Appendix 1: Kids'Cam Screens Annotation Manual—Image data

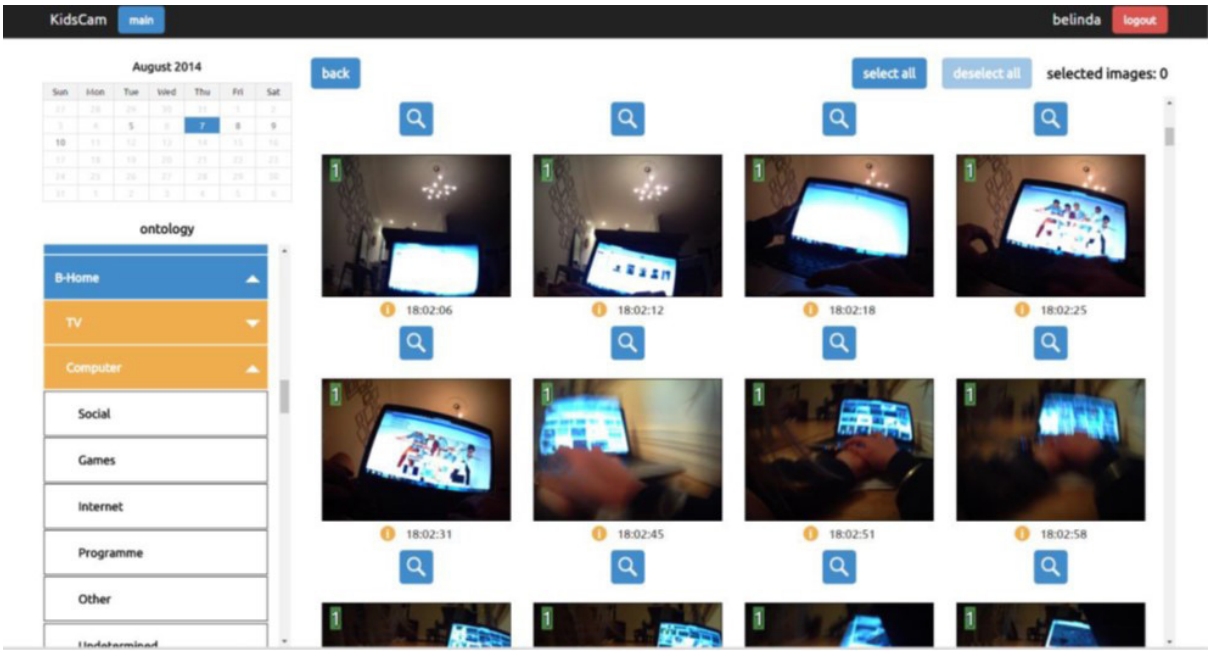
Research questions:

- What is the nature and extent of children's screen time during the after-school period on a typical weekday?
- What is the association between children's after school screen time, type and activity, and children's body weight, gender, ethnicity and socio-economic deprivation?

Annotation overview

The development of the annotation schedule for Kids'Cam Screens was based on observations made during scoping research. It was further informed by the annotation protocols the Kids'Cam food marketing project (hereafter Kids'Cam), and other projects that used wearable cameras (Barr et al., 2015; Doherty et al., 2012; Gemming et al., 2013). The bespoke software developed by Dublin City University for Kids'Cam was adapted for use in Kids'Cam Screens. It required a three-tiered, "tree" > "branch" > "leaf" annotation scheme. An example of the software is shown in Figure 1. The left panel shows the three-tier annotation panel, while images for each hour are shown on the right. A calendar can be seen in the top left corner to navigate day and date of the images shown. Images captured during the designated time period from every eligible participant totalled 120,780. Every image was reviewed for the instance of a screen, the screen type and activity carried out, and annotated accordingly. For Kids'Cam Screen Time the three-tiered annotation scheme of "setting" > "screen type" > "activity" was used.

Figure 1: Example of annotation software interface.



Study definitions

Table 1: Kids'Cam Screens setting annotations and corresponding definitions.

Setting	Definition
Home	Includes all spaces within the home gates and boundaries i.e., indoor and outdoor spaces; or someone else's home
Community venue	Library Recreation centre/community hall— a public space where meetings are held Marae—includes the meeting house, dining hall, education and associated facilities and residential accommodation associated with the marae Church
Street	On the street, outside private property or a community venue or retail store
Food retail	A retail store that sells food. Includes supermarkets, cafes, bakeries, etc.
Other retail	General product retailers whose primary purpose is something other than food retail
Outdoor recreation space	Parks—characterised by the presence of large, open, grassed spaces, possibly with some equipment such as climbing frames or playgrounds (not primarily used for organised sport) Walking track—characterised by in-bush or off-road areas such as the town belt Beach River
Private transport	Inside a car, van or truck
Public transport—facility	Associated with public transport facilities—e.g., bus shelters, train stations, airports etc.
Public transport—vehicle	Inside a bus, train, airplane, ferry

Table 2: Screen categories and corresponding definitions.

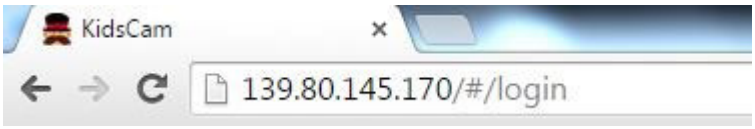
Medium	Definition
Television (TV)	Generally an electronic screen that could stand alone, or mounted to the wall
Computer	Includes desktop computer and laptops
Tablet	An electronic screen that does not require a keyboard or mouse, most commonly used for surfing the internet and running applications: e.g., iPads or Samsung Galaxy tablets
Mobile device	A handheld device, most commonly used for surfing the internet and running applications. Includes smart phones and iPods

Table 3: Screen-based "activity" annotations and corresponding definitions for Kids'Cam Screen Time.

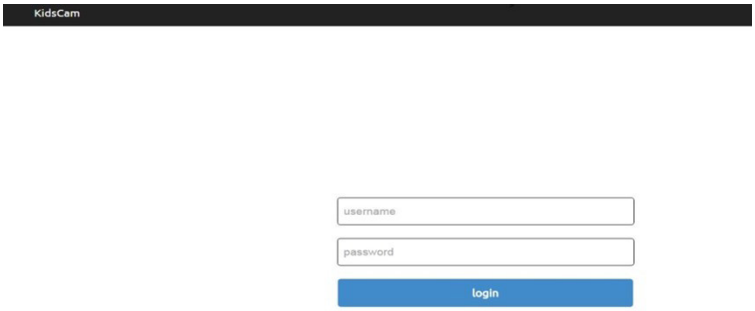
Activity	Definition
Programme	Watching any form of programme or movie; this activity was most common on a television screen
Games	Content of the screen appeared to present some goal or objective, with rules and restrictions around obtaining it
Social	Activities that involved interacting with others. Encompassed activities such as Facebook, Instagram, Snapchat, text-messaging, etc., and were most often carried out on mobile devices, tablets and computers
Internet	Using websites other than those used for social or gaming activity; included online shopping and watching videos on YouTube
Background	When a screen was present in the child's immediate vicinity; however, the child did not appear to be fully engaged with it, but could still be influenced by it
Other	During the scoping study it was determined that an "Other" annotation would be required to describe any screen-based activity other than those described above, such as listening to music on iTunes, or running offline programmes such as Microsoft Word and Microsoft PowerPoint
Undetermined	Images where it was clear the child was engaging with a screen (see page 80), but the annotator was uncertain what was occurring on the screen: this situation most commonly occurred due to an interference of light

Logging in as User

1) Type in the Kids'Cam URL (http://139.80.145.170) into the web browser (*Google Chrome)* of a computer connected to the University of Otago Server.

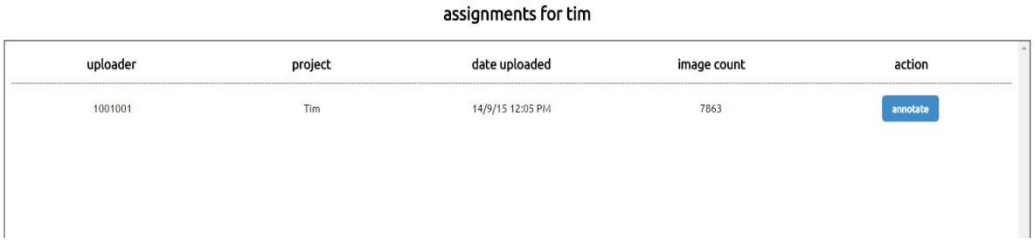


2) Type in your username and password to access the photos you have been personally assigned.

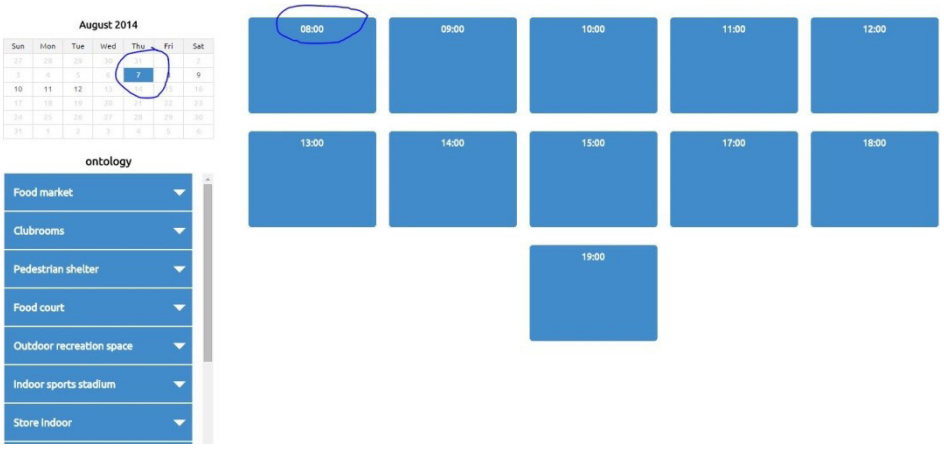


Accessing photos

1) Once logged in, your assignments will appear. In order to access a participant's photos click on the annotate button.

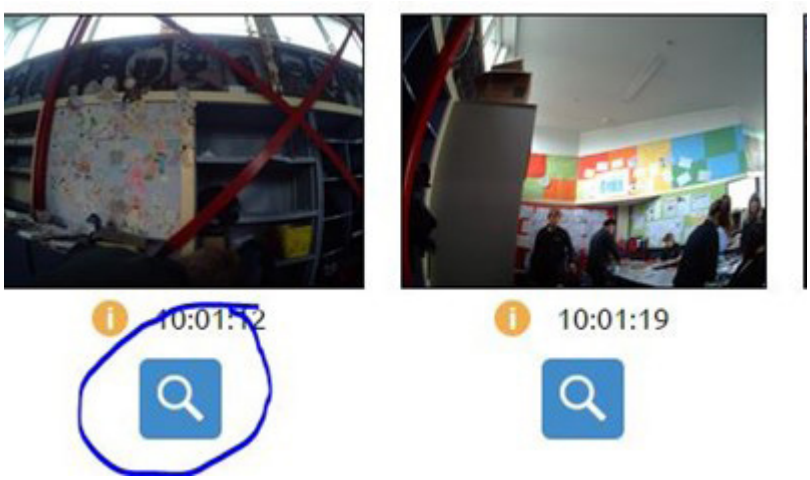


2) Next click on the date you are interested in using the calendar function and then select the time by clicking on the appropriate hour.

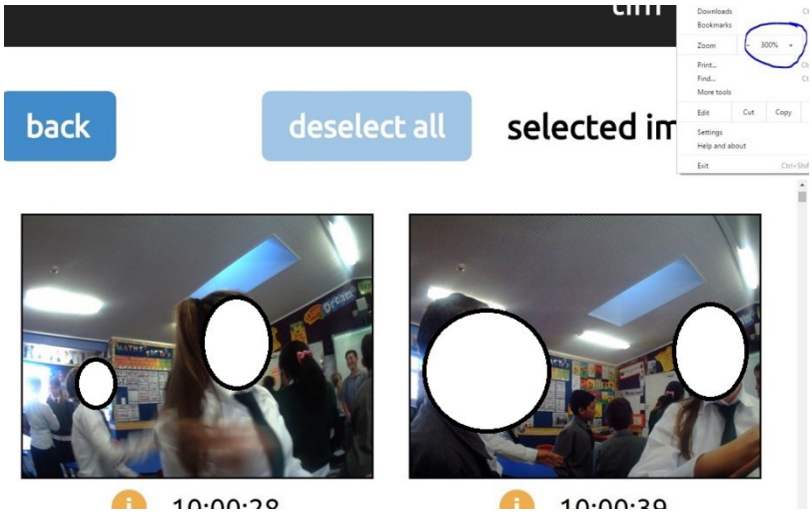


Annotating an image

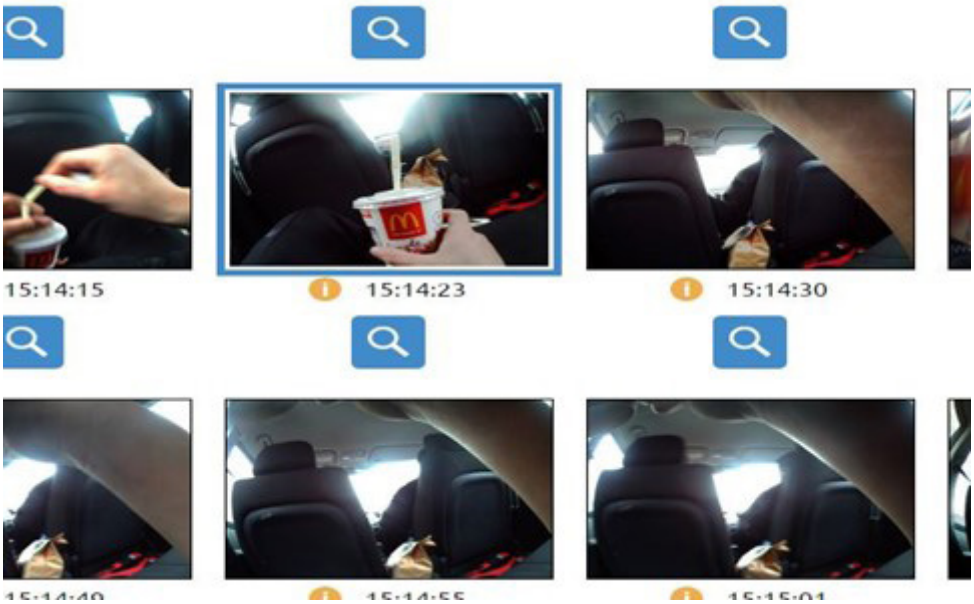
1) Annotations must be made after having magnified the image by clicking the magnify function. Further magnification is permitted if necessary by clicking on the image once. The image will appear in a new tab fully magnified.



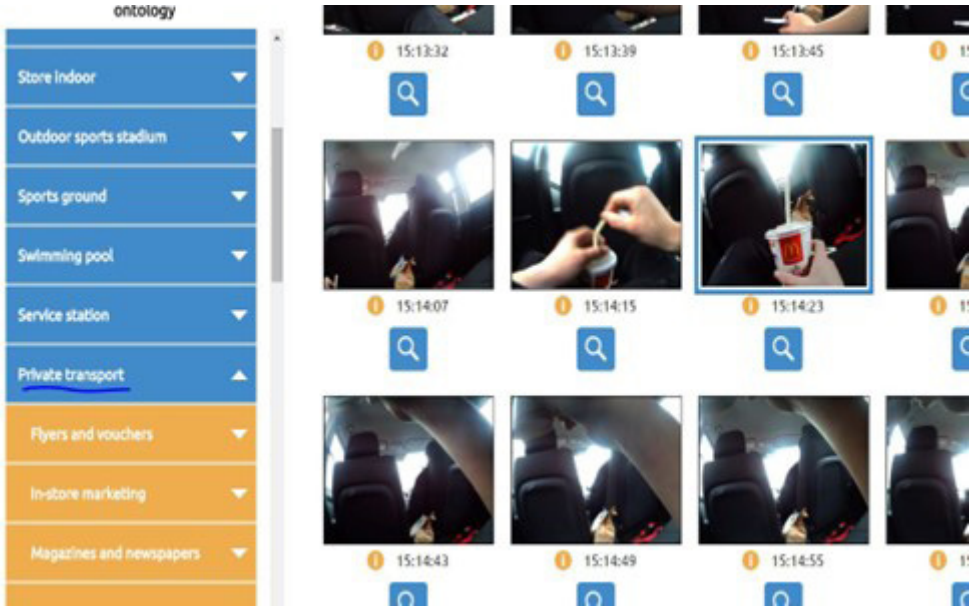
2) Alternatively, you can zoom in 300%; then the thumbnails become the same size as a magnified image and magnification is not required in order to code.



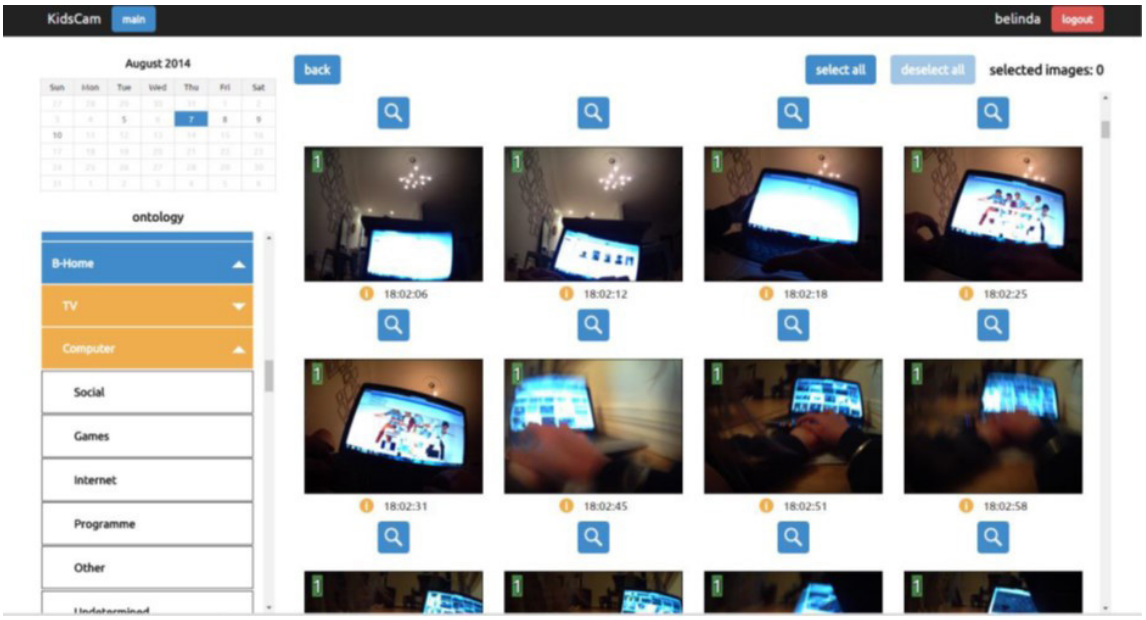
3) In order to annotate an image you **must click out of the magnified image** and click on the image you wish to annotate. Selection is symbolised by the blue border.



4) Annotators are to code images in the following sequence:
Setting > Screen type > Screen activity
5) First the image must be coded for setting (see setting definitions) using the annotation ontology bar to the left of your screen.

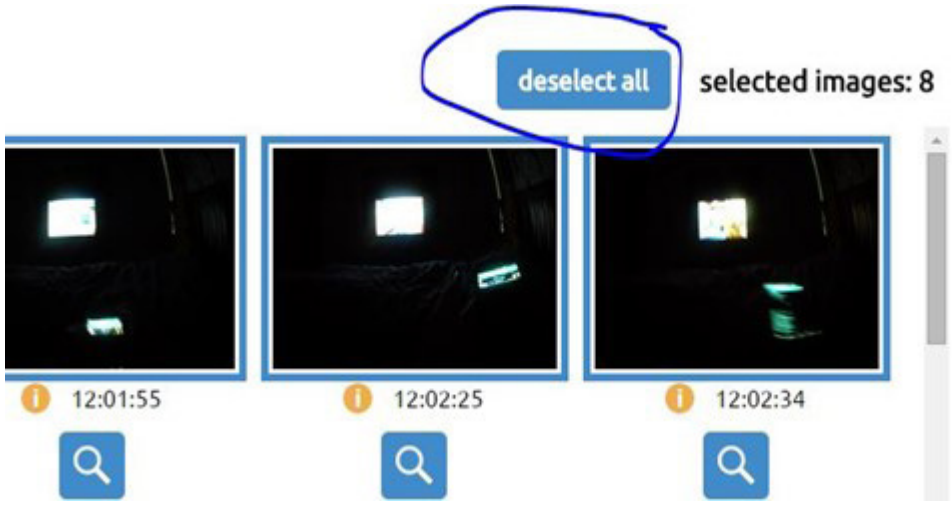


6) Once setting is selected, the ontology will open up a selection of screen types. Once determined (see definitions) select the appropriate screen type.



7) Once the screen type is selected a range of screen activities will appear. Once determined (see definitions) select the appropriate activity and the photo will be annotated. A green marker will appear to inform you the image has been annotated.

8) Make sure you deselect the images before making another annotation by hitting the “deselect” button.



9) To delete an annotation, select the photos you want to remove the annotations from. Then pull curser over highlighted ontology level and a red X will appear. Click the X.

Multiple screen use

Multiple screen use is defined as the use of any two or more screen mediums in an image, e.g., watching television while playing on a tablet. Figure 2 shows an example of a child using two screen types simultaneously.

Figure 2: Example of an image that would be annotated as "Home" > "Television" > "Programme" and "Home" > "Mobile Device" > "Unknown".

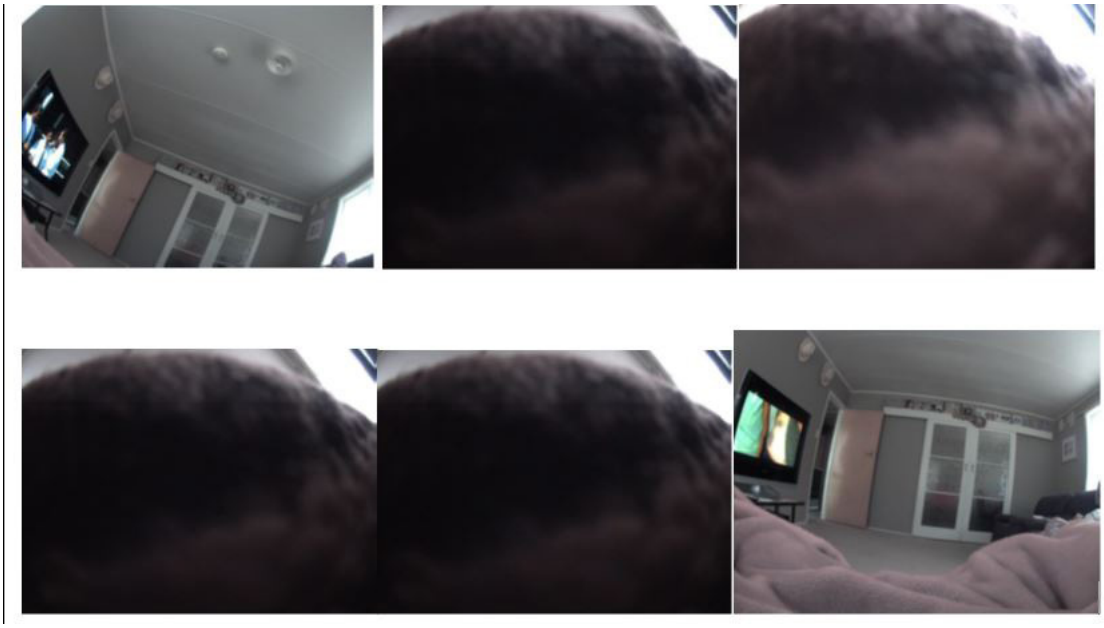
Blurry and blocked images

During the scoping study, it was observed that within a sequence of images containing a screen, some images were completely blocked. Such instances occurred when, for example, the participant was watching television, the camera flipped and images were taken while the camera was lying flat against the child's torso, or the camera fell behind a blanket or sweatshirt. In the event of a completely blocked image, the 18-image rule was devised to ensure consistency throughout the analysis process.

The 18-image rule states that a series of fully blocked images can be counted as screen time if the images before and after the blocked image show a screen, and that no more than 18 images (approximately 2–3 minutes) occur in between. If more than 18 blocked images occur between two images with screens, the blocked images cannot be included as screen time; they are also removed from total time. The rule, and the choice of 18 images, was based on previous wearable camera research. The SenseCam Coding Manual produced by The University of California, San Diego, USA, used a 10-image rule (the equivalent of 3 minutes, given reduced image-taking frequency of the cameras used in the study) when coding for physical activity and environment. The authors thought 3 minutes was justified, as a change in context or environment is unlikely in that time period (Doherty et al., 2012).

The images in Figure 3 illustrate how the 18-image rule was implemented for fully blocked images in Kids'Cam Screen Time. The first image shows that the child is watching television. In the two following images, the camera has fallen behind a blanket, and thus the annotator cannot be certain that the child is still watching the television. However, the subsequent images show the television in plain sight again. In this instance, all four images would be annotated as "Home" > "Television" > "Programme". If, however, 19 or more images elapsed between the images in which the television is seen, the blocked images would be annotated as "Uncodable", and also excluded from total time. The argument for the 18-image rule is that even if the television was obstructed for up to 18 images (2–3 minutes), if an image showing the screen on appears subsequently, it is unlikely the screen was switched off.

Figure 3: Series of 6 images that would all be annotated 'Home' > 'Television' > 'Programme'.



Computers

1) Images are only to be coded using an external computer screen no larger or smaller than 22'. Do not code using a laptop screen or the Kids'Cam server screen.

2) **Always** use the *Google Chrome* internet browser to access and analyse the images, as the annotation framework has been optimised for this platform.

Data analysis rules

For images that are separated by less than 1 second, the first image will be counted towards the data analysis. Any subsequent images within the 1-second time lapse will be removed from the analysis.

Ethics

1. Keep the identifiable features of the data **confidential;** these features of the data should not be discussed with anyone outside the research team.

2. Do not leave data or equipment containing unsecured data unattended. If you leave your computer for any amount of time you must **log out.**

3. The University of Otago possesses ownership of all image data. Applicants cannot copy data without the written approval of the Principal Investigator or retain copies of the data after completion of work. Any data copied or released must be stored on a password-protected device and must have gone through the appropriate anonymised procedure.

4. Protect the anonymity of all participants, third parties and their environments. To protect the privacy of those who may be inadvertently captured in the images, all images used in disseminated material will have identifiable people, street names, places, retail outlets, businesses and school names blurred. The demographic information collected will only be viewed by the core Kids'Cam team.

References

Barr, M., Signal, L., Jenkin, G., & Smith, M. (2015). Capturing exposures: using automated cameras to document environmental determinants of obesity. Health Promotion International, 30(1), 56-63.

Doherty, A. R., Kelly, P., Kerr, J., Marshall, S., Oliver, M., Badland, H., & Foster, C. (2012). Use of wearable cameras to assess population physical activity behaviours: an observational study. The Lancet, 380, S35.

Gemming, L., Doherty, A., Kelly, P., Utter, J., & Mhurchu, C. N. (2013). Feasibility of a SenseCam-assisted 24-h recall to reduce under-reporting of energy intake. European journal of clinical nutrition, 67(10), 1095-1099.