The Computerised Manchester Child Attachment Story Task: a novel medium for a measure of attachment patterns

Introduction
Attachment patterns describe how young children respond with their parents in stressful situations and can be described as “secure” or “insecure” (1) or alternatively as “organised” or “disorganised” (2). These patterns have provided one of the most useful ways of predicting children’s and adults’ social behaviour (3). The Manchester Child Attachment Story Task (MCAST) measures attachment patterns aged 4.5 to 8.5 years (4) and is currently being used in a range of studies internationally. The MCAST has good inter-rater reliability, stability of attachment patterns over time (4) and shows concurrent validity against other key attachment measures (5).

In the original doll-play MCAST, children aged 5 to 7 are given the beginnings of four stories (“story stems”) using a dolls house, each containing an attachment-related theme. For example, a child doll whose mother
doll is in the dolls-house is represented hurting her knee in the garden. At the most intense moment in the story, the interviewer hands over to the child saying “what happens next?” The way the child plays out the story thereafter is subjected to structured coding and the child is assigned an attachment classification (4).

The MCAST is quite an expensive instrument to administer as it requires the input of trained administrators. In addition, we suspect that differences between the delivery style of administrators can influence the child’s responses and complicate rating. We have developed a computerized version of the MCAST (the CMCAST) with the aim of producing an instrument which can deliver replicable assessments of attachment and could be used in large populations.
Figure 1 – basic CMCAST screenshot with 2-D characters
The CMCAST
The CMCAST requires minimal training for administration and can be used on any standard PC. The CMCAST version used in the study described below was written in Java and allowed the story stems to be presented to the children using simple animation techniques. The dolls are used in the MCAST are represented in two dimensions only and character movement is synchronised with a verbal narration of the story stem done in a ‘standard’ voice. The movement of the characters is gross and only involves whole character movement: individual limbs etc do not move. This is because research has suggested that children likely to be in the ‘at risk’ group that the CMCAST is trying to assess may not possess the skills necessary to complete complicated movement of on-screen characters (6).

When the stem narration is complete the child is invited by the software to take over the story and ‘show me and tell me what happens next’. They do this by moving the onscreen characters and providing a verbal narrative as they do. At this stage the software shifts from a ‘playing’ mode to a ‘recording’ mode and records all the movement of characters the child makes as well as capturing the audio of the narrative and a video of the child’s face, captured using a webcam, during the whole stem. The child is able to only move one character or object at a time and while they move it to software records the screen coordinates of the object in 1 millisecond time slices. It also keeps a record of the coordinates of all other objects for each time slice. This data allows the production of a ‘replay’ of the action later by using these coordinates for animation.

The child has control of the stem and can end their narration at any time after an ‘End Story’ button appears. To ensure that a child cannot just click the stem screen away without any response the button does not appear until 30 seconds has passed. The software will also ask for confirmation of completion of the narration in case the button is clicked accidentally.

The software also allows for the use of prompts to ask a series of questions used in the MCAST to wind up each stem. The administrator has the option to turn this on or off at the beginning of each administration.

The replaying of the stem is done via a separate player which takes the coordinate data stored during the child’s narration and uses simple animation techniques to produce a replay of the child on-screen response. This is synchronised with a replay of the audio and video stream recorded during the child’s narrative.
The process followed by the software is:

1) An introduction screen where the subject data can be input, including sex, which will determine the gender of the on-screen characters. At this screen the administrator can select whether the software will display the prompts or not.

2) A screen where the child can choose characters to represent themselves and their mother.

3) A screen and associated narrative to get the child centred within the webcam’s field of view (see Figure 2)

4) A warm-up screen featuring a countdown and rocket launch intended to help the children get comfortable with vocalising their responses.

5) A free play screen where the child can practice moving the characters.

6) A warm up stem to familiarise the child with the protocol for the stems.

7) A final warm-up screen to get the children to vocalise their responses more

8) Each stem is then played in a sequence.

Is CMCAST a valid alternative to MCAST?

Eighty-two children aged 5-8 were originally recruited to the study. Forty-one of these children were recruited through child and adolescent mental health service (CAMHS) clinics or through social work departments and were suffering from severe problems with social behaviour. The other 41 participants were recruited through a family practice clinic and did not have mental health problems. During two appointments, each participating child had full assessment of their social behaviours using standardised and validated instruments and each child was asked to complete the MCAST and CMCAST. Children were randomly assigned to the order of administration of the MCAST/CMCAST and there was a 6 week period between the administrations. Both the MCAST and CMCAST assessments were videotaped, the MCAST using a stand-alone video machine, the CMCAST using a webcam.

Both MCASTs and CMCASTs were rated so as to produce a standard 4-way attachment classification for each of the four stories: A - insecure-avoidant (where the child-doll tends to resolve the dilemma him/herself without reference to the mummy-doll); B - secure (where the child represents the parent as helping to resolve the dilemma); C - insecure resistant/ambivalent (where the mummy-doll is involved in trying to resolve the dilemma, but the stress is poorly assuaged or increases) and D – insecure disorganised (where the child-doll appears to have no coherent strategy for resolving the dilemma). Relative costs of administration were estimated by comparing costs of equipment, training and administration.
Figure 2 – screenshot of set-up screen for helping child sit within the webcam’s view
Results
Of the 82 children originally recruited, only 55 had data for both CMCAST and MCAST for various reasons, but these 55 children did not differ markedly from the total sample on demographic variables. Technical problems included a malfunctioning video camera (MCAST) and malfunctions with either collecting or storing data on computer (CMCAST), all of which were dealt with through modifications to the software code or advice on the use of IT equipment.

Inter-rater reliability
Inter-rater agreement for the 4-way (A,B,C,D) attachment classification for both the MCAST and CMCAST was very good: MCAST kappa = 0.93 (95% CI 0.80-1) – 96% of classifications by independent raters were in agreement; CMCAST kappa = 0.91 (95% CI 0.82-1) – 94% of classifications were in agreement.

MCAST-CMCAST agreement
Agreement between the MCAST and CMCAST for the 4-way (A,B,C,D) attachment classification was good: kappa = 0.63 (95% CI 0.46-0.79) – 76% classifications were in agreement. Agreement between the MCAST and CMCAST for attachment security versus insecurity was also good: kappa = 0.67 (95% CI .48-.87) – 84% of classifications were in agreement.

Costs
We estimate that costs/administration for the two measures are £14.05 for the MCAST and £14.54 for the CMCAST but that if it were possible to deliver up to five CMCASTS simultaneously, costs for the CMCAST could reduce to £10.38 (a 30% reduction in cost).

Can more than 1 CMCAST be administered simultaneously?
We tested the possibility of simultaneous administration of the CMCAST by using it with 86 children in 4 primary schools. We tested 4 pairs of children, 4 groups of 3, 4 groups of 4 and 10 groups of 5. The proportion of CMCASTs lost due to technical difficulties or inadequate participation by the child was almost exactly similar to the previous study where administration was 1 to 1 (60, or 73%, could be rated). There was 84% agreement on attachment security between the original rater and a second independent rater.

Discussion
The excellent inter-rater reliability of the CMCAST and its good agreement with the MCAST suggests that it may be a useful instrument for evaluating attachment patterns in young school-age children. The level of agreement with the MCAST compares well with the test-retest reliability of the MCAST itself (7) and with agreement between the MCAST and other measures of attachment (5). This will of course require replication in future studies.
The CMCAST can be used in groups of children and our impression was that the less the administrator interfered with the child, the more the child interacted with the computer. This remains to be tested empirically but encourages us enough that we plan to go on to test the CMCAST in whole classrooms.

There is currently no satisfactory way of measuring attachment patterns in large-scale research. Attempts to develop screening questionnaires for attachment have shown only modest correlations with the gold standard attachment measures. These gold-standard measures are all expensive to administer and rate and the size of the largest cohorts examining attachment patterns are generally of the order of one or two hundred children (8). The impressive associations in these modest cohorts between attachment patterns and behavioural problems (9) suggest that the measurement of attachment should not be left out of studies which attempt to understand mental health through the lifespan. Various features of the CMCAST may recommend it for use in such large-scale research. The use of computer-based instruments for collecting data in large-scale epidemiological research is already commonplace (10), automatic storage of data on computer is likely to reduce the chance of data loss and the simplified rating scheme is likely to reduce costs of data analysis. Clearly much further work will be required on the CMCAST before we can confidently recommend the CMCAST for large-scale research.

Conclusions

The CMCAST agrees well with the MCAST original in assessing children’s attachment patterns, can be administered in groups of children and cost comparisons favour the computer version. The CMCAST may prove an important and cost-effective tool for measuring attachment patterns in large-scale mental health research.

References


