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Kevin Brewer

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Orsett Psychological Services  
PO Box 179  
Grays  
Essex  
RM16 3EW  
UK

[orsettpsychologicalservices@phoncoop.coop](mailto:orsettpsychologicalservices@phoncoop.coop)

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Kevin Brewer BSocSc, MSc

An independent academic psychologist, based in England, who has written extensively on different areas of psychology with an emphasis on the critical stance towards traditional ideas.

A complete listing of his writings at <http://psychologywritings.synthasite.com/> and <http://kmbpsychology.jottit.com>.

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# **1. UNDERSTANDING SELF-OTHER DISTINCTION**

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## **1.1. INTRODUCTION**

A key part of social cognition is self-other understanding (ie: how individuals relate to others) and distinction (ie: distinguish between themselves and others). This includes a number of different aspects (studied in different ways) (Catmur et al 2016):

- Co-operation and competition
- Imitation
- Autonomy and relatedness
- Representations of self and others
- Need to belong
- Ingroup preference
- Empathy
- Beliefs

## **1.2. CO-OPERATION AND IMITATION**

Imitation is a key part of social learning, to the point that pre-school children show over-imitation, which is not seen in chimpanzees. Over-imitation is the tendency to "copy all elements an adult used when engaging with a novel object, including actions that are obviously causally unrelated to any potential outcome" (Nielsen and Haun 2016 p2).

This was first shown in an experiment by Nielsen (2006). One-two year-olds watched an adult open a latched box to retrieve a toy. This was done by simply opening the latch by hand or using another object to do so. Irrelevant of the adult seen, the younger children always tried to open the box by hand. "In stark contrast, 24-

month-olds overwhelmingly attempted to open the box using the object, commonly persisting in this comparatively inefficient approach to such an extent that they failed to successfully open the box" (Nielsen and Haun 2016 p2).

Homer and Whiten (2005) showed that chimpanzees do not over-imitate. Three-four year-old children and young chimpanzees watched an adult open a box containing a reward with two sticks, where it was clear that one of the sticks was irrelevant to opening. The chimpanzees ignored the causally irrelevant action whereas the children copied everything.

Nielsen and Haun (2016) asked: "Does the apparent lack of over-imitation in non-human animals suggest a fundamental, heritable discontinuity between human and non-human social learning abilities"? Heyes (2016) wondered whether "there is a species-specific genetically inherited 'module' for imitation or if there is continuity, with our 'prodigious imitative capacity... due primarily to the rich resources provided by our socio-cultural environments'" (Nielsen and Haun 2016)?

"While chimpanzees learn from others with a focus on functionality, humans learn from others with an added focus on the social consequences of social learning" (Nielsen and Haun 2016 pp2-3). This can be seen in humans' tendency to conform to the majority, even when the majority is wrong, and in co-operative and pro-social behaviour. In the latter case, in experiments where two children or chimpanzees have to pull strings together to get a reward (eg: Brownell et al 2006), for instance, "children were far more co-operative than chimpanzees. They worked together, shared solutions and achieved better outcomes" (Nielsen and Haun 2016 p3).

Heyes (2016) used imitation to refer to "a topographic resemblance between the behaviour of the copier (or 'observer' or 'self') and the agent who is copied ('model', 'other'); where the parts of the observer's body move in the same way relative to one another as the parts of the model's body" (p1). How are representations of the self aligned with representations of the other to facilitate imitation? This is known as the self-other "correspondence problem" (Brass and Heyes 2005) <sup>1</sup>, and two main explanations exist (Heyes 2016):

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<sup>1</sup> Richards et al (2009) described the "correspondence problem" thus for birds watching a model bird feeding: "pecking yields different visual inputs when it is observed and executed; 'you pecking' and 'me pecking' do not look the same from the focal bird's perspective. When an observer watches another bird pecking, it sees rapid movement of a beak, head and neck, but when the observer engages in pecking behaviour, it sees the object that it is pecking and/or surrounding objects; it cannot see its own head and neck" (p1111).

The authors offered the ASL model explanation: "the sight of another bird engaging in a

i) Transformational theories - A visual representation of the other's action is transformed into a symbolic representation in the self that allows imitation, and to recognise the similarity of the own and other actions (eg: active intermodal matching (AIM) model; Meltzoff and Moore 1997).

ii) Associative theories - The model's actions are stored as a visual representation and this is associated with a motor representation, which leads to "the same actions as the model 'blindly', without explicitly representing the relationship - of similarity or dissimilarity - between the model's and the observers' actions" (Heyes 2016 p2) (eg: associative sequence learning (ASL) model; Heyes and Ray 2000).

The AIM model fits with the idea of "Homo imitans" (Meltzoff 1988). "Humans are more skilled and more prolific imitators than any other animals because only humans have an inborn, genetically inherited 'module' for imitation: an inter-modal matching mechanism that can map representations of the self on to representations of others. In contrast, ASL suggests that there is continuity between imitation in human and non-human animals. Human infants learn to imitate using associative mechanisms that we share with other animals, and our prodigious imitative capacity is due primarily to the rich resources provided by our socio-cultural environments" (Heyes 2016 p2).

The debate between transformative and associative theories revolves around issues like whether human newborns can imitate, and whether non-human animals do (Heyes 2016). In the former case, there is argument over the number of published studies that find support or not for target matching (ie: copying a specific action like "TPside" - "protrusion and retraction of the tongue

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behaviour, B, will activate a motor representation of B in the observer, a necessary condition for the performance of B, to the extent that the observer has prior experience of seeing and doing B together. More specifically, and using pecking as an example, the sight of pecking will elicit a motor representation of pecking, and overt pecking behaviour, to the extent that the observer bird has had 'correlated experience' of observing and executing pecking behaviour, experience in which the sight of pecking and the performance of pecking occur in close temporal proximity and a contingent (or predictive) relationship with one another" (Richards et al 2009 p1112).

between the lips at an angle to the body midline"), or cross-target comparison ("infants performed the target action more often after observing the target action than after observing an alternative action") (Heyes 2016).

In the case of imitation by non-human animals, Richards et al (2009) (appendix 1A), for example, found evidence of "deferred imitation" or "imitation by memory" (an ability assumed to be unique to humans; Heyes 2016)<sup>2</sup>. Budgerigars observed a model opening a stopper in a particular way to access food. The observers copied the action seen when given the opportunity 24 hours later.

Defending the ASL model, Heyes (2016) concluded:

Humans are gifted imitators, and imitation plays an important part in making human minds and human lives very different from those of other animals. Imitation enables us to acquire gestures and skills that mark us out as members of particular cultural groups, gives us a sense of belonging, promotes co-operation and contributes to cultural evolution, the accumulation of knowledge and improvement of skills over generations. When humans are especially good at something, compared with other animals, and when our skill has important consequences, there is a strong temptation to assume that it must be underwritten by very special psychological processes; that genetic evolution has given us a way of thinking that is completely absent in other animals... The mechanisms that make imitation possible, by aligning representations of self with representations of others, are associative mechanisms that we share with a great many other animals (p6).

### 1.3. CO-OPERATION AND COMPETITION

Schmelz and Call (2016) began: "Co-operation and competition are two key components of social life. Coalitions and alliances represent the quintessential example illustrating how individuals simultaneously compete against some group members and cooperate with others. Because many social species such as primates, hyenas, coatis, dolphins and corvids typically interact with multiple partners over extended periods of time, keeping track of friends and foes (for both oneself and other group members) can become a quite challenging enterprise. In fact, it is precisely this fluid state of affairs that constitutes one of the main reasons why social life is thought to be particularly complex, and why some authors placed a particular emphasis on social as opposed to non-social aspects to explain the evolution of cognition" (p1)<sup>3</sup>.

These theories include the "Machiavellian

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<sup>2</sup> Previously, a delay of thirty minutes between observation and imitation had been reported in Japanese quail (Dorrance and Zentall 2001).

<sup>3</sup> The evolution of co-operation can present a challenge to evolutionary theory (appendix 1B).

intelligence hypothesis" (Whiten and Byrne 1988), and the "social brain hypothesis" (Dunbar 1992).

Schmelz and Call (2016) argued that co-operation and competition have been studied in different ways: "Whereas work on competition has mainly been studied in the context of theory of mind and deception, work on co-operation has focused on collaboration and helping. Such dissociation can be misleading because it may give the impression that theory of mind is not implicated in co-operative activities and conversely, that helping could not be an integral part of competition" (p1).

The theory of mind (ToM) was first proposed in non-human animals by Premack and Woodruff (1978). There has been subsequent debate about it, and different ways of studying it. For example, the "information donation paradigm" used gestures to see if one individual could understand the intentions of the other (Schmelz and Call 2016). While Hare et al (2000) were the first to use a competitive food game with a subordinate and a dominant chimpanzee. The subordinate had a choice of two foods, and tended to vary their decision based on what they believed the dominant chimpanzee could or could not see. However, some authors still argued that "that chimpanzees did not really attribute mental states to others, they read their behaviour and had learned (or were predisposed) to behave in appropriate ways" (Schmelz and Call 2016) <sup>4</sup>.

One alternative explanation for ToM is the "evil eye hypothesis", which suggests that chimpanzees simply use the gaze of the other as the cue to what the competitor can see rather than attributing mental states to them. Schmelz et al (2011), for example, provided evidence against this explanation by offering subordinate chimpanzees the choice of food when a dominant chimpanzee was nearby or not, but could not see the food at that point. The subordinate "therefore had no chance of reading behavioural cues from the competitor and had to infer the competitor's choice" (Schmelz and Call 2016 p2).

Chimpanzees have been shown to understand the perspective of a human competitor in the "googles

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<sup>4</sup> The tendency to attribute intentional mental states and agency to other people is so strong in humans that it becomes "generalised as the tendency to represent objects and events in our environments anthropomorphically, ie: in terms of human features and attributes... There is, in other words, little cognitive difference between attributing agency to actual, intentional agents (friend or foe) and to non-agentive effects, especially when they are deemed to be potentially significant for our lives. And if otherwise inexplicable events are judged significant for our lives, again whether those effects are positive or negative, it is natural to conclude that they also may be the instigation of unexplainable, ie: of superhuman, agency" (Martin 2005 p478). This is the basis to Boyer's (2001) cognitive theory of religious ideas.



experiment" (Karg et al 2015). Chimpanzees are made familiar with a pair of goggles that blindfold the wearer and a pair that are see-through. When a human is wearing the former, the chimpanzees take food as if not being watched, but not so when the human wears the see-through goggles.

Chimpanzees do not seem to have a "full-fledged ToM" because of their failure of the false belief test (Schmelz and Call 2016). An individual sees an object placed in box A before leaving the room. While away, the experimenter moves the object to box B. The question is where will the individual look when they return. To show evidence of ToM (specifically, false belief), the answer is box A.

Co-operation by chimpanzees is tested with devices where pairs of individuals have to simultaneously pull ropes, say, to both gain the reward (eg: Hirata and Fuwa 2007). "One thing that quickly became apparent is that even though chimpanzees could co-operate with others in a competent manner, their motivation to do so seemed quite different from that observed in humans. More specifically, studies with human children have shown that they prefer to play together with another individual even if succeeding in the game does not require collaboration with a second person – the joint activity seems to be rewarding to humans in its own right" (Schmelz and Call 2016 p4).

Bullinger et al (2011) offered chimpanzees a device where they could work alone or collaborate to get the same amount of food, and the preference was always for alone (unless the collaboration offered more food). Human children, on the other hand, usually preferred the collaboration option.

Chimpanzees have been shown to share food in experiments with begging humans, for example, but whether this is empathetic concern is disputed (Schmelz and Call 2016).

#### **1.4. MECHANISMS AND PROCESSES**

"When interacting with another person, we must process constantly changing social information including the actions, perspectives, beliefs and emotions of others. There is now compelling evidence that processing these attributes in another activates the same neural representations as when the self experiences these events ('mirroring' [eg: di Pellegrino et al 1992]) (appendix 1C), because of associations between other- and self-relevant representations. Such 'mirror' processes result in potential conflict between self- and other-relevant representations, and thus a requirement for 'self-other control' [SOC]: the ability to manipulate the

extent to which self- or other-relevant representations are activated" (de Guzman et al 2016 p1).

SOC is needed to be "turned on" in some situations, though, and not others. For example, when imitating the actions of another, it is important to distinguish between one's own actions and the other's. On the other hand, taking another perspective as in "theory of mind" needs SOC "turned off", while empathy requires an inbetween - to experience the other's distress but not be overwhelmed by it (de Guzman et al 2016).

A common neural mechanism behind SOC for imitation and perspective-taking may be based in the right temporo-parietal junction (rTPJ) in the brain, but the SOC for empathy is in the supramarginal gyrus (parietal cortex) (de Guzman et al 2016).

The blurring of the self-other boundary, which leads to identification with another's body or actions, can improve empathy. de Guzman et al (2016) (table 1.1) found that participants, who performed movements that were opposite to those performed by another person, showed increased empathy as compared to copying the actions of the other person. Steinbeis (2016) argued that distinguishing between the self and the other reduced egocentric bias, and thus increased empathy.

- Participants watched a video of a person moving their index and middle fingers in a particular way, and were asked to copy the movements (decreased SOC group) or do the opposite (increased SOC group). Empathy was measured by the Questionnaire of Cognitive and Affective Empathy (QACE) (Reniers et al 2011) before and after the experiment. It contains thirty-one items, like "I am good at predicting how someone will feel", with four response options.
- The increased SOC group a significant increase in empathy between baseline and post-experiment, whereas the decreased SOC group did not (figure 1.1).

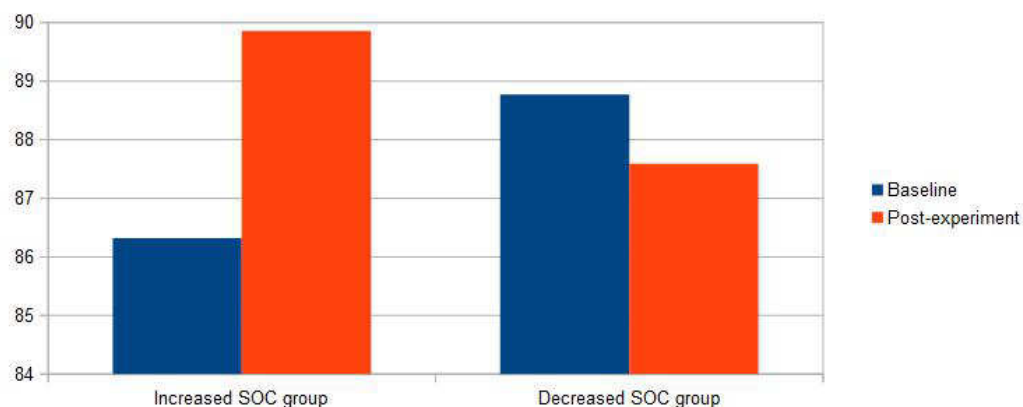


Figure 1.1 - Mean QACE scores (out of 124).

Table 1.1 - Details of experiment by de Guzman et al (2016).

Milward and Sebanz (2016), however, were not convinced: "While this may be a plausible mechanism when it comes to appreciating differences in beliefs and perspectives <sup>5</sup>, it is unclear how exactly making a distinction between one's own and another's actions could increase empathy" (p1).

de Guzman et al (2016) argued that the self-other distinction is "an over-arching mechanism that links three domains of social cognition (motor, cognitive and affective), potentially through neural connectivity between temporo-parietal brain regions that have been linked to each domain" (Milward and Sebanz 2016 p2).

Milward and Sebanz (2016) found this idea promising, but wondered whether "a single mechanism of self-other distinction is plausible given that the problems to be solved within each domain may differ substantially. For instance, in the motor domain, actors sometimes have to determine whether action effects were caused by their own or by another's actions on a millisecond scale. This fine-grained temporal scale is less important for distinguishing between one's own and others' beliefs or emotions" (p2).

The self-other distinction can be influenced by the type of social interaction. For example, in joint action, where individuals co-ordinate their actions on a task it is necessary to keep the own and other's contribution separate in the mind (known as task co-representation). But interference can occur, even if the other person's role is completely different to the own, where the other person is in another room but believed to be doing the task, and where the partner's actions are hidden from view (Milward and Sebanz 2016).

Wenke et al (2011) proposed the explanation that "participants represent not what their partner is doing (either through a direct perception-action link or through a cognitive representation of the action or goal required for the task), but when it is their turn to act, highlighting the importance of self-other distinction in avoiding interference from a joint actor" (Milward and Sebanz 2016 p2).

Over (2016), on the other hand, suggested, from an evolutionary viewpoint, that the need to distinguish between the self and others in social interactions may not be important because this would give a sense of belonging to the group. This would mean that all members of the group holding the same opinion (cognitive domain), and feeling the same emotion (affective domain), for

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<sup>5</sup> For example, implicit attitudes towards outgroup members can become more positive after a participant has experienced the "rubber hand illusion", where, through mirrors, the outgroup person's hand is made to feel like own (Maister et al 2013) (appendix 1D).

instance (Milward and Sebanz 2016).

McAuliffe and Dunham (2016) (appendix 1E) took the idea of no need for self-other distinction further by arguing that ingroup favouritism is because "we have a preference in general for things that are associated with ourselves. This would mean that others in our social group are merely extensions of our representation of our self, and thus are just another part of the information that needs to be kept separate from representations of the 'other' (presumably members of an out-group)" (Milward and Sebanz 2016 p3).

The "GROOP effect" (Tsai et al 2011) (appendix 1F), however, may challenge this idea. Participants saw different numbers of people moving their hands (eg: one person moving two hands or two people moving one hand each), and tended to imitate the observed movements. "However, this imitation tendency only occurred when the number of actors on the screen (ie: one person using both hands versus two people each using one hand) corresponded with the number of participants acting on the task, suggesting that participants entered a 'we-mode' [Gallotti et al 2013], whereby they identified themselves with the individual when acting as an individual but as a group when acting as a group" (Milward and Sebanz 2016 p3).

So, self-other distinction and self-other integration seem to be important for social cognition (Milward and Sebanz 2016).

### **1.5. EMPATHY FOR PAIN**

Singer et al (2004) found, with neuroimaging, that the same brain areas (eg: anterior mid-cingulate cortex; aMCC) were active in empathy for pain as in pain itself. "It has thus been suggested that empathy involves the sharing of pain affect, and that understanding others' emotions indeed may be based on an embodied simulation of other people's emotions grounded in one's own emotion experiences" (Lamm et al 2016 pp1-2).

Lamm et al (2016) offered some challenges to this view:

i) Functional magnetic resonance imaging (fMRI), for example, shows the physiology of the brain involved ("the language of the brain"), but how does this relate to mental representations ("the language of the mind/cognition")?

ii) Dependence on one method. "While fMRI certainly allows important new insights into the neural bases of social cognition, real progress seems to require a combination of methods and the generation of converging

evidence – ie: different methods or paradigms advocating the same type of conclusions" (Lamm et al 2016 p2).

iii) Do individuals with congenital insensitivity to pain (with no aMCC response, for instance) experience empathy for the pain of others?

iv) Studies (eg: Lamm et al 2007) have shown activation in the aMCC when watching an aversive but not painful experience (eg: pin pricks in anaesthetised hand).

But certain methods may allow the establishing of causation (Lamm et al 2016):

a) Lesion studies - eg: damage to the aMCC produces a decline in empathy (eg: Hillis 2014). Such case studies are rare, however, and the damage may have affected other areas or activities (Lamm et al 2016).

b) Brain stimulation or "virtual lesions" - The use of electrodes on the scalp, for example, to stimulate areas of the brain. But the aMCC is "far away from the cortical surface" (Lamm et al 2016).

c) Psychopharmacological studies - The use of analgesia to see if reducing the experience of pain also reduces the feeling of empathy.

"Emotional egocentricity bias" will influence empathy. Two individuals are given mild pain of varying strength, and the level of one's own experience affects the empathic judgment of the other's experience (Silani et al 2013). This bias, however, is relatively small, except when a certain brain area (right supramarginal gyrus) was inhibited (Lamm et al 2016).

So, affective self-other distinction usually overcomes this bias. But how do brain regions do this? Lamm et al (2016) listed the options as either amplifying representations of the self or other as appropriate, suppressing the representations not relevant, or by "tagging" "which representations belong to the self and which to the other. This strategy would therefore not require modulating the existing representations, but simply require 'keeping them more clear' and allowing a more efficient switching between them" (Lamm et al 2016 p4).

## **1.6. AWE**

Being awestruck makes individuals "less self-involved and more attuned to the needs of the larger group" (Russo 2015) (appendix 1G). Piff et al (2015)

showed this in five studies.

The experience of awe as in spirituality, say, has two aspects: "the feeling of being diminished in the presence of something greater than the self, and the motivation to be good to others" (Piff et al 2015 p883). The first aspect makes sense as awe is "an emotional response to perceptually vast stimuli that defy one's accustomed frame of reference in some domain" (Piff et al 2015).

Shiota et al (2007), for example, found that individuals classed as high in dispositional awe were more likely to use terms that described themselves as part of a collective (eg: "an inhabitant of the Earth") and less likely to use individuated terms (eg: "one-of-a-kind") than individuals low in awe. This was also seen when awe was induced by getting participants to stand next to a full-sized model of a Tyrannosaurus Rex dinosaur.

Piff et al (2015) referred to the idea of the "small self" - ie: "a relative diminishment of the individual self and its interests vis-a-vis something perceived to be more vast and powerful than oneself" (p884).

But why does awe encourage pro-social behaviour? Piff et al (2015) answered that awe is "a collective emotion" that produces "specific cognitive and behavioural tendencies that enable individuals to fold into collaborative social groups, and engage in collective action" (p883). Reducing focus on the self tends to increase donation to the collective, for example (Campbell et al 2004) <sup>6</sup>.

Piff et al's (2015) five studies tested the hypothesis that "the experience of awe will trigger a sense of a small self and, in turn, lead to greater pro-social behaviour".

## Study 1

This study aimed to establish the link between dispositional awe and pro-social behaviour with 1519 participants drawn from across the USA. The Dispositional Positive Emotions Scale (DPES-r) (Shiota et al 2006) was used to measure awe, with items like "I often feel awe", and six other positive emotions (eg: compassion, love). There were three items for each emotion, and a seven-point Likert scale was used for responses. This

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<sup>6</sup> "Some researchers have speculated that awe might have evolved as the response to a powerful leader. Maintaining social hierarchies and ensuring membership in a group can boost odds of survival" (Russo 2015).

questionnaire was completed online, as was the next part of the study - the dictator game (Forsythe et al 1994).

A participants is told that they have ten raffle tickets ("decider") and can share as many as they want with another randomly chosen participant ("receiver"). The raffle prize was varied at \$10 or \$500.

Dispositional awe was significantly positively correlated with willingness to share raffle tickets. When controlling for other positive emotions, the correlation was only significant in the \$500 raffle group. The authors noted that this represented "a more authentic type of pro-sociality".

This study was only correlational, and so causation could not be established.

### Study 2

In this experimental study with seventy-five US participants, the researchers induced awe, pride or no emotion by asking individuals to think about relevant events. For example, awe: "Please take a few minutes to think about a particular time, fairly recently, when you encountered a natural scene that caused you to feel awe. This might have been a sunset, a view from a high place, or any other time you were in a natural setting that you felt was beautiful" (p887). Then, after a filler task, participants read eight hypothetical moral scenarios, like being given too much change at a shop, and the responses given measured "the willingness to prioritise self-interest over collective norms and others' interests". In the awe condition, participants made significantly less self-interested decisions (ie: more pro-social).

### Study 3

This study experimentally induced awe with a five-minute nature video (as opposed to amusement or no emotion) using 264 students at a US university. Then the participants played the dictator game with ten raffle tickets for a \$100 prize. Participants were more generous after watching the awe-inspiring video.

### Study 4

This online experiment with 130 participants varied the video that induced awe. Participants watched a three-minute video of "threatening nature" (eg: tornados, volcanoes) to induce "negative awe" or a video of coloured water dropping into a bowl in ultra-slow motion and close up to induce "non-nature awe". Then pro-social

allocation was measured by hypothetical examples of sharing between the self and another person (eg: choose between 480 points for self/80 for other or 540/280 or 480/480).

Both types of awe lead to significantly more generosity (ie: allocation of more points to the other) than the control (who watch a video about woodworking).

### Study 5

This experiment involved actually taking ninety US undergraduates to an awe-inspiring natural site on campus or not before reading the moral scenarios used in Study 2. Helping behaviour was also measured by the experimenter spilling a box of eleven pens and seeing how many the participants picked up. Finally, there were questions about personal entitlement (eg: I honestly feel I'm just more deserving than others").

Awe-inspired participants picked up significantly more pens, and made non-significantly more positive ethical decisions than the control group, but scored significantly lower on personal entitlement.

To sum up the findings of the five studies about awe:

- Individuals higher in dispositional awe are more generous (Study 1).
- Induced awe causes more ethical decisions (Study 2 and 5).
- Induced awe causes more generosity to a stranger (Study 3 and 4).
- Inducing awe leads to more helping behaviour (Study 5).
- Inducing awe leads to less personal entitlement (Study 5).

Table 1.2 summarises methodological issues with the studies.

Piff et al (2015) concluded (somewhat poetically): "Awe arises in evanescent experiences. Looking up at the starry expanse of the night sky. Gazing out across the blue vastness of the ocean. Feeling amazed at the birth and development of a child. Protesting at a political rally or watching a favourite sports team live. Many of the experiences people cherish most are triggers of the emotion we focused on here – awe. Our investigation indicates that awe, although often fleeting and hard to



POSITIVE	NEGATIVE
<p>1. Wide selection of participants both online and face-to-face (n = 2078).</p> <p>2. Use of validated questionnaires, scenarios, and materials.</p> <p>3. Variety of methods - correlational study and laboratory experiment.</p> <p>4. Inclusion of filler tasks online to reduce the risk of demand characteristics (ie: participants guessing the purpose of the study and behaving accordingly).</p>	<p>1. The feeling of awe after inducement was checked by self-reports only.</p> <p>2. Online studies limited by lack of control of environment of participants when inducing awe, for example.</p> <p>3. Hypothetical scenarios short, and not the same as real-life.</p> <p>4. Manipulation of awe with a short video is not the same as being in nature, say, and Study 5 was on campus rather than in the wilderness.</p>

Table 1.2 - Positive and negative methodological issues of the five studies by Piff et al (2015).

describe, serves a vital social function. By diminishing the emphasis on the individual self, awe may encourage people to forego strict self-interest to improve the welfare of others" (p897).

### 1.6.1. Health Benefits

Awe is also linked to a healthier immune system. Pro-inflammatory cytokines (PICs) are part of the inflammatory response to injury or illness, but they are detrimental if there is an elevated level in the absence of illness or injury (as in negative emotions or stress). For example, self-reported fear and stress were associated with elevated PICs (Moons et al 2010). Also, shame, clinical depression and anxiety (Stellar et al 2015).

Stellar et al (2015) found that positive emotions were associated with lower levels of PICs in the absence of illness or injury. Ninety-four US undergraduates gave a mucus sample (for measurement of PICs), and completed a questionnaire about positive and negative emotions in the past month. Having had more positive emotions predicted lower levels of the PIC, interleukin-6 (IL-6).

Another study with 119 more undergraduates found that awe, among seven positive emotions, was significantly associated with lower levels of IL-6. The more frequently participants reported feeling awe, wonder or amazement each day (on a scale of 1 to 10), the lower the levels of IL-6 (controlling for body mass index). Joy, contentment, and pride also related to lower IL-6, but less than awe. But the findings were correlations

only (ie: bidirectional) (Makin 2015).

Stellar et al (2015) felt that awe "may be part of an integrated response that includes emotional and biological responses that facilitate approach and social exploration" (p131). In other words, high levels of IL-6 encourage withdrawal to recover, while awe leads to curiosity and exploration.

Alternatively, "awe elicits feelings of interconnectedness with others... and may affect levels of cytokines through fostering social connection and supportive relationships" (Stellar et al 2015 p132).

### **1.7. APPENDIX 1A - RICHARDS ET AL (2009)**

Richards et al (2009) showed thirty-eight juvenile budgerigars (*Melopsittacus undulatus*) a video of a demonstrator budgerigar pecking a stopper (Group Peck) or stepping on a stopper (Group Step) to access food. The observers were given the opportunity to imitate immediately after viewing the video or 24 hours later <sup>7</sup>. Overall, the findings were "that birds that saw a pecking demonstrator were more likely to solve the task by pecking than were individuals that saw a stepping demonstrator, and did not indicate that this effect was diminished after a 24 h delay" (p115).

In a second experiment, twenty-four more budgerigars were allocated to Group Peck, Group Step, or (a new) Group Control (watching a video of a bird feeding) to see if imitation was evident after a 24-hour delay. Pecking was significantly more likely in the Group Peck than the other two conditions, but stepping was not imitated more often in the Group Step.

### **1.8. APPENDIX 1B - EVOLUTION OF CO-OPERATION**

Charles Darwin struggled to understand co-operation, altruism, and self-sacrifice. He said in "On the Origins of Species" (Darwin 1859): "Natural selection will never produce in a being anything injurious to itself, for natural selection acts solely by and for the good of each". And in "The Descent of Man" (Darwin 1871): "He who was ready to sacrifice his life... rather than betray his comrades, would often leave no offspring to inherit his noble nature... Therefore, it seems scarcely possible... that the number of men gifted with such virtues... could be increased through natural selection, that is, by the

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<sup>7</sup> The researchers scored imitation by two independent raters agreeing that a stopper was removed within one minute of presentation. A discrimination ratio was calculated for each bird: total number of trials in which pecking was used to remove stopper divided by the total number of trials in which the stopper was removed. A score between 0.5 and 1 favoured pecking, and below 0.5 favoured stepping.

survival of the fittest" (both quoted in Tabersky et al 2016).

Since Darwin there have been some theories to explain the evolution of co-operation (eg: kin selection theory; Hamilton 1964), but it is still a challenging idea (Tabersky et al 2016).

### **1.9. APPENDIX 1C - MIRROR NEURONS**

"Mirror neurons" (MNs) in the brain not only fire when the individual does an action (eg: grasp an object), but when another person is observed to do the same action. Discovered originally in monkeys in the ventral pre-motor cortex and the inferior parietal lobe (Rizzolatti et al 1996), but there is "now a substantial body of evidence suggesting that MNs are also present in the human brain" (Cook et al 2014) <sup>8</sup>.

MNs have been called "cells that read minds" and "the neurons that shaped civilisation" (quoted in Cook et al 2014), and there has been "much theorising and speculation about their function" (Cook et al 2014). One explanation for the origin and function of MNs is that they facilitate "action understanding" (di Pellegrino et al 1992) (an evolutionary account), but Cook et al (2014) preferred an "associative account". This separates the origin and function, and explains the former thus: "MNs acquire their capacity to match observed with executed actions through domain-general processes of sensori-motor associative learning" (p178).

The evolutionary account sees that natural selection has acted directly on MNs, whereas the associative account sees that as indirect (ie: natural selection acts on the mechanisms of associative learning) <sup>9</sup>.

### **1.10. APPENDIX 1D - MAISTER ET AL (2013)**

With the "mirror neuron system", individuals show activation in similar brain regions when they experience the same bodily state as watching someone else experience that state (eg: pain) (Maister et al 2013). However, this

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<sup>8</sup> There is also evidence of MNs in other areas of the brain, but whether they should be called MNs is disputed (Cook et al 2014). "In addition to this variation in anatomical specificity, some researchers reserve the term 'mirror neuron' for units that discharge during the observation and execution of precisely... or broadly similar actions..., whereas others use the term, at least on occasions, to refer to any neuron that is responsive to both the observation and execution of action, regardless of whether the observed and executed actions are even broadly similar to one another" (Cook et al 2014 p179).

<sup>9</sup> "In its starkest form, the genetic hypothesis would suggest that gene-based natural selection has provided each individual – monkey and human – with MNs that code the mapping between a fixed set of observed and executed actions, and that experience plays a minimal role in the development of the observation-execution matching properties of these neurons" (Cook et al 2014 p180).

reaction to the observation of a painful stimulus applied to another person was only evident for ethnic/racial ingroup not outgroup members (Avenanti et al 2010).

It seems that the "more negative our implicit attitudes are towards individuals from a racial outgroup, the less overlap there is between the representation of their bodies and our own" (Maister et al 2013 p171). But Inzlicht et al (2012) showed that behaviour mimicry of an individual from the ethnic outgroup reduced implicit prejudice towards that outgroup. The researchers suggested that the behaviour mimicry had increased the self-other overlap, and thus reduced prejudice that way.

Maister et al (2013) deliberately increased self-other overlap with a bodily illusion known as the Rubber Hand Illusion (RHI) (Botvinick and Cohen 1986) - ie: "seeing a rubber hand being touched in synchrony with one's unseen hand creates a sense of ownership over the fake hand, allowing its incorporation into our body-representation" (Maister et al 2013 p171).

In their first experiment, Maister et al (2013) recruited thirty-four White participants who had implicit bias against Blacks. Implicit bias was measured by the Implicit Association Test (IAT). This uses reaction time as the measure of bias. Put simply, individuals with racial bias will be quicker to respond to negative words associated with the outgroup than to positive words associated with the outgroup.

Participants, who had experienced the RHI with a dark-skinned hand, and self-rated a feeling of ownership of that hand, showed a reduction in racial bias between baseline and post-experiment measurement. This change in implicit attitude did not occur with the ingroup (ie: a White hand in the RHI) as shown in Experiment 2.

The authors stated: "These findings suggest that an increase in overlap between self and other, induced by a change in body-representation, was able to alter the perceived boundaries between ingroup and outgroup to modulate high-level social attitudes. Changes in body-representation may therefore constitute a core, previously unexplored, dimension that in turn changes social cognition processes" (Maister et al 2013 p176).

### **1.11. APPENDIX 1E - INGROUP BIAS**

The origins of the bias towards members of one's own group and co-operation with them has two main explanations - the norms-focused hypothesis (NFH) and the mere preference hypothesis (MPH) (McAuliffe and Dunham 2016). The former suggests that adherence to group norms evolved to promote co-operation, which gives the testable prediction that ingroup norm violation by own group members will produce greater punishment than violation by

outgroup members. The MPH sees ingroup preference as a by-product of the general preference for ingroup members. Thus, "because ingroup members are viewed more positively than outgroup members, an in-group violator will be evaluated less negatively and perhaps forgiven more readily than an outgroup individual" (McAuliffe and Dunham 2016 p3).

Different sources of evidence are used to test these predictions:

i) Ultimatum Game - This is a two-player game where Player A is given a sum of money, and they can share it with Player B as they want. If Player B agrees with the sharing, both players get the agreed amount of money, but if B rejects the offer both players get nothing. If the two players are ingroup members, and Player A offers a small amount to B (norm violation of fairness), how will B react? Rejection by Player B could be seen as punishment of A, and thus support the NFH, if it happens more often than when Player A is an outgroup member.

Mendoza et al (2014), for example, used pairs of ethnic ingroup and outgroup members. Player Bs were more likely to reject marginally unfair offers (eg: 8 of 20 units) from ingroup than outgroup members. But Valenzuela and Srivastava (2012) did not find this using students from own university class (ingroup) or another university (outgroup). Such studies "paint a puzzling picture", and one reason may be that "the game demands that participants resolve a tension between the desire to favour the ingroup and the desire to reach a deal that the other party will accept" (McAuliffe and Dunham 2016).

ii) The "Black Sheep effect" (Marques and Paez 1994) - This describes the situation where an ingroup member who violates a core group norm is disliked more than outgroup members who violate the norm. This supports the NFH.

iii) Children - Young children, who have just been taught the rules of a simple game, will correct an ingroup violator more than an outgroup violator (eg: Schmidt et al 2012). This supports the NFH.

However, "children are especially reactive to unfairness when it places them in a disadvantageous position and this strong reaction may eclipse group bias effects in games structured like the Ultimatum Game" (McAuliffe and Dunham 2016 p6). Furthermore, McAuliffe and Dunham (2016) pointed out that the sparse evidence with children was "more consistent with the mere preference account".

Overall, McAuliffe and Dunham (2016) felt that there was more evidence for the MPH, but this was far from conclusive.

### 1.12. APPENDIX 1F - TSAI ET AL (2011)

Individuals are faster at performing a particular finger movement when another person is doing the same rather than the opposite (Brass et al 2001). The theory of event coding (TEC) (Hommel et al 2001) explained the findings thus: "the more features of observed events overlap with features of our own actions, the greater the interaction between perception and action" (Tsai et al 2011 p135).

Tsai et al (2011) asked undergraduates to watch one or two index fingers moving towards particular computer keys in pairs (of which one of the pair was a confederate). The two independent variables were thus:

- i) The congruency between the number of people observed and the number of people responding.
  - Congruent (group observed) - two observers watched two left hands.
  - Incongruent (individual observed) - two observers watched right and left hand of one person.

ii) The response of the observers to the actions seen.

- Compatible - the observers mimicked the actions seen. Both responded to two hands ("we-response"), but only the participant responded to one person ("me-response").
- Incompatible - the confederate did the opposite to the action seen in the "we-response".

It was predicted that "people acting together should have a stronger tendency to mimic actions performed by a pair compared to actions performed by an individual" (Tsai et al 2011 p136), and this was found. The reaction time (RT) to mimic the action was used as a measure of compatibility (ie: faster in congruent than incongruent conditions).

Tsai et al (2011) coined the term "GROOP effect". This is "congruency between the number of perceived actors and the number of acting individuals modulates effects of action observation on performance. In particular, groups were more strongly affected by actions performed by a group than by actions performed by an individual, even though the observed actions were identical.... [This] suggests that participants formed task representations that specified not only the actions to be performed by them ('me-representation'), but also the actions to be performed jointly ('we-representation'). Whenever participants saw the ipsilateral hand moving, the 'me-representation' was activated. Whenever participants saw that both hands

moved, the 'we-representation' was activated" (Tsai et al 2011 p139).

Applying the TEC to the findings, Tsai et al (2011) stated: "the me-representation links a perceived hand movement on the right with the participant's individual action through a common code that specifies the perceptual consequence of the action as 'right'. Therefore, observing movements of the hand on the right activated me-responses and led to faster RTs than observing movements of both hands. The we-representation links perceived hand movements on both sides with the perceptual consequences of jointly performed actions (left and right). Accordingly, we-responses to movements performed by both hands were faster than we-responses to movements of the ipsilateral hand" (p139).

But, the authors continued: "The GROOP effect demonstrates that we-representations can take precedence over me-representations when there is a close match between perceived and performed group actions" (Tsai et al 2011 p140).

### **1.13. APPENDIX 1G - AGENCY AND REFLEXIVITY**

How much agency do individuals have within social structures? Margaret Archer, for example, would see a high degree as reflexivity is an increasing characteristic of the modern world (known as late modernity or post-modernity). Reflexivity is defined as "the regular exercise of the mental ability, shared by all normal people, to consider themselves in relation to their (social) contexts and vice versa" (Archer 2012 quoted in Akram and Hogan 2015).

"This increase in reflexivity derives from the absence of social guidelines indicating what to do in novel situations, meaning that individuals are increasingly asked to be reflexive in their lives, where once they could follow social rules and norms. Increases in reflexivity in society mirror a transition from a morphostatic (stability and reproduction) to a morphogenetic society (constant change) (Archer 1995)" (Akram and Hogan 2015 p607).

Farrugia and Woodman (2015) explained further: "The concept of reflexivity is therefore meant to encompass both the creativity of action in late modernity, and the possibility of a life lived according to meaningful 'ultimate concerns'" (p627). Ultimate concerns are "'sounding-boards, affecting our (internal) responses to anything we encounter, according to it resonating harmoniously or discordantly with what we care about most' (Archer 2012). In this sense, the concept of reflexivity is aimed at describing the means by which, through engaging in the world, purposive and agentic subjectivities with meaningful inner lives are

constructed" (Farrugia and Woodman 2015 p628) <sup>10</sup>.

Archer (2012) distinguished four modes of reflexivity:

i) Communicative - internal conversations before action. These "need their ultimate concerns to be completed and validated by others, and establish ways of life oriented towards maintaining the relationships of their original natal contexts" (Farrugia and Woodman 2015 p628).

ii) Autonomous - internal conversations leading to actions.

iii) Meta - internal conversations that evaluate previous internal conversations and actions.

iv) Fractured - internal conversations that produce personal distress. These relate to "those who have had their capacity for reflexive deliberation significantly compromised, and for this reason are unable to successfully establish a coherent and meaningful way of life" (Farrugia and Woodman 2015 p629) <sup>11</sup>.

Furthermore: "Frustrated by uncertainty and lacking the capacity to reflexively establish a meaningful way of life, fractured reflexives rely not on reflexivity, but rather survive by 'placing great reliance upon their 'gut feelings' as a guide to action' (Archer 2012). Archer suggests that this reliance on gut feelings, and their lack of reflexivity, means that fractured reflexive subjects are ultimately passive, reacting to events around them without reference to a clear plan" (Farrugia and Woodman 2015 p638).

The emphasis on reflexivity and agency, argued Akram and Hogan (2015), ignored other influences like reacting to the situation and to others, or habit <sup>12</sup>. Bourdieu (1990) referred to "habitus" <sup>13</sup> to cover habits and taken-

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<sup>10</sup> "Illusio" is a concept from Bourdieu (1990), which refers to "a basic investment in meanings which may seem arbitrary from an 'objective' perspective, but which make social life meaningful and thereby possible, such that 'everything that takes place in [the field] seems sensible: full of sense and objectively directed in a judicious direction' (Bourdieu 1990)" (Farrugia and Woodman 2015 p633). This could be likened to "ultimate concerns".

<sup>11</sup> "Archer (2012) argues that pre-modern societies were morphostatic, with communicative reflexivity encouraging social reproduction. In industrial modernity, the newly arrived logic of the capitalist market led to the rise of autonomous reflexivity, operating according to instrumental means-ends rationality. The shift from industrial modernity to late modernity creates what Archer calls a 'situational logic of opportunity'" (Farrugia and Woodman 2015 p629).

<sup>12</sup> Too much reflexivity can produce a situation of "hyper-deliberation" - "a kind of social and mental paralysis where no one would be able to deliberate or act" (Fleetwood 2008 quoted in Farrugia and Woodman 2015).

<sup>13</sup> Farrugia and Woodman (2015) described habitus as "the generative principle of practices available



for-granted that play a role in behaviour. "Action guided by habit is unintentional, pre-conscious, and in a sense 'automatic' - it takes place outside of cognitive awareness or reflexivity... Routine habitual action is necessary for everyday living and the functioning of the taken-for-granted, in that adherence to habits developed over the life course guide behaviour providing daily reinforcement of routine and often useful habits" (Akram and Hogan 2015 p610).

Lahire (2011) has argued that social change today is such that individuals are "embedded within multiple fields of action, each of which requires a different schema of dispositions to successfully negotiate" (Farrugia and Woodman 2015 p639) (ie: "habitus").

The "routinisation of everyday life" can be seen in heuristics (mental shortcuts). Akram and Hogan (2015) pointed out that "it is not only basic behaviours that get in from the habitus to form who we are, our routinised pattern of everyday behaviour, our values and sense of self are also deeply written as it were overtime into how we understand ourselves and act. Deeply written as well is a very strong sense of how others expect us to behave and an awareness (or fear) of the social sanctions for breaching the taken-for-granted, social facts of everyday interactions" (Akram and Hogan 2015 p613).

Farrugia and Woodman (2015) argued that Bourdieu was more successful than Archer in explaining social behaviour because the former "shows not only that human subjectivity is necessarily and completely invested in systems of meaning, but these systems are generated within social struggles...By situating the investments of the *illusio* as a condition for meaningful subjectivity, and emphasising that the habitus is actively generative on the basis of embodied dispositions created in practice, Bourdieu explains why it is that differently situated people cultivate different tastes, pursue different careers, and adopt different life projects in ways that are socially patterned" (p636) <sup>14</sup>.

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to give socially situated subject".

<sup>14</sup> Berlant (2011) noted "the 'cruel optimism' of contemporary capitalist societies, where class inequalities coexist with widespread material insecurity, personal reflexivity is valorised precisely as the possibility for a life lived according to ultimate concerns is undermined for a growing number" (Farrugia and Woodman 2015 p641).

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## **2. ESTABLISHING THE NUMBER OF DOG BITE-RELATED FATALITIES IN THE USA**

Pinckney and Kennedy (1982) identified 74 dog bite-related fatalities (DBRFs) in the USA between 1966 and 1980 from the medical literature and major newspaper reports <sup>15</sup>. The German shepherd was the breed most involved, and 90% of the victims were under twelve years old.

Sacks et al (2000) collected details, from news accounts and the Humane Society of the United States' databank, of over three hundred DBRFs in the USA between 1979 and 1998. This constituted less than 0.00001% of all dog bites annually (Francia and Alleva 2007) (which was calculated at 129.3 per 100 000 population in 2001; Gilchrist 2003). The majority of victims (60%) were under 10 years old, and pit bulls were most implicated.

Delise (2002) found evidence of 431 deaths between 1965 and 2001 in the USA (which included the data from Pinckney and Kennedy 1982 and Sacks et al 2000) using newspaper accounts and official sources (Medical Examiner files and law enforcement records). Pit bulls most common breed, and three-quarters of the victims were under one year old.

Shields et al (2009) used data for the state of Kentucky from 1991 to 2005, and retrospectively reviewed eleven cases of DBRF. The data included autopsy reports from the Medical Examiners and investigatory evidence from law enforcement agencies.

Seven of the victims were pre-school age (ie: under six years old), and deaths were caused by multiple bite marks and blunt force injuries <sup>16</sup>. The breed most commonly involved was pit bull (five of the cases). However, Shields et al (2009) noted the difficulty in determining the breed: "The inclusion or exclusion of crossbred dogs also poses a dilemma. Ignoring crossbred dogs in statistical data may underestimate their involvement, yet, including them allows an individual dog to be counted more than once" (p229).

Shields et al (2009) summarised seven categories of canine aggression:

- i) Territorial - eg: guarding owner's home.
- ii) Possessive - eg: guarding food.
- iii) Fearful - eg: over-reaction to child.

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<sup>15</sup> Media reports are "impossible to verify for completeness and accuracy", particularly in relation to breed (which is usually done by visual identification) (Patronek et al 2013).

<sup>16</sup> Most studies do not include secondary causes of death, like rabies from a dog bite, strangulation from a dog pulling on a scarf, or injury after being chased but not bitten by a dog (Shields et al 2009).

- iv) Predatory - eg: chasing moving object.
- v) Intra-sexual - eg: male-to-male aggression.
- vi) Parental - protecting their young.
- vii) Dominance - attempting to impose will on another.

In their cases, Shields et al (2009) spotted indicators of potential aggression, including a dog in poor health from previous maltreatment, other behaviour described as "vicious" (eg: killing a kitten), and deliberate teasing or enragement by the owner.

Shields et al (2009) highlighted the key point: "As all studies demonstrate that most dog bite-related fatalities are consistently children, this datum may serve as a significant educational opportunity in support of public health and prevention. Children should not be left alone with a dog and should be instructed not to approach an unknown dog without the owner's permission. Youngsters often loudly squeal with delight at the sight of a dog or quickly advance towards a dog, instilling a sense of fear within the dog and provoking him to attack the child" (p227).

Shields et al (2009) stated that 0.0000003% of the 53 million dogs in the USA were involved in a human fatality, and the risk factors were "unleashed dogs on their owner's property and dogs who killed their owner" (p229).

Patronek et al (2013) warned that the "undue emphasis on breed has contributed to a lack of appreciation of the ownership and husbandry factors that more directly impact dogs and the complex genetic factors that work in combination with husbandry to influence a dog's behaviour and responses to a given set of stimuli" (p1726).

In their study which attempted to rectify this problem, Patronek et al (2013) used official sources to identify 256 DBRFs in the USA between 2000 and 2009. The law enforcement sources included homicidal detectives, chiefs of police, sheriffs, or other investigators, who were interviewed in 177 of the cases <sup>17</sup>, while animal control officers were interviewed in forty-four cases. Twenty-four cases were covered by interviews with veterinarians, prosecutors, owners, and witnesses. There were only eleven cases where primary sources could not be interviewed. The researchers stated that their "intent was to analyse data from previously unused sources...; examine previously unreported behaviourally relevant and potentially policy-relevant factors associated with the victims, the dogs, the husbandry of the dogs, and the

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<sup>17</sup> Interviews obtain information not reported in the media or reported inaccurately.

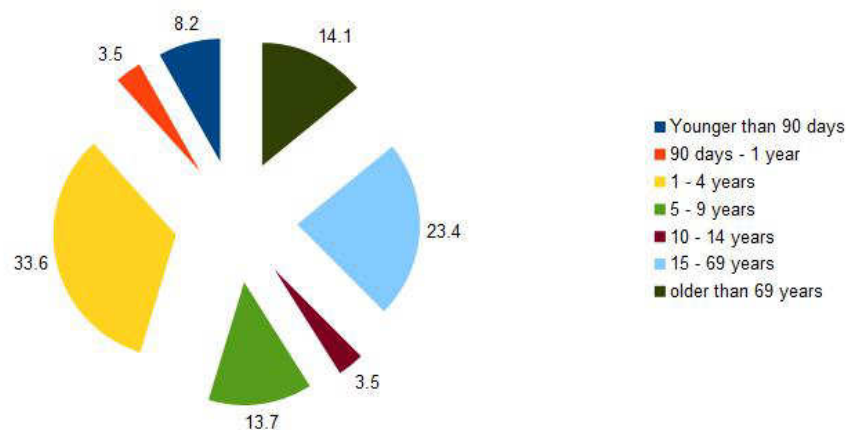
situational factors attendant to these incidents; describe the co-occurrence of these factors; and characterise the reliability and accuracy of breed attribution in media accounts of DBRFs" (Patronek et al 2013 p1727).

DBRF was defined as death from the "mechanical trauma of a dog bite", which excluded infection and other factors leading to a DBRF. The cases were initially found by an Internet search of media reports for each day of the study period using terms like "dog bite", "dog attack", and "dog mauling".

The statistical data were converted to standardised measures of frequency - 0.087 fatal bites per 1 million person-years or 0.38 fatal bites per 1 million dogs in the USA.

Information from the case reports and interviews were summarised as <sup>18</sup>:

a) Victim-related factors - About half the victims were under five years old (figure 2.1). Most victims had no relationship with the dog, but were interacting inappropriately with it at the time of the attack.



(Data from Patronek et al 2013 table 1 p1730)

Figure 2.1 - Percentage of DBRFs by age of victim.

<sup>18</sup> The researchers admitted: "The coding system used for abstracting information from official reports and interviews, despite being repeatable among different coders, nevertheless requires subjective assessment. The information available for each case varied, depending on officials' interest in conducting an investigation and pursuing a criminal prosecution. Some information that might be highly relevant to an animal professional might not be reported by police investigators (eg: animal abuse or neglect); therefore, those situations may be underreported. Most detectives had little knowledge about dogs and relied on what owners or animal control personnel told them" (Patronek et al 2013 p1734). Also the photographs were of "variable quality". The socio-economic characteristics of the owners were not collected by law enforcement and so the researchers did not have this information. This is a problem of the use of official sources, which is dependent on the information collected by the authorities.



b) Dog-related factors - Male dogs were the main perpetrator, and most had not been spayed or castrated. This is important because "testosterone may modulate behaviour, and thus sexually intact male dogs react more intensely, more quickly, and for a longer period of time. It is also possible that people who desire protective dogs choose males and decide not to have them castrated, expecting or encouraging any tendency to be protective or aggressive. It is easy to envision that when sexually intact male dogs are raised as resident dogs, tied outside, and left unsupervised, they could be even more likely to bite" (Patronek et al 2013 p1733).

A lot of effort was put into establishing accurately the breed, with DNA analysis being the preference of the researchers (but this was rare). The researchers found much contradiction between sources (table 2.2), and could only establish breed confidently in 45 cases.

Sources	Strict definition *	Expanded definition **
Single dog incidents:		
• Different media reports	21.6	12.8
• Media vs law enforcement	34.9	14.0
Multiple dog incidents:		
• Different media reports	36.4	17.0
• Media vs law enforcement	43.3	11.1

(\* Strict definition = eg: both sources reported purebred Rottweiler

\*\* Expanded definition = overlap between sources; eg: purebred Rottweiler in one source, but mixed bred Rottweiler - German Shepherd in other)

Table 2.2 - Percentage of conflicting accounts of breed from different sources.

c) Husbandry-related factors - Dogs were often kept isolated from homes, along with a history of neglect, and the owner was aware of prior dangerousness.

Patronek et al (2013) summed up: "the most striking finding was the co-occurrence of multiple factors potentially under the control of dog owners: isolation of dogs from positive family interaction and other human contact; mismanagement of dogs by owners; abuse or neglect of dogs by owners; dogs left unsupervised with a child or vulnerable adult who may be unfamiliar to the dog; and maintenance of dogs in an environment where they are trapped, neglected, and isolated and have little control over either the environment or choice of

behaviour. These conditions potentially predispose dogs to enhanced territorial, protective, and defensive behaviours toward stimuli that occur commonly in everyday life" (p1732). All in all, the researchers emphasised the multi-factorial nature of DBRFs.

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