

Epistemic Actions in Attachment Relationships and the Origin of the Socially Extended Mind

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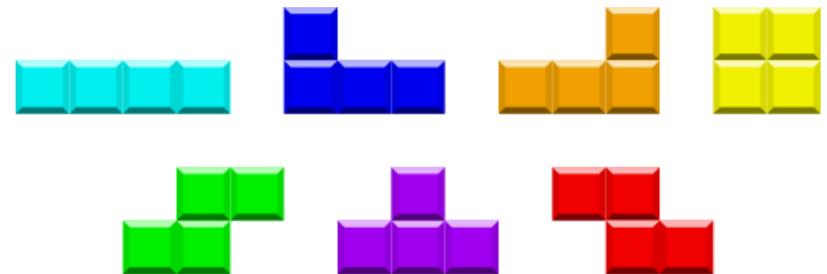
Introduction to the extended mind concept

- *“entities in the external environment may interact with internal environment in a way that these entities can be seen as extensions of the mind itself”*
 - (Clark and Chalmers (1998), Clark (2008))
- Mathematicians using pen and paper? Using electronic devices like personal organisers? Using ‘Evernote’?:
 - “We've always had the idea that Evernote should be everywhere. It needs to be ubiquitous because we are going to build you a second brain - the idea is, eventually, it's just part of you.”
 - <http://www.bbc.co.uk/news/technology-21602069>

Pragmatic versus epistemic actions

– do you like to play tetris?

- How do you work out which piece will fit which 'hole'?
 - Mentally rotate the piece and in your minds eye see when the match occurs
 - Physically rotate the piece and use your external perception to see if the match occurs
- Pragmatic actions – that change the world
- Epistemic actions – that change the nature of our mental tasks
- Kirsh and Maglio (1994)



Otto and Inga

- Otto and Inga navigating to MOMA thought experiment
 - Otto – external memory in a notebook
 - Inga – internal memory (the regular human type)
- For cognition to extend onto any entity, it must be:
 - Trusted
 - Relied upon
 - Accessible
 - (do mothers achieve these criteria for their children?)

Tetris versus Otto and Inga

- Otta has a notebook (with slow access)
- Tetris relies upon fast, closely coupled physical actions
- Can extended cognition examples be embodied and/or GOFAI?
 - *“A curious feature of Clark's response to Shapiro is its apparent endorsement of precisely the sort of body-neutrality that Shapiro thought was adverse to the embodied perspective. If all that matters to minds are computational processes, or if minds just are particular sorts of computational processes, one must begin to wonder about the novelty of embodied cognition.”*
 - **Lawrence Shapiro** - <http://ndpr.nd.edu/news/24037-supersizing-the-mind-embodiment-action-and-cognitive-extension/>

Socially extended minds

- Surgical teams, police partners, military formations
 - Symmetrical (but what about brainwashing?)
 - Context dependent
- Infants being extended by their carers
 - asymmetrical
 - Infant cognition ‘outside’ as well as ‘inside’ their heads
 - Epistemic actions in infant carer relationships
 - Social referencing,
 - Attachment?

What do carers provide by extending infant cognition

- Faster, bigger capacity,
- More reliable
- Less effortful
- Clark – language extends minds:
 - Labelling and conceptualising
 - Structuring
 - Promoting self-reflection
 - do carers extend minds in the same way as language?

The extended mind pencil joke

- Mind extension relies upon close coupling
- Adams and Aizawa:
 - "Question: Why did the pencil think that $2+2=4$?"
 - Clark's Answer: Because it was coupled to the mathematician"
- Difference between supporting/be involved in cognition and actually doing the thinking – does a neuron think? Does a molecule in the brain think?
- Joke not so funny when the entity that does the extending is another thinking agent:
 - Question: "Why did the mother think ?"
- Locus of control – mother or child?

Introduction to Attachment Theory

- Multidisciplinary origins
 - Psychoanalysis;
 - Ethology;
 - Piagetian Developmental Psychology;
 - Systems Theory/Cybernetics;
 - A.I.;
 - Cognitive Psychology
- Early concentration on long separations, loss, mistreatment and psychopathology
 - Changed hospital visiting practice
- Later focus on Individual Differences

Behavioural Component of Attachment Theory

- Hospitalisation; maternal deprivation, bereavement (Bowlby 1944 onwards)
- Ganda study (Ainsworth 1967)
- Naturalistic study of exploration in a park (Anderson 1972)
- ***The Strange Situation Procedure*** (Ainsworth, Blehar, Waters and Wall, 1978)
- Attachment Q sort (Waters and Deane (1985)
- Measures in later childhood; adolescence; adult romantic relationships; Adult Attachment Interview (AAI)
- Secure-base scripts in adults (Waters and Waters 2006)

Cognitive Component of Attachment Theory

- behaviour systems: from ethological 'behaviours' to cybernetics, control systems, and hierarchical plans
- Instincts that have to be constructed; expectable environments;
- Flexible repertoire direct by outcomes
- Constructed and reconstructed through development
- Hierarchy of forms of information processing

Hierarchy of forms of information processing

- Reflexes, Fixed action patterns
- Goal directed mechanisms
- Internal Working Models (IWMs)
 - Cybernetic and GOFAI (c.f. Bayes versus Model-based - Petters and Waters 2010)
- Hierarchical plans
- Natural Language

“instead of each one of us having to build his environmental and organismic models entirely for himself, he can draw on models built by others”

Bowlby (1969)

The Strange Situation Experiment

- Year long home observation
- Maternal and infant home behaviour observed prior to the SS
- Then at 1 year, a 24 minute structured observation which involves separation and reunion episodes
 - Each separation increases level of anxiety
- Compare home and laboratory behavioural patterns
- A key link found between home behaviour of mother and infant; and infant behaviour on final re-union episode in the SS

Strange Situation Experiment

- Reunion (not separation) is key – how does infant represent carer as secure base?
- Three main clusters of response found (with a 4th minor cluster later characterized)
- Secure
 - Type B, positive, greeting, being comforted
- Insecure
 - Avoidant - Type A, not seeking contact, avoiding gaze
 - Ambivalent/resistant – Type C, not comforted, overly passive, showianger
 - Disorganised - Type D, totally disorganised and confused
- Move to level of representation (Main 1986, 1991)
- Longitudinal correlations with Adult Attachment Interview

Integrating cognitive extension and Attachment Theory

- Attachment Theory
- Developmental and evolutionary
- Corriveau *et al* (2009):
 - *Young children's trust in their mother's claims (ages 4-5)*
- So Strange Situation categories linked to:
 - trust,
 - being relied upon,
 - accessibility

Attachment Theory and Mental Health

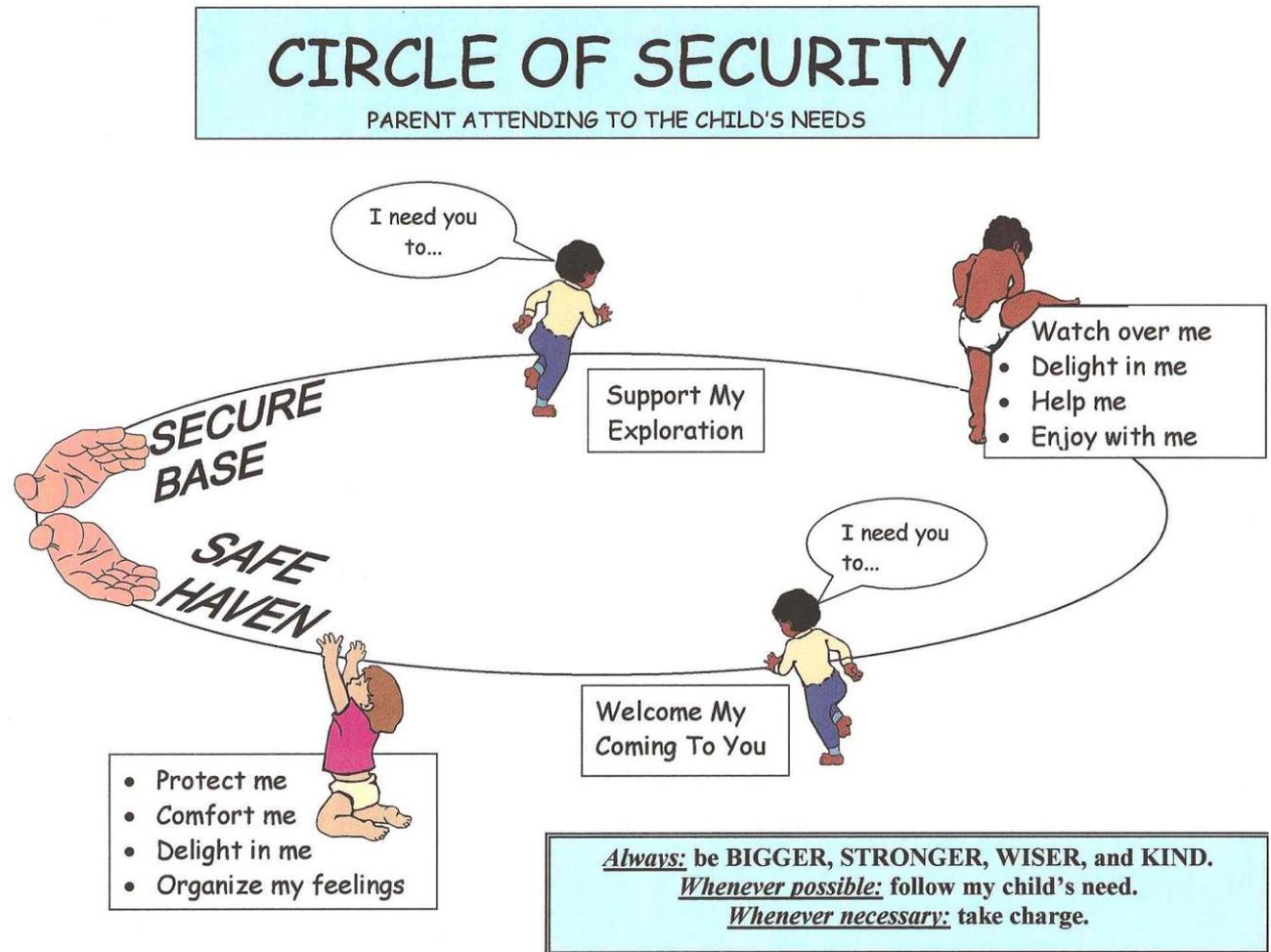
- Substantial evidence that gaining secure attachment status confers advantages in social competence
 - Extended mind experiences -> upper reaches of cognitive and social performance
- Attachment and psychopathology
 - Risk factors approach
 - No direct link of SS insecure status to psychopathology
 - No 'main effect' with development later illness
 - No 1:1 relationships, multiple risks, multiple outcomes
- Second order effects?:
 - Developmental 'tuning'

Future directions 1

- Mind extension as important stage for all non-pathological development
 - Enactive viable trajectories which start very early in development*
 - Early isolation/neglect versus typical development
- Ainsworth's (1969) maternal sensitivity scales versus contemporary mind-reading measures
 - mother's sensitivity/acceptance/accessibility
 - Two systems for mind reading (enkinaesthetic musical attunement*)

Future directions 2 - Computational modelling of Attachment?

- Preference
- Familiarity
- Relative Uniqueness
- Use as a secure base
- Grief and mourning in response to loss
- (Petters, Waters, and Schonbrot 2010)



(Figure from Marvin et al 2002)

Future directions 3 – development by bringing the external inside

- *“The child is surrounded by exemplars of mind reading in action ... Prompted by parental rehearsal of her own intentions” (Clark 2008)*
- *“self structured environments alter and transform the problem spaces of human reason [...] the complex transformative effects of the socio-cultural cocoon in which it develops.” (Clark 2012)*
- **Percolation, diffusion, circulation (Wright *et al* 1996) – (c.f. Bateson’s “Tangle of ideas”)***
 - Add to this looser boundaries between carer and infant, poor source monitoring and tagging from knowledge early in life

Conclusion

- Extended mind
 - Onto physical environment
 - Onto other agents
 - Asymmetrical relationships between carer and cared-for
- Attachment Theory
 - Representational diversity at its core
 - Bowlby and Ainsworth conceived of tightly coupled relationships with transfer of 'models' between carer and infant
- Reconceptualising mental illness?
 - Reconceptualising positive mental health
 - Multiple risk factors and higher order tuning?