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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.

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1. AN OLD EVOLVED BRAIN IN A VERY MODERN WORLD

1.1. THE CHALLENGE

Humans face many challenges today like climate change, sophisticated artificial intelligence (appendix 1A), and genetic engineering unlike those seen before. "In the face of such challenges, our evolved moral sense often proves inadequate... [and] It will take evolution a long time to catch up, if it ever does" (Editorial 2015b).

From an evolutionary point of view, morality developed to aid co-operation between selfish individuals in small groups (Jones 2015). So how to deal with decisions in the world today?

The first thing to establish is that many moral judgments are more to do with emotion than cognition [1]. The "trolley problem" has been used to study this area (appendix 1B).

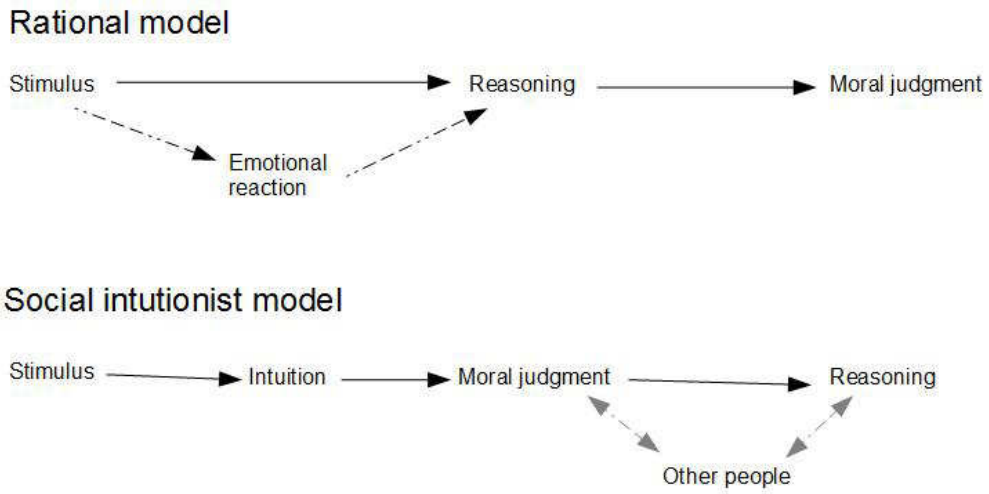
Kohlberg (eg: 1971) was the strongest advocate of a rational basis to moral judgments (ie: moral reasoning causes moral judgments). Haidt (2001) argued that moral judgments [2] are not caused by moral reasoning [3], "rather, moral reasoning is usually a post hoc construction,

[1] In relation to financial markets, Orphanides (2015) observed: "Regulators and investors blithely assumed, among other things, that people tend to make rational economic choices and that market prices reflect the true value of assets".

[2] Defined as "evaluations (good vs bad) of the actions or character of a person that are made with respect to a set of virtues held to be obligatory by a culture or sub-culture" (Haidt 2001 p817).

[3] Defined as "conscious mental activity that consists of transforming given information about people in order to reach a moral judgment. To say that moral reasoning is a conscious process means that the process is intentional, effortful, and controllable and that the reasoner is aware that it is going on" (Haidt 2001 p818).

generated after a judgment has been reached" (p814). Moral judgments are quick and automatic (intuitions [4]), in the main (figure 1.1).



(After Haidt 2001 figures 1 and 2 p815)

Figure 1.1 - A rational model and the social intuitionist model of moral judgments.

Haidt (2001) reported offering participants the following story:

> Julie and Mark are brother and sister. They are travelling together in France on summer vacation from college. One night they are staying alone in a cabin near the beach. They decide that it would be interesting and fun if they tried making love. At the very least it would be a new experience for each of them. Julie was already taking birth control pills, but Mark uses a condom too, just to be safe. They both enjoy making love, but they decide not to do it again. They keep that night as a special secret, which makes them feel even closer to each other. What do you think about that? Was it OK for them to make love?

Most participants said it was wrong, but when asked why, often ended up saying: "I don't know, I can't explain it, I just know it's wrong". Haidt (2001) proposed a social intuitionist model which explained this behaviour thus: "one feels a quick flash of revulsion at the thought of incest and one knows intuitively that

[4] Defined as "the sudden appearance in consciousness of a moral judgment, including an affective valence (good-bad, like-dislike), without any conscious awareness of having gone through steps of searching, weighing evidence, or inferring a conclusion" (Haidt 2001 p818).

something is wrong. Then, when faced with a social demand for a verbal justification, one becomes a lawyer trying to build a case rather than a judge searching for the truth. One puts forth argument after argument, never wavering in the conviction that Julie and Mark were wrong, even after one's last argument has been shot down. In the social intuitionist model it becomes plausible to say, 'I don't know, I can't explain it, I just know it's wrong'" (p814).

Haidt and Hersh (1993) asked participants in the USA and Brazil about "offensive yet harmless behaviours", like eating one's dead pet dog, or eating a chicken carcass that one had used for masturbation. The participants often ended up saying, "It's just wrong". The affective/emotional reaction predicted the moral judgment of right or wrong.

Haidt et al (2000 quoted in Haidt 2001) talked of the participants being "morally dumbfounded" - "they would stutter, laugh, and express surprise at their inability to find supporting reasons, yet they would not change their initial judgments of condemnation" (Haidt 2001 p817). Haidt and Hersh (2001) reported this behaviour for sexual morality issues (eg: unusual forms of masturbation) among conservatives and liberals in the USA.

So it is possible to talk of "auto-mode moral decision-making" which is based on empathy, say. "Roughly speaking, this is feeling the pain of others [5]. It functions like a spotlight, throwing into stark relief the plight of whoever falls under its beam, and moving us to action" (Jones 2015 p38). In a small group, this is a good strategy, but in the global world, it leads to the focus on the single person at the expense of the fate of the many (Jones 2015).

One possibility is "character education" at school that develops the desirable traits like honesty and compassion. Miller (2015), however, pointed out that there is limited research on the effectiveness of such programmes.

Moral decision-making can be influenced by varying the levels of neurotransmitters like serotonin and dopamine (Crockett et al 2015). These researchers gave participants the anti-depressant citalopram (which increases serotonin) or levadopa (which increases dopamine) (or a placebo) before offering them the opportunity to inflict pain on themselves or others for financial reward. The pain involved delivering a mild

[5] Miller et al (2014) suggested that this was not as important as the action itself (appendix 1C).

electric shock to the left wrist. Usually participants show "hyperaltruism" (Crockett et al 2014), which is where individuals require a larger reward to inflict pain on a stranger than on themselves.

Crockett et al (2015) found that increased serotonin increased harm aversion for both the self and others (ie: delivered fewer shocks compared to placebo), but did not affect hyperaltruism, while increased dopamine reduced hyperaltruism only (ie: "reduce the extent to which people placed others' welfare before their own").

Crockett et al (2015) summed up the implications of their studies: "We have shown that some of the most commonly prescribed psychiatric drugs influence moral decisions, raising important questions about the ethics of pharmacological interventions. A single dose of citalopram nearly doubled the amount of money people were willing to pay to avoid harming others, while a single dose of levodopa eliminated a hyperaltruistic tendency to prefer harming oneself over others. However, it is important to stress that these drugs probably have different effects in healthy volunteers compared to patients..." (p1857).

1.2. ACCIDENTS

Leaving aside moral issues, there is the practical challenge of dealing with potential catastrophes, not helped by the need to find someone or something to blame for "accidents". Of course, there is the possibility of no-blame or no-fault, but this "goes against our social instinct to seek out causes and allocate blame" (Editorial 2015a).

The minor human error that leads to a major disaster in the complex world could be a product of the out-of-place evolved brain. There are a number of cognitive and social processes that have been highlighted (van Gilder Cook et al 2015) [6]:

i) Confirmation bias - The tendency to focus on information that confirms beliefs and ignores contradictory evidence.

ii) "Fixation error" - Focusing on one thing and thus missing other (apparently obvious) things.

iii) "Primal freeze" - The increase in the hormone cortisol in a situation of danger can lead to freezing (ie: inaction) or automatic behaviours.

[6] A number of these factors have been linked to "conspiracy theories" (appendix 1D) and other behaviours (appendix 1E).

iv) "Outcome bias" - The tendency to ignore near misses as long as the outcome is positive.

Also the "good news/bad news" (GNBN) effect (Eli and Rao 2012), which is the tendency to pay more attention to good news and ignore bad news in relation to beliefs and predictions.

For example, individuals adjust their beliefs about themselves upwards if they are told that they are more intelligent than the average, but do not adjust downwards if told less intelligent than the average (Koszegi 2006).

The GNBN effect has been used to explain stock market bubbles, ill preparedness in the face of natural disasters, overconfidence, and optimism, for example (Sharot et al 2012).

The inferior frontal gyrus (IFG) (in the left hemisphere) is the part of the brain thought to be involved in this behaviour, and Sharot et al (2012) disrupted this area with repetitive transcranial magnetic stimulation (rTMS). Thirty volunteers at a London university were asked to rate their probability of experiencing forty negative life events (eg: car theft). Then they were given good news (their risk was less than estimate) or bad news (their risk was greater), and asked to estimate the probability again while undergoing rTMS to the left or right IFG or a control region of the brain.

The GNBN effect was not seen with left IFG rTMS. In the other two rTMS conditions, participants adjusted their estimates positively in response to good news, but made no change in response to bad news (ie: the GNBN effect). Sharot et al (2012) concluded: "The enhancement in the inclination to adjust one's beliefs when confronted with bad news following TMS of the left IFG, suggests that this region normally inhibits this ability and that its disruption releases such inhibition" (p17060).

v) Group think and conformity - Within a small group, the pressure to conform leads to a consensus (which can objectively be a poor decision).

More generally, the social influence hypothesis (Engelmann et al 2012) predicts that risk perception is influenced by the risk ratings of others. This social influence or social conformity effect is stronger for children and adolescents.

Knoll et al (2015) showed evidence of this in a study of over five hundred visitors to the Science Museum in London. Participants were individually presented with health risk scenarios (eg: crossing the road while texting; driving a car without wearing a seatbelt), and rated the level of risk (first rating). Then they were told the "average" rating, and asked to give a second

rating of risk. The average rating was either randomly-generated or the participant's first rating (control condition). Social influence was measured by a change in the second rating towards the average.

The magnitude of change towards the "average" was 33% for 8-11 year-olds, 27% for 12-14 year-olds, 18% for 15-18 year-olds, 12% for 19-25 year-olds, and 7% for older individuals. The social influence effect was significant for all age groups.

vi) Default mode - The tendency of the mind to wander when an environment or task is predictable. For example, up to half of 1000 car accidents in a French study were linked to the driver daydreaming (van Gilder Cook et al 2015).

vii) "Technology clash" - "In an increasingly automated world, misunderstandings between human and machine... Part of the challenge is making it easy for humans to grasp what computers and devices are up to - in other words, presenting information clearly" (van Gilder Cook et al 2015 p33).

1.2.1. Safety Checklists

One way to deal with medical accidents/mistakes is through checklists, like the World Health Organisation (WHO) Surgical Safety Checklist, which has nineteen tasks (eg: washed hands, sterilised area) to be completed before an operation can begin (Anthes 2015) [7].

Haynes et al (2009) found a dramatic benefit from using this checklist in a pilot study with eight hospitals - death rates halved and infections after surgery by about one-third.

However, larger studies have not replicated such benefits - for example, Urbach et al (2014) looked at the use in 101 hospitals in Canada.

The difference between studies could be methodological (eg: randomisation of participants or not; control group or not), or the proper use of the checklist by staff. For example, only completed two-thirds of the time (Mayer et al 2015), all items not read out loud, or team members absent during checklist (Russ et al 2015a). Full compliance with the checklist is key (Anthes 2015). One researcher (Nick Sevdalis) said: "If it's used for people to tick the box and say, 'Oh yes, we've done it', but without really thinking about the patient, without really informing their team members about aspects of the procedure that are relevant to them, I don't think the

[7] The checklist has three phases - "sign-in" (when the patient arrives at the operating theatre), "time-out" (before surgery begins), and "sign-out" (after surgery ends) (Russ et al 2015b).

checklist will make any difference" (quoted in Anthes 2015).

Russ et al (2015b) (appendix 1F) interviewed 119 operating-theatre team members at ten hospitals in the UK at two points one year apart about the use of the WHO Surgical Safety Checklist. About half of the respondents admitted that senior staff actively resisted the checklists, which severely limited full compliance by other staff. Other complaints included the poor wording of the checklist, its appropriateness for certain procedures, and being time-consuming. About one-quarter of respondents criticised how the checklist was introduced - in many cases, imposition by the institution with little staff consultation (Anthes 2015) [8] [9].

Dixon-Woods et al (2013) found this latter complaint of top-down imposition in her interviews in seventeen ICUs (intensive care units) in British hospitals [10]. Dixon-Woods et al (2013) described, however, an "exemplary ICU": "The unit was led by a charismatic physician who championed the checklist and rallied others around it. 'He formed coalitions with his colleagues so everyone was singing the same tune, and they just committed as a whole unit to getting this problem under control', says Dixon-Woods" (Anthes 2015) (table 1.1).

- One junior doctor said: "Working with different consultants is that I would say probably without exception as registrars [residents] we do what the consultant tells us to do, certainly where they've got very strong personalities, so I've put central lines in with just a pair of gloves with the individual who does it like that... because that's how he does it, he won't let you do any other way and as registrars you're under pressure to do things

[8] The imposition of processes and procedures by management can be seen through Boltanski's (2011) idea that social life "oscillates between the two poles of dominance and critique" (West 2013). Management ("institutions") seek to avoid criticism in different ways, like the use of "quasi-tautologies" (eg: "doing the best for the patients").

Dominance allows the institution and institution actors to "command reality" "(stating and restating 'the whatness of what is' [Botanski 2011]), but also of interpreting the world itself such that critique is denied the possibility of intervention between reality and the world" (West 2013 p648). One clear mode of dominance is the "inevitability of change".

[9] Kienzler and Amro (2015) felt that "political and socio-economic forces gain their influence not by being openly discussed in public fora, project reports, or scientific texts, but precisely because they are rendered invisible and turned into what Geissler (2013) calls 'unknown knowns'. Like 'public secrets' (Taussig 1999), unknown knowns are open to experience but, for one reason or another, cannot be articulated in a particular societal arrangement. As active practices, unknown knowns create particular forms of knowledge while also serving specific political and economic interests by 'making domination unspoken, silencing critique and resistance, and exacerbating power differentials' (Geissler 2013)" (p114).

[10] This was an ethnographic study that involved non-participant observation in the ICUs, and ninety-eight interviews with staff, where a programme was introduced to reduce catheter-related bloodstream infections (known as "Matching Michigan"). Though this study was about the implementation of a new programme rather than just a checklist, it highlighted the importance of "local leaders".

as the consultant wants you to do them... [or] you know makes the rest of your day miserable" (p7).

- A consultant said: "Cultural change is the biggest threat, because all of a sudden it fundamentally means that what you've been doing so far is maybe wrong, or people don't value what you've done for the last 15 years. People think 'oh, there's the smart-arse telling us how we're supposed to do things'. So there were a lot of discussions and persuasion" (p9).

- Another consultant said: "I think it's been successful because it's a unifying programme, it's one of the few things that we've done that hasn't been just a doctor thing, or just a nurse thing, it's involved the doctors and the nurses together" (p9).

- An ICU nurse said: "So the fact that the lead consultant was passionate about it helped us to bring about change. [We could] actually [say to the junior doctors,] 'You will gown up! You will put a mask on!' And that was coming from [the lead consultant] as much as it was from [the nurses]" (p9).

- Consultant: "I recall from reading that there wasn't anything that made me change my practice. I haven't seen any people [using hats and masks] and I certainly wouldn't you know ask my juniors to do that" (p9).

Table 1.1 - Quotes from Dixon-Woods et al's (2013) interviews showing the importance of "local leaders".

Conley et al (2011) found that such champions were crucial in their study of five hospitals in Washington state, USA (table 1.2).

- Based on interviews in 2009 with implementation leaders and surgeons who had used the WHO Surgical Safety Checklist, the researchers divided the five hospitals in to three groups:

- 1. Highly effective implementation (2 months from pilot to full use - two hospitals) - summed up by the quotes: "It was a team effort... everybody worked together... The chief of surgery was a strong member who helped drive the process" (p875).

- 2. Moderately effective implementation (more than two months - one hospital) - more emphasis on the leader than the team effort of the previous group. "Surgical staff responded to the implementation leader's approach to enrolment and took an interest in ensuring that checklist processes were completed correctly" (Conley et al 2011 p875).

- 3. Less effective implementation (more than six months - two hospitals) - the medical directors took the view: "hey guys, this is what I want to do and I need your support" (p876). This led to nurses worrying that they would have to "force" surgeons to use the checklist, and the medical director responding: "either the nurses are too big of wimps to pull this off or the surgeons are too big of jerks to pull this off... Getting it done was more important than trying to make it perfect... if I continued to fine tune this thing it would never reach everybody's satisfaction and would never get implemented" (p876).

- Conley et al (2014) summed up the differences between the best and worst hospitals in terms of successful implementation - "active leadership, deliberate enrolment, extensive discussion and training, piloting, multidisciplinary communication, real-time coaching, and ongoing feedback" (p877). Put together, "explaining why" and "showing how" were key in successful implementation.

- Conley et al (2011) felt that "despite significantly reducing mortality and other post-operative complications in the WHO Pilot Study... the real world impact of surgical safety checklists on patient outcomes is likely to vary with the effectiveness of each hospital's implementation process. Deploying a checklist without building an appreciation for how and why it works ignores the critical sociocultural dimension of how safer care is achieved" (878).

Table 1.2 - Conley et al (2011).

In terms of low-income countries, Aveling et al (2013) found that the WHO Surgical Checklist was ticked in an African hospital even when the basic equipment and supplies were not appropriate/present because the staff's attitude was that it was better to do the surgery (without supplies) than not at all.

1.2.2. Forecasting

Forecasting or predicting the future is a highly prized ability for analysts (as well as in everyday life) (table 1.3). Mellers et al (2014) outlined three main ways to improve this ability in a geopolitical forecasting tournament [11]:

i) Training - This involved training individuals to avoid any cognitive biases, like overconfidence, and the confirmation bias.

ii) Teaming - This approach had a team working together rather than individuals alone or crowd-sourcing (average of individual predictions).

iii) Tracking - Getting individuals of similar ability to work together (eg: "superforecasters" in a team).

All three techniques significantly reduced forecasting errors to untrained individuals alone. The

[11] A two-year tournament (September 2011-April 2013) forecasting 199 geopolitical events. The tournament used a Brier score (Brier 1950) which measures individual accuracy between the forecast and reality from 0 (best score) to 2 (worst score). Predictions were made on probability scale from 0-100% for items like: "Will Italy's Silvio Berlusconi resign, lose re-election/confidence vote, or otherwise vacate office before I January 2012?".

best approach was a combination of these techniques and a statistical algorithm.

- Prediction of future illness is a growing aspect of developments in medicine, and this will be done by technology, like skin-surface or implanted sensors [12]. Such wireless sensors on the skin would record temperature, pulse, and breathing rate, for instance. While implanted sensors could detect chemical signals in the blood, say (Gibney 2015). For example, Iverson et al (2013) placed a carbon-nanotube sensor in mice for over a year to monitor nitric oxide in blood, which is an inflammatory marker of infection, without an immune response.

  The widespread adoption of such devices by humans is limited by medical regulation, and manufacturers who fear lawsuits if devices fail, as well as concerns over hacking (Gibney 2015).

Table 1.3 - The future of medicine?

1.3. APPENDIX 1A - ROBOTS AND FUTURE

Enriquez and Gullans (2011) described today as a period of "hypernatural evolution" - "we are transitioning from a hominid that is conscious of its environment into one that drastically shapes its own evolution. We have already started to evolve from Homo sapiens (a conscious hominid) into 'Homo evolutis': a hominid that directly and deliberately controls the evolution of its own and other species" (quoted in Xenopoulos 2015 p19). Part of this process is the relationship with robots.

Rus (2015) argued for a future where humans and robots worked together. She stated: "In a robot-rich world, people may wake up in the morning and send personal-shopping robots to the supermarket to bring back fruit and milk for breakfast. Once there, the robots may encounter people who are there to do their own shopping but who travelled to the store in self-driving cars and who are using self-driving shopping carts that take them directly to the items they want and then provide information on the freshness, provenance, and nutritional value of the goods - and that can also help visually impaired shoppers navigate the store safely. In a retail environment shaped by pervasive robotics, people will supervise and support robots while offering customers advice and service with a human touch. In turn, robots will support people by automating some physically difficult or tedious jobs: stocking shelves, cleaning windows, sweeping sidewalks, delivering orders to

[12] Implants can act as "a nidus for infection" (eg: bacteria along wires), and provoke immune reactions, which requires surgical removal of the implant with the associated risks and concerns (Kang et al 2016).

customers" (p6) [13].

Brynjolfsson and McAfee (2015) pointed out that "human interaction is central to the economic transaction, not incidental to it... Humans have economic wants that can be satisfied only by other humans" (p10). Thus, they argued, humans will not become obsolete as robots become more important in everyday life in the way that the internal combustion engine replaced the horse for transport [14].

"Technology has also brought about the rise of winner-take-all markets, as superstars have come to bestride the globe. Substantial evidence exists, too, of 'skills-biased' technological change. As the demand for and rewards offered to highly skilled workers (software programmers, for example) rise, the demand for and rewards offered to those with skills in the middle of the distribution (such as clerks) decline (table 1.4). The value of intellectual property has also risen. In brief, a modest impact on aggregate output and productivity should not be confused with a modest impact across the board" (Wolf 2015 p19) [15].

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[13] This view ignores the socio-cultural situation, like neo-liberalism. Neo-liberalism involves a move toward "techno-managerial governance" (Goven and Pavone 2015) (ie: a shift in the style and goals of state intervention rather than non-intervention). "For the neo-liberal project to succeed it is democratic control rather than the state that must be strictly limited" (Goven and Pavone 2015 p311). However, neo-liberalism is "promiscuously pervasive, yet inconsistently defined, empirically imprecise and frequently contested" (Brenner et al 2010).

Another aspect of society is the power of large corporations. Wrong (1997) described power as in the growth of large corporations, like supermarkets, as a zero-sum game for smaller businesses (ie: bigger players take more of the limited amount at the expense of smaller players). The alternative is a positive-sum game, where resources are not fixed, and the growth of large corporations is beneficial to all (Allen 2009).

Not ignoring the dominance of financial markets in life. The "futures" market, for example, involves disentangling a physical object (eg: a bag of grain produced by a particular farmer) from the "homogeneous abstractions" (Cronon 1991) (eg: the standardised contract that is traded by brokers). But this process assumes that everything can be disentangled (ie: traded). Callon (1998) referred to a new entanglement which "helpfully focuses attention on the infrastructure of markets: the social, cultural, and technical conditions that make them possible" (MacKenzie 2006 p13). Like scientific knowledge, there is a construction process involved rather than an objective truth that is simply discovered.

[14] Labour (human beings), land (nature) and money are "fictitious commodities" for Polanyi (1944/1957). This means that they are treated as if for sale, and become subordinated to the role of commodities. Thus, "their essential character (or use value) is fundamentally threatened or destroyed in the process" (Goven and Pavone 2015 p309).

[15] Different terms have been used to describe changes in work in the late twentieth century, including "flexible accumulation", "neo-Fordism" or "post-Fordism" (Abercrombie and Warde 1991). "Fordism" described by Braverman (1974), was based on fixed machines used to produce for mass consumer market with hierarchical control of labour. Post-Fordism involves computerised flexible machines producing diverse specialised goods with greater labour flexibility (Abercrombie and Warde 1991).

- "Nikefication" - contracting out or outsourcing aspects of production. Derived from the athletic shoe company Nike - "the designing and marketing could be in Oregon, while other companies in China or Indonesia or Vietnam could handle manufacturing, and still other companies could manage distribution" (Davis 2015 p510).

Davis (2015) stated: "The corporation was nothing but a nexus-of-contracts that existed to create shareholder value" (p509). While Jensen and Meckling (1976) described it thus: It is important to recognise that most organizations are simply legal fictions which serve as a nexus for a set of contracting relationships among individuals [...] Viewed this way, it makes little or no sense to try to distinguish those things that are 'inside' the firm (or any other organisation) from those things that are 'outside' of it. There is in a very real sense only a multitude of complex relationships (ie: contracts) between the legal fiction (the firm) and the owners of labour, material and capital inputs and the consumers of output" (quoted in Davis 2015).

- "Uberisation" - on-demand labour to be contracted via online platforms (ie: "renting" rather than "buying" (full-time employee)) (Davis 2015).

Originally, the concern was the "death of the career" to be replaced by "jobs" (as individuals were "perpetual free agents"). "But now the task may be replacing the job. 'Job' implies an employer (often a corporation) and an employee. But platforms like Uber..., and countless other 'sharing economy' apps provide a means to contract for specific tasks rather than hiring for jobs" (Davis 2015 p512). Also called the "gig economy", the "on-demand economy", the "Task Rabbit economy" (Kuttner 2013), or "platform capitalism" (Davis 2015).

So, "it is not the level of skill but the firm-specificity of the skill that is likely to determine which jobs remain with employers and which become Uberised tasks" (Davis 2015 p514).

Table 1.4 - Two key changes in working conditions in recent years.

In the future, Goos and Manning (2007) envisaged that those doing "lovely jobs" (eg: creating and managing robots) will do fine, but those in "lousy jobs" (eg: routine office work) will not. "Economic inequality across society as a whole is likely to grow, along with demands for increased state expenditures on social services of various kinds - just as the resources to cover such expenditures are dropping because of lower tax contributions from a smaller work force" (Colin and Palier 2015 p29) [16].

Frey and Osborne (2013) see software talking over from humans sitting at computer screens, but not manual labour tasks.

One consequence for the labour market, noted by Sachs and Kotlikoff (2012), is "if automation absorbs

[16] Bauman (1988) distinguished between the seduced and the repressed in consumer society. The seduced are "those in a position to be admitted to membership in society because they are able to consume effectively in the eyes of others" (Hetherington 2009 p27), while the repressed are those at the margins of society and not able to "participate fully in a consumer society" (Hetherington 2009).

jobs previously reserved for young people, who have not yet had time to build up skills, it will stop them from acquiring those skills, and its destructive effects will reverberate down the years" (Staff 2014 p13).

Nourbakhsh (2015) referred to the "double-edged sword" with technology in a different way. For example, robotic legs that allow wheelchair users to walk "would represent unqualified gains for humanity. But as robotic prosthetics enter the mainstream, the able-bodied will surely want to take advantage of them, too" (p25). Moravec (1999), for example, described this as "transhumanism", and such a situation has "the potential to vastly magnify the already-significant gaps in opportunity and achievement that exist between people of different means" (Nourbakhsh 2015 p27).

What is different about artificial intelligence (AI) today is rather than being programmed with all the necessary information, the machines learn for themselves based on learning algorithms programmed in (Koch 2015).

Writing about the day when "strong" AI surpasses human intelligence, Bostrum (2014) was concerned with "the unpredictability of what might happen when the technology starts edging toward acquiring capabilities of a strong AI that takes its goals to extremes never intended by its original programmers" (Koch 2015 p28). For example, a "paper-clip maximising AI" that changes the world to produce paper clips only (Koch 2015). The "control problem" is to produce strong AI/highly intelligent machines that are not a threat to humanity (Bostrum 2014).

1.4. APPENDIX 1B - TROLLEY PROBLEM

In the "trolley problem" or dilemma (Foot 1978), a runaway trolley (trolleybus, tram or train) is about to hit/kill five people. The "switch dilemma" offers the possibility to turn a switch which diverts the trolley onto another track, but this would hit/kill one person. The "footbridge dilemma" involves stopping the trolley from hitting the five people by pushing an individual off the bridge into the line of the trolley. This stops the trolley, but the individual is killed. The sacrifice of one person to save five is acceptable to most people in the "switch dilemma", but not in the "footbridge dilemma" (Greene et al 2009).

Neuroimaging shows that individuals reason differently about the two dilemmas, and two factors are taken into account (Greene et al 2009):

- The agent's intention - pushing the individual intends to kill, whereas turning the switch leads to an

unintended side-effect of the individual's death.

- "Directness" or "personalness" of the harm - eg: pushing an individual involves physical contact in a way that turning a switch does not.

Greene et al (2009) developed the latter factor in what they called "personal force" (which involves actions generated by the agent's muscles). In their first experiment (Experiment 1a), the researchers distinguished between personal force, physical contact, and proximity with 620 participants recruited on the streets of New York and Boston. In an independent design experiment, participants rated how "morally acceptable" one of four versions of the "footbridge dilemma" (table 1.5) (as yes/no and on a nine-point scale):

i) Standard version - push individual with own hands (ie: involves proximity, physical contact, and personal force);

ii) Remote version - turn remote switch and the individual will fall through trap door. This involves none of the above factors;

- An empty runaway trolley is speeding down a set of tracks toward five railway workmen. There is a footbridge above the tracks in between the runaway trolley and the five workmen. On this footbridge is a railway workman wearing a large, heavy backpack. If nothing is done, the trolley will proceed down the main tracks and cause the deaths of the five workmen.

- It is possible to avoid these five deaths. Joe is a bystander who understands what is going on and who happens to be standing right behind the workman on the footbridge. Joe sees that he can avoid the deaths of the five workmen by pushing the workman with the heavy backpack off of the footbridge and onto the tracks below. The trolley will collide with the workman, and the combined weight of the workman and the backpack will be enough to stop the trolley, avoiding the deaths of the five workmen. But the collision will cause the death of the workman with the backpack.

- Note: Joe cannot avoid the deaths of the five workmen by jumping himself because he is not heavy enough to stop the trolley. There is also not enough time to remove the backpack from the workman.

- Is it morally acceptable for Joe to push the workman off of the footbridge in order to avoid the deaths of the five workmen, causing the death of the single workman instead?

(Source: Greene et al 2009 pp365-366)

Table 1.5 - Text of standard version of "footbridge dilemma".

iii) Pole version - as the standard version, but the push is made using a pole. Thus, proximity and personal force;

iv) Switch version - as remote version, but the switch is beside the individual. There is spatial proximity only here.

So, comparing remote versus switch conditions shows the effect of proximity, standard versus pole conditions the effect of physical contact, and switch versus pole conditions personal force.

There was no significant difference for spatial proximity or physical contact, but there was for personal force. The pole version was less morally acceptable than the switch version (mean 4.15 vs 5.14, where a higher score is more acceptable) (table 1.6). "These results indicate that harmful actions involving personal force are judged to be less morally acceptable. Moreover, they suggest that spatial proximity and physical contact between agent and victim have no effect and that a previously reported effect of physical contact... is in fact an effect of personal force" (Greene et al 2009 p367).

Condition (mean)	Testing the effect of:	Significance
Remote (5.02) vs Switch (5.14)	Proximity	Not
Standard (3.89) vs Pole (4.15)	Physical contact	Not
Switch (5.14) vs Pole (4.15)	Personal force	p = 0.006

Table 1.6 - Mean ratings (out of 9, where a higher score means more morally acceptable).

In their next experiment (Experiment 1b), Greene et al (2009) used a different dilemma with ninety-one volunteers recruited online. The "speedboat dilemma" (Cushman et al 2006) involves saving the lives of five drowning swimmers by removing one passenger who cannot swim from the boat. Participants responded to one of three versions - push the passenger with hands (physical contact and personal force; Pc-Pf), push with (NoPc-Pf), or accelerate quickly causing passenger to fall overboard (NoPC-NoPf). A seven-point rating scale was used, from 1 "forbidden" to 7 "obligatory".

There was a significant difference for personal force (NoPc-Pf vs NoPc-NoPf; mean 2.33 vs 3.3), but not for physical contact (Pc-Pf vs NoPc-Pf; mean 2.28 vs 2.33). Thus, accelerating the speedboat was the most morally acceptable option. This finding showed that the results of Experiment 1a could be generalised to other

contexts.

Experiment 2a investigated the effects of personal force and agent's intention, using the trolley dilemma again with 366 participants recruited on the streets. Participants responded to one of four versions of the dilemma:

i) Loop version - a switch can be turned to send the trolley onto a side-track (loop) where there is a person working who will be killed and this stops the trolley. There is intention, but no personal force involved.

ii) Loop weight version - the side-track has a weight across it that will stop the trolley, but the worker will still be killed as a side-effect. There is no intention or personal force here.

iii) Obstacle collide version - in order to reach a switch to turn the trolley onto the side-track, Joe will collide with an individual which results in them falling off the bridge to their death. This version has personal force, but no intention.

iv) Obstacle push version - as the last version, but Joe pushes the victim out of the way (ie: personal force and intention).

The obstacle push version was rated significantly lower (ie: less morally acceptable) (mean 4.98 out of 9) than the other versions (loop 5.89, loop weight 5.85, and obstacle collide 6.25). This showed that "personal force interacts with intention, such that the personal force factor only affects moral judgments of intended harms, while the intention factor is enhanced in cases involving personal force. Put simply, something special happens when intention and personal force co-occur" (Greene et al 2009 p369).

Greene et al (2009) presented an "action-planning" explanation for their findings. Personal force and intention together "suggests a system of moral judgment that operates over an integrated representation of goals and personal force—representations such as 'goal-within-the-reach-of-muscle-force'. In a general sense, this suggests a mechanism of moral judgment that is a species of embodied cognition... One natural source of such embodied goal representations is system of action planning that coordinates the application of personal force to objects to achieve goal-states for those specific objects. A putative sub-system of moral judgment, monitoring such action plans, might operate by rejecting any plan that entails harm as a goal-state... to be achieved through the direct application of personal force" (p370).

Furthermore, they said: "our sense of an action's moral wrongness is tethered to its more basic motor properties, and specifically that the intention factor is intimately bound up with our sensitivity to personal force" (Greene et al 2009 p370).

1.5. APPENDIX 1C - MILLER ET AL (2014)

Moral condemnation of harmful behaviour to another person could come from empathy for a victim's pain ("outcome aversion") or from aversion to performing the act itself ("action aversion") (Miller et al 2014).

Miller et al (2014) explored these two possibilities in five online experiments.

Experiment 1 - Over three hundred participants were offered six moral dilemmas to rate [17], which involved witnessing another person experiencing pain (outcome aversion) or think about performing a harmless version of a violent act (eg: stab a person with a stage knife) (action aversion). Dilemmas of both types were equally condemned, which showed that "when one considers the permissibility of a violent act, she is moved by the emotional aversiveness of both the act itself and its harmful consequences" (Miller et al 2014 p577).

Experiment 2 - This experiment presented around one hundred participants with the same moral dilemmas with a 2-3 year gap. Action aversion, but not outcome aversion, was found to predict moral judgment of harmful actions over the time period.

Experiment 3 - This experiment was a replication of the first one with new dilemmas and 150 new participants. Action aversion was more predictive of moral condemnation of harm.

Experiment 4 - Next, the researchers tested action aversion with more abstract dilemmas with 150 more participants. The findings in Experiment 3 were replicated.

Experiment 5 - The final experiment varied the amount of suffering (outcome aversion) in the moral dilemmas (focused on mercy killings) with 150 more participants. The action aversion was the predictor of moral condemnation even when no harm was caused by the action.

[17] Aversion rated as 1 ("not at all") to 7 ("very much so").

Overall, "these results suggest we may judge others' actions by imagining what it would feel like to perform the action rather than experience the consequences of the action" (Miller et al 2014 p573).

1.6. APPENDIX 1D - EXAMPLES OF "CONSPIRACY THEORY" THINKING

"Conspiracy theories" present society as "secretly dominated/manipulated by certain groups/individuals" (Nafes 2015 p557). While Furnham (2013) defined them as "beliefs that attribute the ultimate cause or concealment of an event or behavioural pattern from public knowledge, to secret, unlawful, and malevolent plots or processes, usually by multiple actors working together" (p1) [18].

Such theories are usually viewed as paranoid delusions (ie: pathological and irrational) or as "rational attempts to understand society" (ie: "agency panic [Melley 2000] - ie: intense anxiety about the loss of autonomy or self-control - drives people towards conspiracy theories, which provide integral stories for the shattered personalities"; Nefes 2015 p558) [19] [20].

Nefes's (2015) case study of Donmes in Turkey suggested both alternatives. The Donme community is a "secret society" originating as followers of a "Jewish messiah", Sabbatai Sevi, in the seventeenth century Ottoman Empire. There may be up to four thousand followers today, who are distinct from the orthodox Jewish and Muslim communities in Turkey (Nefes 2015).

Nefes (2015) noted five persistent themes in the conspiracy theories about Donmes:

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[18] "Those who share conspiracy theories argue that it is usually naïve to believe in the official version of events because governments and corporations are Machiavellian manipulators of the media who often try to keep people in a state of ignorance and fear. Those with a 'cover-up' as opposed to a 'conspiracy theory' mindset accuse others of demonising them and being close- minded, whereas what they are doing is actually holding those in power to account and reclaiming history. They are often motivated by strong socio-political and religious ideologies" (Furnham 2013 p1).

[19] Byford (2014) noted that the "conspiracy mentality is no longer regarded as the prerogative of 'extremists', but as a form of everyday social explanation and an increasingly common way of accounting for some of the key political, and some would argue existential challenges of the modern age: secrecy in politics, increase in surveillance and threat to privacy, the rise in the power of transnational corporate bodies and their diminished accountability, the widespread sense of weakened personal agency, and so on..." (p85).

[20] Shermer (2010 quoted in Furnham 2013) proposed four characteristics of individuals who hold general conspiracy theories - patternicity (tendency to find patterns in random events), agenticity (belief that the world is controlled by unseen intentional agents), confirmation bias (tendency to seek confirmational evidence for beliefs), and hindsight bias (using knowledge after the event to explain the event).

Different explanations for holding conspiracy theories include to help maintain a sense of meaning, control and personal security (Newheisser et al 2011), to maintain self-esteem (Young 1990), or as a means to assert individuality (Melley 2000).

- They are the hidden ruling elite of Turkey.
- They established the Turkish Republic.
- They deliberately hide their agenda.
- They intentionally dilute Turkish culture.
- They are allies of foreign powers against Turkish interests.

Nefes (2015) linked these themes to "Sevres syndrome", which refers to the Sevres Treaty between the Ottoman Empire and the Allies at the end of World War I. "The Sevres Treaty signalled the end of the Ottoman Empire and its struggle to stop its land loss to the Western powers and its minorities. The treaty was an embodiment of the empire's dismemberment, which the empire had been attempting to evade since the early nineteenth century. Hence, the treaty signifies an ongoing trauma attributed to the lurking existential threat in Turkish politics..." (Nefes 2015 p564). The Donme community is an "ideal suspect of the Sevres syndrome" [21].

Nefes (2015) used two main methods to collect data:

i) Content analysis of two popular conspiracy theory books on Donmes.

ii) Semi-structured interviews with thirty-one volunteers (recruited via the Internet) who had read the two books.

The response to the books depended on the political views of the interviewees. Individuals with left-wings views saw Donmes as a threat "allied with imperialism and capitalism", while right-wingers saw "the Donme community as ethnic and religious outsiders who exploit the country" (Nefes 2015 p569).

Nefes (2015) summed up: "The respondents' acceptance of the conspiratorial content of the book series confirmed the Sevres syndrome's position that internal and external enemies plot to weaken Turkey. At the same time, the respondents interpreted the conspiratorial accounts according to their political views by blaming either global capitalism or the Jews" (p571). The conspiracy theories here combined rational accounts of society and paranoid narratives of the world.

Coleman (1990) pointed out that "much of what is ordinarily described as non-rational or irrational is merely so because the observers have not discovered

[21] This syndrome can be linked to "ontological insecurity", where "ontological security" is the confidence "in the continuity of self-identity and in the conspiracy of the social and material environments of action" (Giddens 1992 quoted in Nefes 2015).

the point of view of the actor, from which the action is rational" (quoted in Nefes 2015 p562).

The important point is that individuals are not "rational machines", but produce "value-laden narratives". Entirely rational beings would weigh up the costs and benefits of holding certain views, whereas subjective aspects influence the decision to hold a political view, say (eg: "axiological rationality"; Boudon 2001). So, individuals "may use the conspiracy theories pragmatically to delegitimize other views even without believing in them, or they may believe in conspiracy theories because of the values they hold without necessarily aiming for a benefit" (Nefes 2015 p562).

1.6.1. Commercial Conspiracy Theories

Furnham (2013) investigated commercial conspiracy theories with a British sample of 324 adults in London, who completed the thirty-item belief in commercial conspiracy theories inventory. This was specially designed to cover tactics by advertisers and behaviours by companies. Participants rated how regularly each practice occurred from 1 (very) to 6 (never). The participants also completed a personality questionnaire.

Factor analysis of the scores produced four sets of items on the belief in commercial conspiracy theories inventory:

- Sneakiness - eg: "placing the word 'sex' very subtly in advertisements to attract your attention"; "shops tricking you with pricing - ie: putting up prices for a few minutes, then down claiming big discounts".

- Manipulative - eg: "shops faking 'sell-by' dates to make more profit"; "drug companies falsifying their data on the effectiveness of their drugs".

- Changing the rules - eg: "banks manipulating inflation and other figures to make more profit"; "oil companies encouraging politicians to invade countries to take their oil".

- Suppression/prevention - eg: "oil companies deliberately suppressing better car technology that uses less fuel"; "drug companies getting normal behaviour being called disorder so they can invent drugs to cure it".

In terms of personality questionnaire scores, conspiracy theories were endorsed more by more left-wing, less religious, self-rated poorer, and more pessimistic

individuals, who were lower N (neurotic) and O (openness to experience) scorers. But "individual difference variables explained relatively little of the variance in these beliefs" (Furnham 2013 p1) [22].

1.6.2. Psychology Research

Psychology research on conspiracy theories has tended to take two strands (Byford 2014) - the "certain types" of people who are "conspiracist individuals" (Swami et al 2010), and the perceptual or cognitive deficits involved (ie: "cognitive illusions, paralleling the widely documented perceptual illusions"; Kruglanski 1987) [23]. Both approaches emphasise the individual, and the findings are often inconsistent, whereas Byford (2014) gained more understanding by using Billig's (eg: 1988) concept of ideology (or ideological tradition) - ie: conspiracy theories as a stance in an argument [24].

Byford (2014) stated: "Talking about conspiracy theories is therefore an act of advocacy, replete with arguments and counter-arguments, accusations and justifications. This argumentative, rhetorical dimension of the conspiracy theory is accentuated by the fact that conspiracy theorising is more often than not a shared endeavour and a social activity. It is performed through organisations, movements and campaigns, or increasingly through jointly produced websites and internet forums where claims and arguments are continuously exchanged, debated, evaluated and modified... They are much more relevant as a dynamic set of ideas circulating in the public domain, an ideological discourse on the basis of which movements are established, political projects forged and power relations challenged and sustained" (p88). Thus, conspiracy theories are not politically or ideologically neutral (Byford 2014).

1.7. APPENDIX 1E - MISCELLANEOUS BEHAVIOURS

The human side of cybercrime is another example where individuals can be "exploited". For example, clicking on an email, apparently from an authority figure

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[22] Individuals tend to be general conspiracy theorists - ie: "if they believe in one theory they believe in many" (Furnham 2013). For example, Swami et al (2011) found that individuals who believed in conspiracy theories were more likely to accept a fictitious one created by the researchers.

[23] For example, Brotherton (2016) referred to "proportionality bias" ("when something big happens we tend to assume that something big must have caused it"), "intentionality bias" ("when something ambiguous happens, we assume that it was intended"), and the "illusion of understanding" ("a tendency to overestimate our knowledge of how things work").

[24] This is distinct from "broader discourses of suspicion" (Byford 2014), and "routinised paranoia" (Knight 2000), or genuine cases of cover-up.

at work, which activates malware, "relies on people's instinctive deference to authority and their lowered capacity for scepticism when they're busy and distracted" (Waldrop 2016 p165). Added to this, the pressure for passwords each day (eg: 23 "authentication events" per day in one organisation studied; Waldrop 2016).

"So people resort to subversion", noted Waldrop (2016). One study found that workers tried to avoid cybersecurity demands to get their work done - eg: writing down passwords (Waldrop 2016).

Gullibility to scams and cons generally could be a consequence of the "old brain" as "trust is a more evolutionarily beneficial path than adeptness at spotting deception" (Konnikova 2016 p40). Generalised trust (ie: assuming the best in others) is also linked to health and happiness (Konnikova 2016).

Trustworthiness can be based on perceived similarity. DeBruine (2002) found that participants trusted a player on a computer game whose photograph was a version of themselves more than with a photograph of a stranger.

Another characteristic that leads to vulnerability to deception is self-deception. A study of competitive swimmers, for example, found that individuals who saw the world as they wanted it did better than individuals who saw the world clearly (Starek and Keating 1991).

Storytelling is important, and the more engaged in a tale the more the reader or listener will believe it (eg: Green and Brock 2000).

1.8. APPENDIX 1F - RUSS ET AL (2015b)

Analysis of the transcripts of the interviews produced eleven themes that related to barriers to checklist implementation and nine themes that were facilitators.

Barriers:

- Organisational (2 themes) - style of checklist implementation; culture of hospital.
- Systems (2 themes) - time taken to implement; checklist repetitive.
- Team - active resistance or passive non-compliance by individuals or team.
- Checklist-specific (6 themes) - checklist content (eg: "awkward wording); timing (eg: when "sign-out"); inappropriate to certain circumstances; concern over reaction of patients (eg: some items may produce anxiety); unintended negative consequences; scepticism about its usefulness.

Facilitators:

- Organisational (4 themes) - education/training; feedback about implementation; accountability for non-compliance; support from hospital management.
- System - integration with existing procedures.
- Team (3 themes) - "senior staff buy-in"; leadership skills; involving entire team.
- Checklist-specific - customise to local requirements.

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2. TWO DIFFERENT ASPECTS OF SOCIAL ATTENTION

2.1. ATTENDING TO AND NEGLECTING PEOPLE

Interacting with other individuals requires attention and social cognition, but "we pay radically different amounts of attention to physically very similar humans and their actions in different contexts, depending on whether the persons are our significant ones, colleagues, dentists, bus drivers, shop keepers or refugees. Naturally, how we attend to and neglect other people, and thereby look, listen, align and synchronise with them during social encounters, strongly affects the information we receive from them, and how we consequently understand their intentions and behaviour" (Hari et al 2016 p1).

What are the processes involved in attending to and neglecting people? "A central question is the role of social interaction in cognition: does the brain have a specialised machinery for processing sensory cues from conspecifics (the classical view); or could the interaction with others constitute even the default mode' of human brain function that enables human social interaction" (Hari et al 2016 p2).

A key aspect of social perception is to predict the other person's actions, and facial cues are important here. These "change at different timescales: symmetry and sexual dimorphism of the face alter slowly across the lifespan, facial adiposity changes over a medium time course, and skin colour can alter over a short time" (Hari et al 2016).

Previous experience and expectations are also involved in "predictive coding" (Hari et al 2016), and the study of abnormal predictive coding helps in understanding here (eg: individuals with high-functioning autism). Such individuals struggle to distinguish communicative and non-communicative actions (von der Luhe et al 2016), for example. Implicit processing is involved normally as many "human-to-human interactions are so automatic that effortful mind reading – interpretation of another's beliefs and intentions – is not needed all the time; often just a glance of an eye is enough to find out that the other is still 'tuned in'" (Hari et al 2016 p2).

Similarity between individuals in terms of attitudes aids an interaction, and such individuals have been found to have similar spatio-temporal brain activity patterns

in neuroimaging studies (eg: Lahnakoski et al 2014).

Hari et al (2016) outlined three major pitfalls in studies of social cognition and interaction:

i) Spectator view - Studies tend to focus on individuals and their reaction to social stimuli ("spectator view") rather than real-life, dynamic interactions.

ii) Timing - A need to include and quantify the timing of social interactions in studies (as in "out of turn" or "out of sync").

iii) Quantification of behaviour - Many current tools for this are inadequate (eg: "the human brain reacts markedly to eye blinks of a conversation partner, even though the blinks typically do not capture the viewer's attention"; Hari et al 2016).

2.2. ATTENTIONAL BIAS TO EMOTIONS

Attention to others' emotions is a key skill for social animals, particularly in preventing conflict. Humans show an attentional bias towards threatening faces over neutral ones, for instance, using the dot-probe task (Kret et al 2016).

Kret et al (2016) showed an attentional bias in bonobos towards images of conspecifics showing mating, yawning or grooming, but not distress or aggression using the dot-probe task. This task is based on reaction time to tap a touch-screen or press a button. Two pictures are presented simultaneously on a computer screen for 300 ms, and then a large dot. The task is to respond as quickly as possible to the dot. There is a tendency to respond quicker if the dot appears in the part of the screen where the individual was attending to a picture. This is attentional bias.

Four female captive bonobos in The Netherlands were trained to use the touch-screen. Pictures of bonobos and other animals (eg: rabbits) were used. An emotional picture and a neutral picture were presented together.

Overall, the bonobos were quicker in tapping the dot on the screen when it replaced an emotional bonobo picture than a neutral bonobo picture (mean: 611 vs 645 ms). The more emotionally intense the bonobo picture (as rated by human experts) the faster the reaction time.

Kret et al (2016) summed up: the "bonobos' attention is quickly captured by the emotional expressions of others. Interestingly, this attentional bias was strongest for affiliative behaviours (grooming and mating) and behaviours that are highly contagious

(yawning) and not significant for scenes depicting distress. The results suggest that protective and affiliative behaviours are pivotal in bonobo society and therefore prioritised" (p3764).

2.3. REFERENCES

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