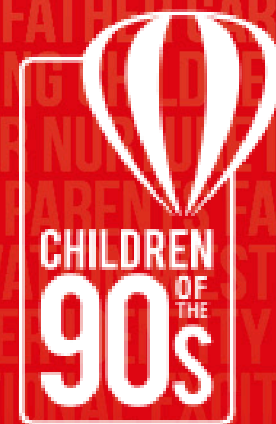


Through babies' eyes: practical and theoretical considerations of using wearable technology to measure parent-infant behaviour from the mothers' and infants' view points

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4th May 2017



Avon Longitudinal Study
of Parents and Children

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Content

- Background
- Validation studies
- Use of head cameras in longitudinal cohorts – pilot
- Preliminary results
- Future research

Acknowledgements

Dr Rebecca Pearson, Prof. Marc Bornstein, Ruby Lee, Callum Cree, COCO90s study team.

Importance of early parent-infant interactions

- Associated across species with cognitive, emotional, behavioural and physical (e.g., growth and obesity) outcomes in adulthood and across generations (Bornstein, 2015).
- It is modifiable! (IF we can understand better)



Measurement in humans

- Parent report: subject to several biases
- Objective observation by a third party
 - Laboratory setting
 - Pros: control and consistent environment good camera angles
 - Cons: unrealistic setting , demand characteristics , no observation of home
 - Home Setting
 - Pros: more realistic , more at ease, observe home environment
 - Cons: Less control, camera angle

Problems with current measurement methods

- Small snapshot of time
- Third person always there
- Times of stress, tantrums, crying are particularly relevant but rarely captured on film.

Improvements?

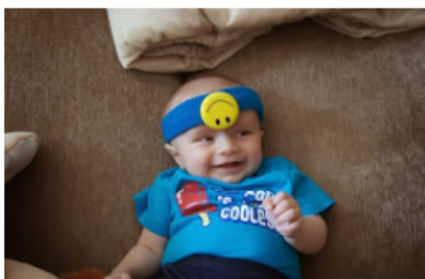
- Longer periods of time at home
- Cut out third person

Technology?!

First published use of head cameras

Monday, 24 February 2014

Psychologists use baby-cam to study infants' exposure to faces



An infant sporting the baby-cam, worn upside down to ensure the camera was level with the eyebrows. Image reproduced with permission of N. Sugden.

What does the world look like from a baby's perspective? In the first research of its kind, psychologists in Canada have analysed hours of video footage taken from small cameras worn by babies on their heads. Nicole Sugden and her [colleagues](#) were particularly interested in the babies' exposure to faces, to find out whether the kind of faces they were exposed to might explain a developmental process known as "perceptual narrowing". In the context of face recognition, this is the finding that babies gradually lose their ability to distinguish between other-race faces and other-species faces.

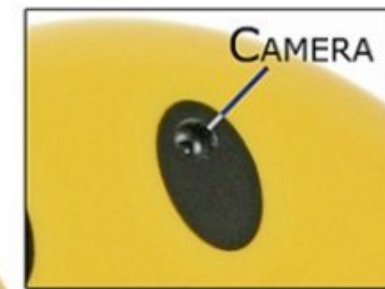
The researchers recruited the parents of 14 1-month-olds and 16 3-month-olds. There was an even mix of girl and boy babies, and the families were of a variety of ethnic backgrounds including Caucasian, Southeast Asian, and Black-Caucasian. For a two-week period the parents were asked to place the smiley faced camera, attached to a headband, onto their baby's head whenever he or she was awake.

In total, the researchers obtained nearly 20 hours of footage from the 1-month-olds and over 25 hours footage from the 3-month-olds. This difference reflects the fact that the older babies were awake an average of 9 hours a day, while the younger babies were awake an average of 7 hours daily. The footage was varied, taking in the home environment and outdoors, including situations where adults were playing with their babies but also many other contexts such as riding in a stroller, at parent groups, and out at a restaurant.

Head camera technical specification

BoddBan camera specification

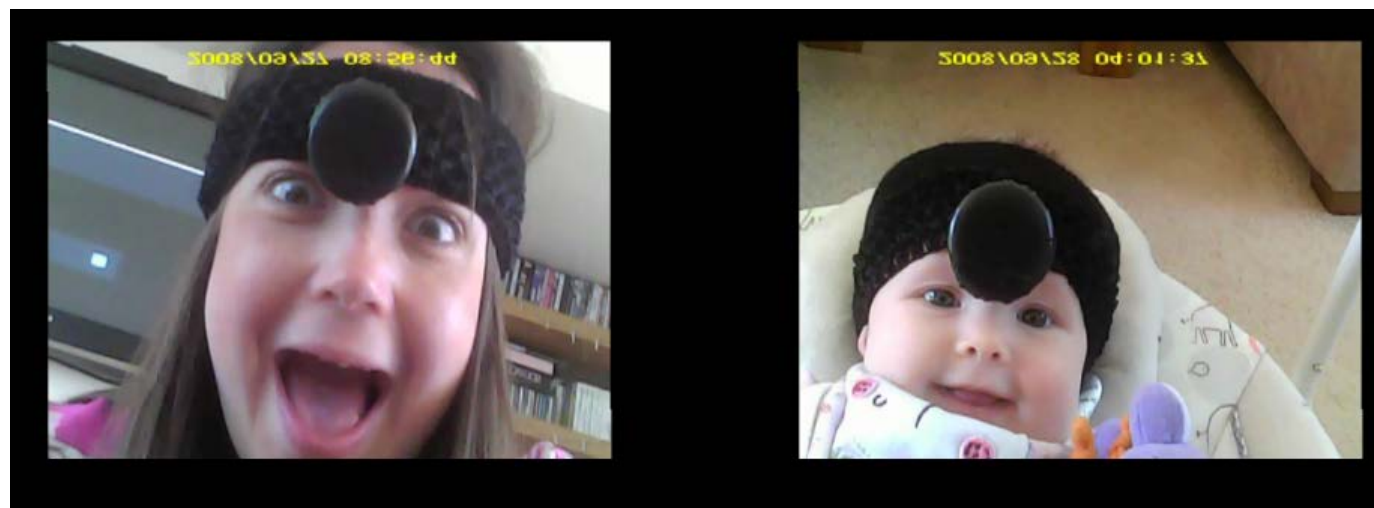
- resolution: 720x480
- framerate: 30/s
- format: avi
- storage capacity: with largest sd
- memory card: ~1hr



Validation of first person cameras: Pilot

How could this technology be used to measure parent-child interaction?

- Put cameras on both parent and child
- Cameras made black to prevent distraction
- Compared with recordings made at the same time using traditional 3rd person camera



Validation of first person cameras: Pilot

Infant Behavior & Development 47 (2017) 62–71



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Infant Behavior and Development



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Validation of first person cameras: Pilot results

Table 1.

Comparisons of rates per minute of mother and infant behaviours according to recording method and scenario.

Mean rate per min (SD)	Infant			Mother		
	Happy	Neutral	Distressed	Sensitive behaviours ^a	Neutral ^b	Less sensitive behaviours ^c
Initial test session (3rd PC)	0.72 (0.55)	0.93 (0.59)	0.43 (0.52)	2.13 (1.5)	1.12 (0.9)	0.21 (0.33)
Initial test session (1st PC)	0.52 (0.34)	0.82 (0.29)	0.63 (0.65)	1.35 (0.88)	0.73 (0.44)	0.13 (0.16)
Free sessions (1st PC)	0.50 (0.51)	0.70 (0.45)	0.48 (0.40)	1.24 (0.55)	0.78 (0.78)	1.04 (0.63)

a Comforting, engagement, encouragement, positive affect.

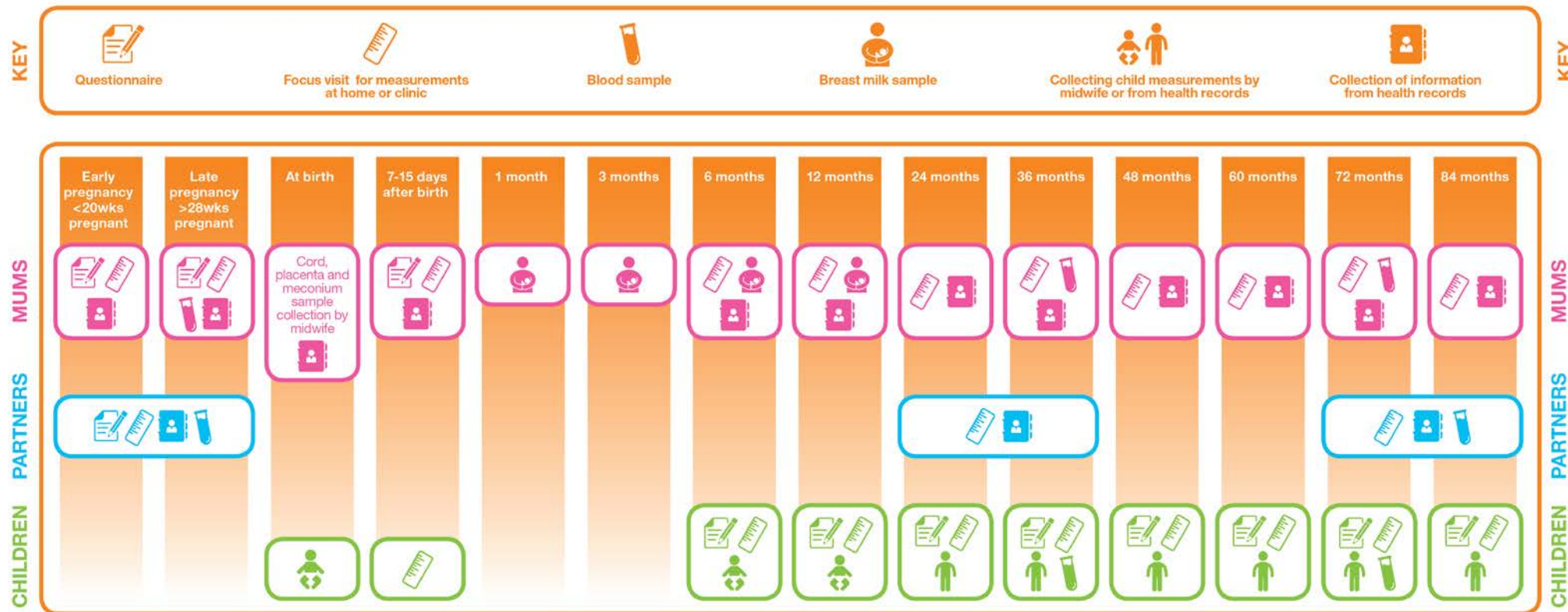
b Monitoring, routine care.

c Distracted, critical, mismatched affect, persistent ineffective, intrusive.

- Can be used to reliably record mother-infant interactions
- Can record more ecologically valid behaviours
- Reduce demand characteristics

Head camera use in cohort studies

Currently carrying out a pilot study with the ALSPAC-G2 cohort

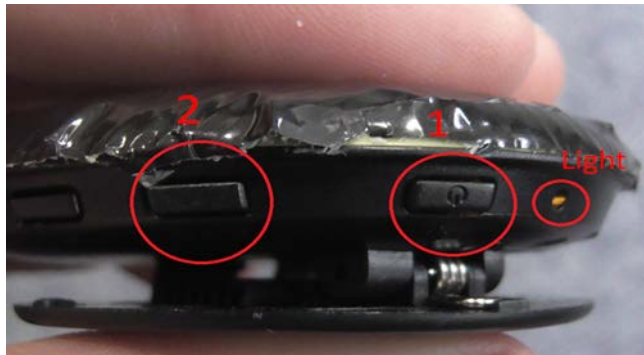


ALSPAC-G2 Head camera protocol

Day 1 – COCO90s clinic visit; participant consented, demonstration of how to use cameras, pack provided

Day 2-6 – Participant takes camera home; records up to 5 sessions across 2 days (of their choice), suggested times/activities given, diary to complete

Day 7 – Collection of cameras; COCO90s fieldworker collects cameras from the participants home



ALSPAC-G2 head camera response rate

- n=59 invited to take part
- n=30 (51%) consented
- n=20 (66%) provided at least one recording

ALSPAC-G2 head camera preliminary results

- 17 feeding observations averaging 11 minutes
- Best scenario, most popular
- Looked at the precursors to “interesting behaviours”

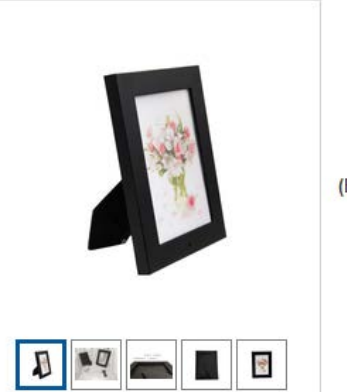
ALSPAC-G2 head camera preliminary results (cont)

Mean (SD) Proportion of total time each behaviour occurs	Mother speaks in 'infant register'	Mother speaks in Adult register	Mother has positive affect	Baby look at mother	Baby touch object
Total Observation	0.31 (0.12)	0.009 (0.01)	0.082 (0.06)	0.18 (0.17)	0.025 (0.04)
5 s Before distress	0.31(0.15)	0.033 (0.08)	0.073 (0.11)	0.18 (0.17)	0.025 (0.04)
5s Before non-distress	0.24 (0.15)	0.001 (0.01)	0.88 (0.12)	0.40 (0.24)	0.021 (0.04)
5s After distress	0.40 (0.26)	0.002 (0.004)	0.059 (0.11)	0.26 (0.22)	0.001 (0.007)
5s After non-distress	0.23(0.12)	0.007 (0.001)	0.087 (0.10)	0.40 (0.25)	0.013 (0.027)

Head cameras – future research

- Compare results of further analysis of recordings to maternal depression
- Now also piloting father-child interactions and also mother-father-child (Iryna Culpin)
- Head cameras do have a limited field of view and therefore can be difficult to understand positioning – introducing the use of a wider field camera for use at the same time

Picture Frame Hidden Camera



- Potential other uses??

ALSPAC-G2

Our participants

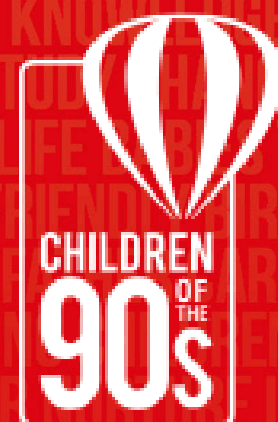


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ANY QUESTIONS?



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