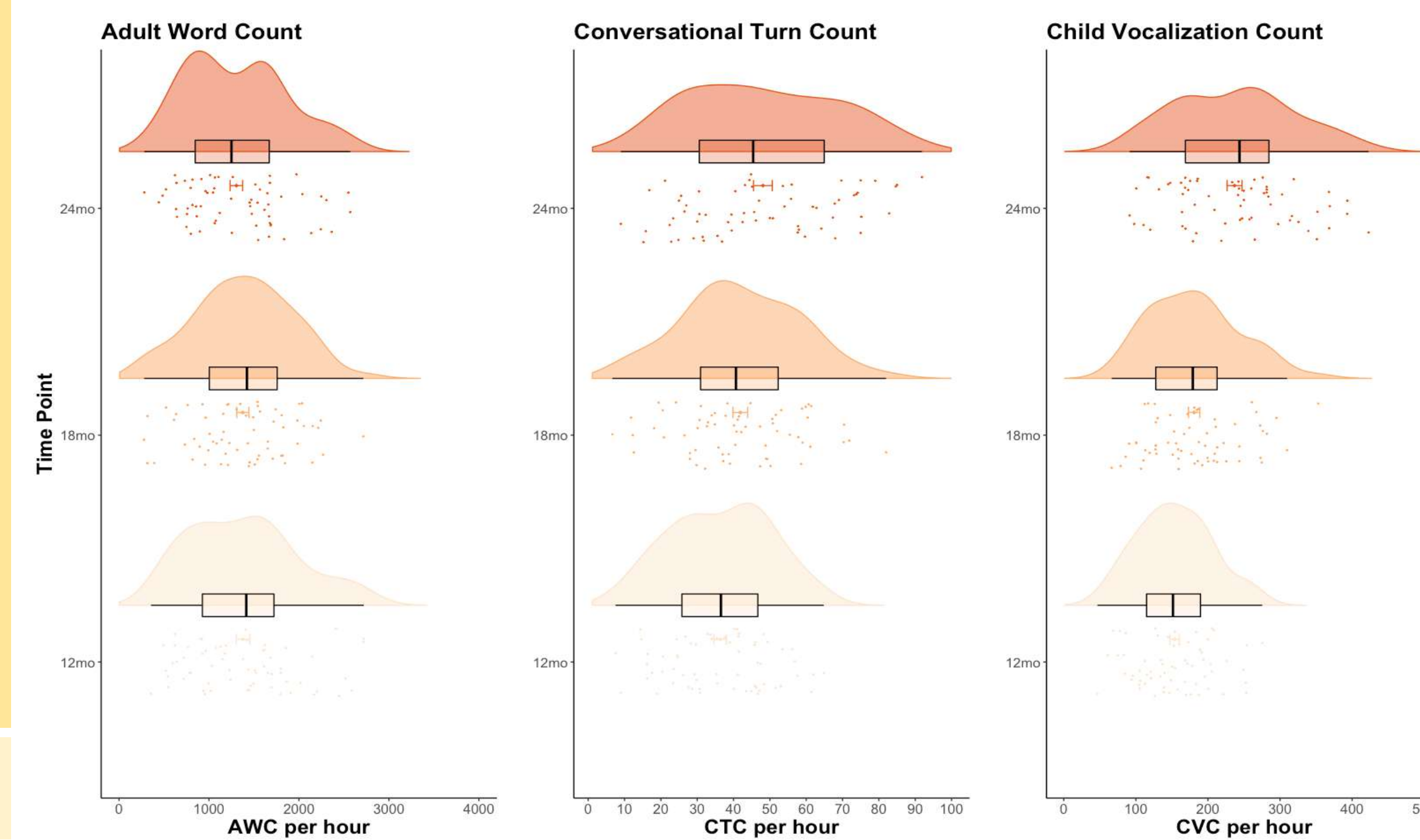- Early, dialogic interactions support the development of language neural systems[7]

Methods

Participants

The Gambia

N = 64 (34 females)
  12-month: M_{age} = 12mo; SD_{age} = 0.98
  18-month: M_{age} = 17.46mo ; SD_{age} = 0.82
  24-month: M_{age} = 23.41mo; SD_{age} = 0.50

The UK

N = 33 (17 females)
  18-month: M_{age} = 18.09mo; SD_{age}= 0.63
  24-month: M_{age} = 23.85mo; SD_{age}= 0.71

Measures

Language ENvironment Analysis (LENA) system

Automated counts of language activity in the natural environment of the child. It is composed by a digital language processor (DLP) and an analysis software that parses the audios based on speech recognition algorithms

LENA Procedure

The Gambia

The UK

Aims

1. Explore the home linguistic environment of Gambian and UK infants across the first 2 years of life

2. Identify disparities in the amount of adult words and conversational turns infants are exposed to

3. Identify variations in infant's level of vocalization production

4. Investigate whether the amount of conversational turns predicts infants' vocalization production
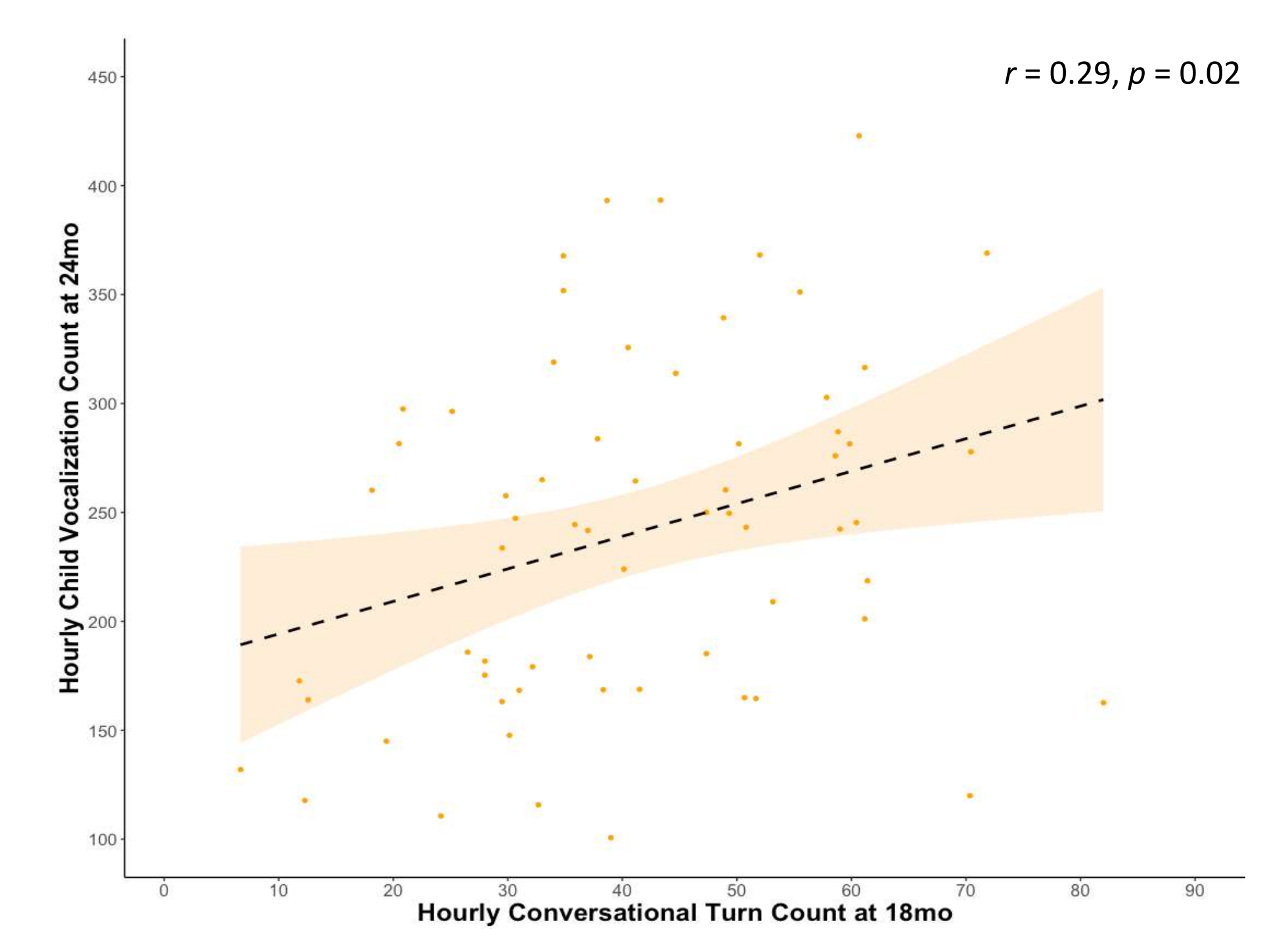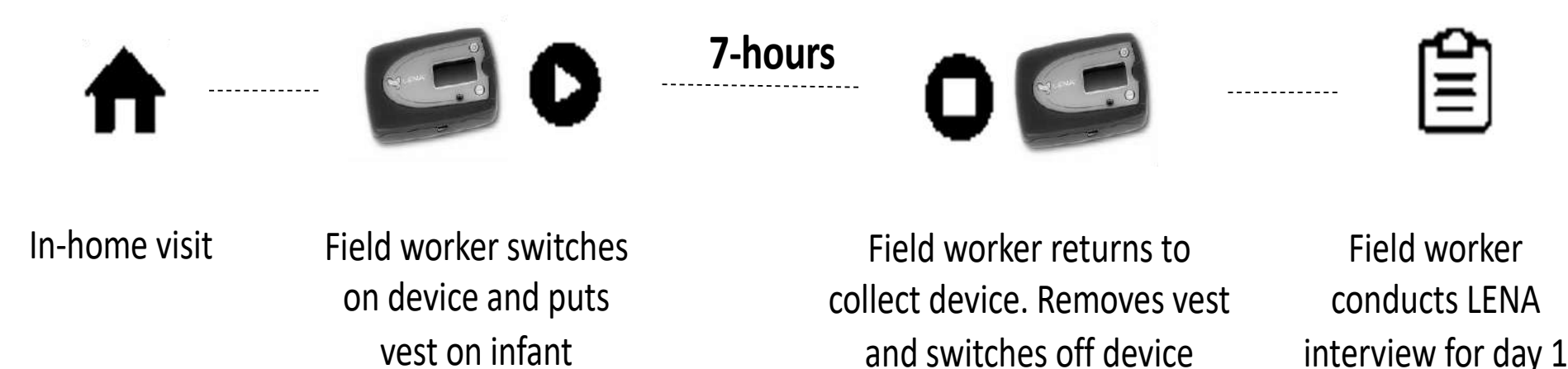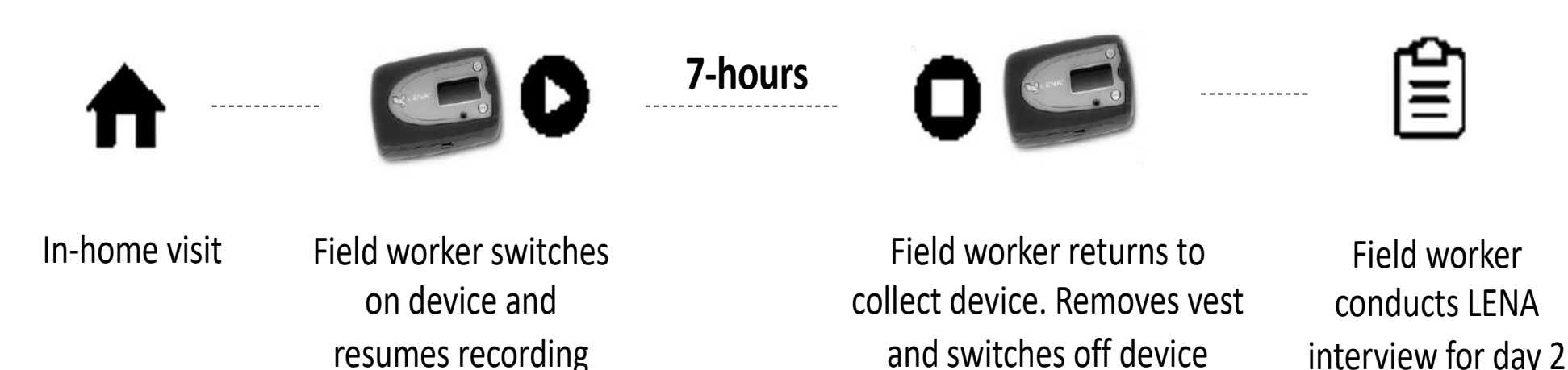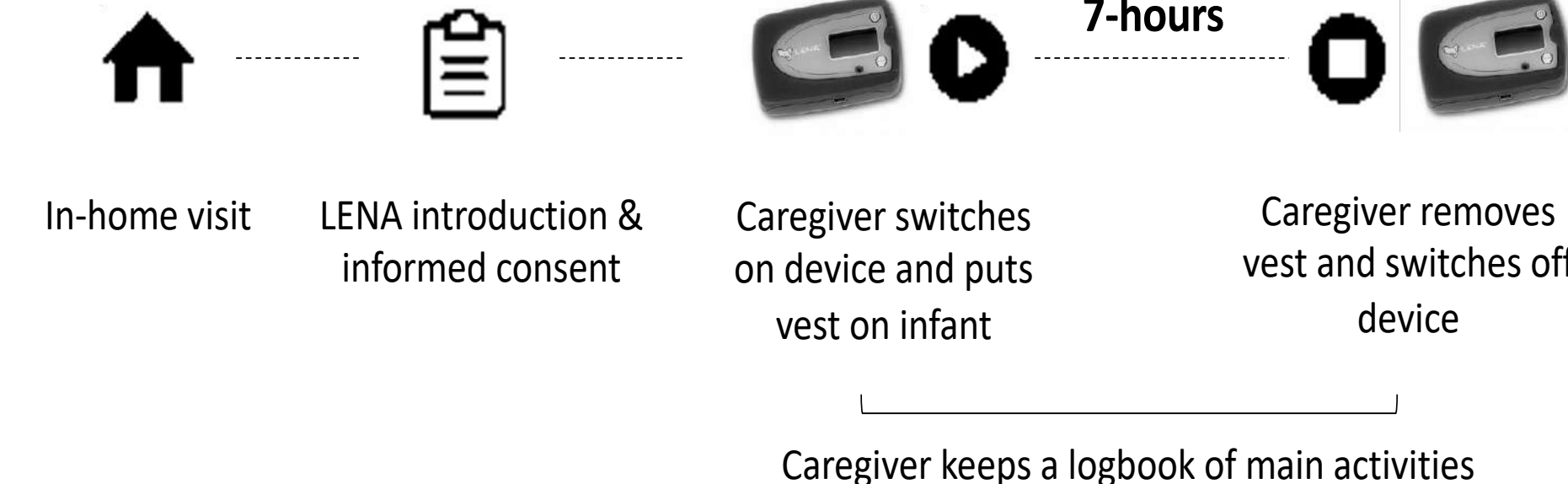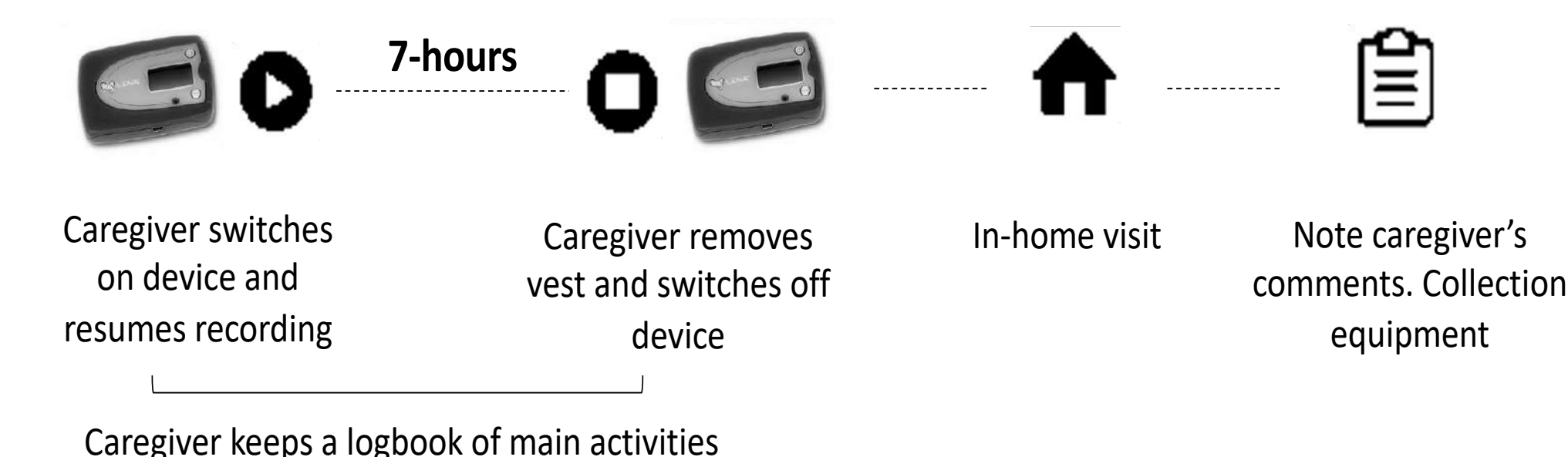
Results

The Gambia
Repeated measures ANOVA with Time Point as within-subjects factor

The Gambia
Stepwise linear regression

$r = 0.29, p = 0.02$

Although Gambian infants hear a similar amount of adult words at each time point, they were exposed to more conversational turns at 24mo as compared to 12mo. Infants produced more vocalizations with increasing age

Conversational turns at the age of 18mo predict child vocalizations counts at 24mo. Adult word count and child vocalization count were not good predictors

The UK
Repeated measures ANOVA with Time Point as within-subjects factor

Cross-cultural comparison
Mixed effects ANOVA with Time Point as within-subjects factor and Country as between-subjects factor

UK infants were exposed to a similar amount of adult words and conversational turns at 18 and 24mo. Infants produced significantly more vocalizations with increasing age
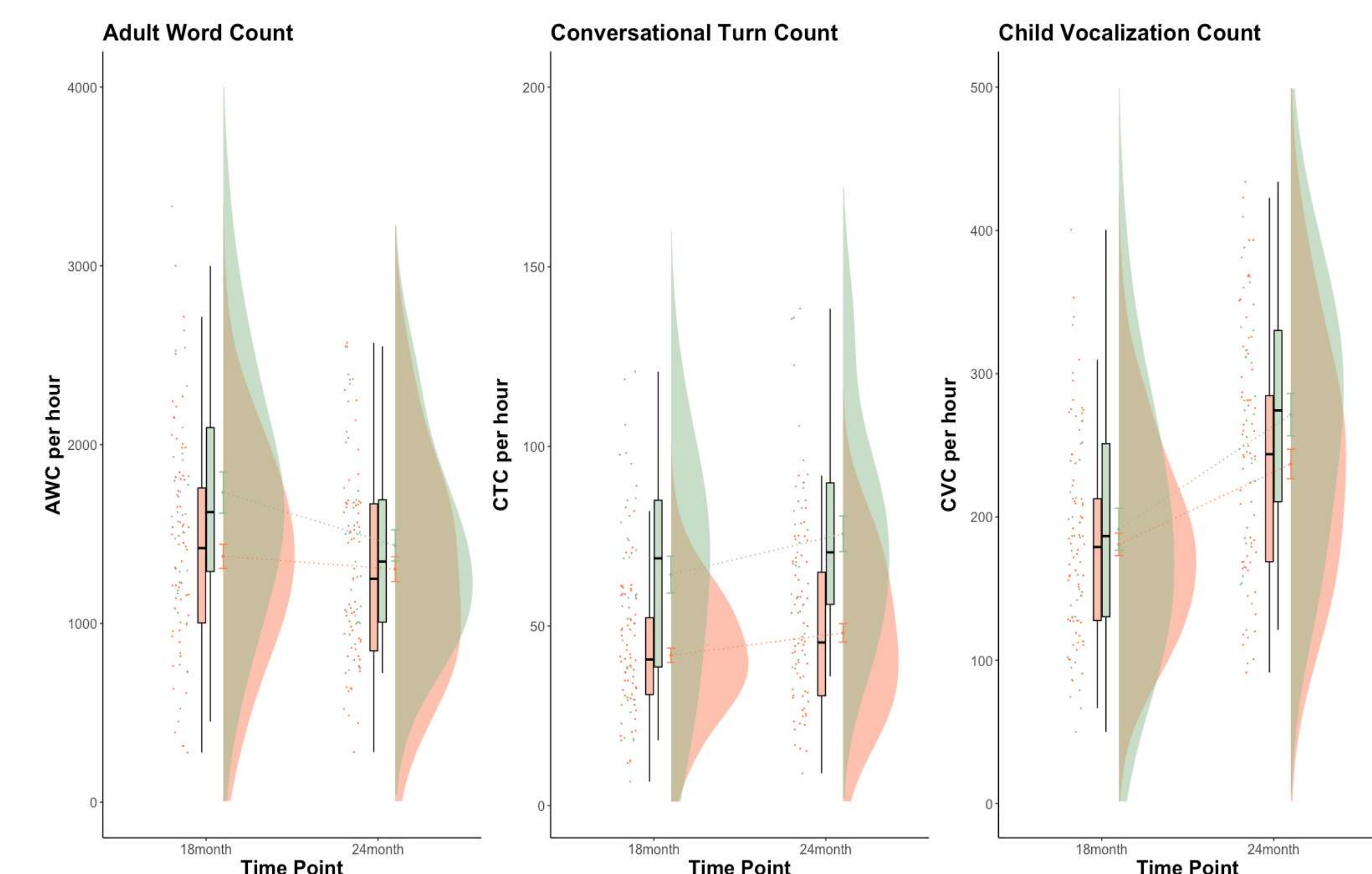
From 18- to 24-mo, adult word count decreased while conversational turns and child vocalizations increased. Adult words and turn taking were higher in the UK. Yet, child vocalization counts did not differ across settings

Discussion

Gambian and British infants were exposed to more conversational turns and produced more vocalizations with age. In both settings the hourly adult word count decreased as infants got older. Compared to British infants, Gambian infants were exposed to fewer adult words and conversational turns at each time point. Nonetheless, the groups produced a similar amount of vocalizations at both time points

Contact details: m.crespollado@bbk.ac.uk

References:[1]Huttenlocher et al. (1991). *Developmental Psychology*; [2]Rowe (2012). *Child Development*; [3]Hart & Risley (1995). *Meaningful differences in the everyday experiences of young American children*; [4]Rowe (2008). *J Child Language*; [5]Richman et al. (1992). *Developmental Psychology*; [6]Levine et al. (1996). *Child care and culture: Lessons from Africa*; [7]Romeo et al. (2018). *Psychological Science*