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The limits of pretending

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Abstract

We propose that pretending is a cognitive faculty which enables us to create and immerse ourselves in possible worlds. These worlds range from the veridical to the fantastic and are frequently realised as stories varying from the fictional to the scientific. This same ability enables us to become immersed and engaged in such stories (which we may have created) too. Whether we are shooting "aliens" or are engaged in a passionate romance, these experiences are facilitated by our ability to pretend. While it might seem that we can imagine or make-believe anything, in practice there are limits to what we can pretend. We draw upon both theoretical perspectives and from the work practice of animators. By identifying these limits, we are, of course, also defining the nature of pretending.

Keywords: pretending, animation, embodiment, schemata

1. Introduction

Forbidden Planet (Wilcox 1956), one of the greatest science fiction movies ever, is a direct inspiration for this discussion. In particular, it was the scene involving Lt. Ostrow who had just made a cast of a "footprint" of an unknown creature which had sabotaged the visitors' starship. He found himself confused by this plaster cast as its make up violated "all known laws of adaptive evolution" having the characteristics of both a four-legged, ground-living animal and an arboreal biped. And it was invisible.

We never see this creature, not just because it is invisible (though there is an outline in a flaring force field) but, it will be argued, because it is *unbelievable,* in other words, we cannot believe that it exists. And this is odd as we have little difficulty in believing a whole host of things which are not the case such as interstellar travel and starships manned by clean-cut Americans. We are happy to believe that there are lost, "god-like" civilisations, and that brilliant scientists have beautiful daughters. Technological marvels such as "ray guns", "force fields", and intelligent robots present no difficulties but a creature which is four-legged, tree-dwelling and invisible is *unbelievable*. It is unbelievable because there are limits on what we can pretend even in a genre as forgiving as science fiction. Discussion of the limits of this ability, our imagination and what we can and cannot make-believe has received some attention (e.g. Walton 1990; Leslie 1987; Gendler 2008; Driver 2008; and Van Leeuwen 2011 among others) but such work is very largely confined within the high walls of individual disciplines, and in the case of

pretending, almost entirely limited to its development in childhood. (Indeed, many researchers in the fields of developmental psychology and education continue to adopt Vygotsky's (1990/1930; 1991/1931) position that pretending is superseded by acts imagination in adults.)

We aim to build upon this body of existing work from a structured, multi-disciplinary perspective. Our approach is twofold: first, we adopt a theoretical perspective which will bring together threads of research from developmental psychology, cognitive science and narratology. Second, we complement this with insights from a particular form of practice, namely animation. To restate this as a research question, what are the limits of pretending in adults, and thus of believability, and as such how can this contribute to a new definition of pretending.

1.1 Premises

So where to begin? Our first obstacle is vocabulary or more accurately, definitions. Pretending, making-believe and imagining are intimately related terms but their definitions vary very widely both within and between disciplines and there really is no consensus. Thus, even trying to define our terms presents something of a conceptual minefield. So, in an attempt to clarify our position, we would like to take a moment to make explicit the premises which underpin our argument.

For the purposes of this paper we will treat make-believe as the product of pretending, which we define in turn as a mode of cognition that allows us to think, act, emote as if or as though something were the case. *To pretend p is to make-believe p*. Unlike the treatment of pretending in psychology, which is largely confined to its developmental role in children, our discussion concerns pretending in adults, and extends its place from a behaviour which carries overtones of deception to one which underpins speculative and imaginative cognitive activity much more generally. Our ability to pretend allows us to both create and engage with stories of all kinds. Stating that storytelling relies on pretending is hardly contentious as authorities, including Searle and Ryan among others, would readily agree but we should also recognise that storytelling extends beyond fiction to include such activities as the creation of scientific theories. Beyond make-believe as the source of storytelling, our engagement with stories also relies on pretence.

Having defined pretending as a cognitive faculty which is primarily concerned with creating make-beliefs, pretending is at work when we engage with virtual reality, or enjoy a movie at our local IMAX or spend a couple of hours with our games consoles "killing" aliens on a remote planet. In each instance, the experience of being present, engaged and active in these technologically mediated worlds relies on our ability to pretend, and therefore, make-believe, that we are (for a detailed discussion of this please see Turner forthcoming[1]).

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While it might seem that we can imagine, fantasise or make-believe anything in practice there are limits. When these limits are breached, whatever we are participating in becomes unbelievable. Encountering unbelievability might be experienced as a "plot hole" or similar breakdown in the narrative, as an interruption to immersion or a break in the sense of being present (e.g. Garau et al. 2004). It might result in a computer game becoming unplayable. It may result from an unconvincing animation. Indeed, it may be that unbelievability might be responsible for many of the breakdowns in the experience of digital media.

In discussing these limits we adopt a multi-disciplinary perspective bringing together developmental psychology, cognitive science and narratology. As a guiding framework we draw very loosely on cognitive science and Marr's three levels of analysis (1982). These three levels are the functional (*what is pretence for*), the algorithmic (*how is pretence expressed*) and the physical (*how is pretence instantiated*).

To define the limits of pretending our major focus is on the algorithmic, namely *how is pretence expressed* while recognising the other levels need to be addressed to provide the necessary context. We begin with a discussion of the function of pretending and then turn to how it

may be instantiated before turning our attention to how it operates.

1.2 What is pretence for?

We identify two related purposes for pretending. While this list is not exhaustive, it is reassuringly broad. First, for children, pretending (as pretend play) has an important role in "bootstrapping" our social, affective and cognitive development. Second, and more generally (children included), pretending allows us to create stories by which we explore and access the world. We now consider these in turn.

1.2.1 Social and cognitive development

Pretending is important to the social and cognitive development of children through its expression as pretend play. Russ (2004), for example, has argued that the development of a number of cognitive and affective processes rely on such play, which involves the exercise of alternating cycles of divergent and convergent thinking, that is, the abilities to generate a variety of different ideas, story themes and so forth, and to weave them together. Pretend play also facilitates the expression of both positive and negative feelings, and the ability to integrate emotion with cognition (e.g. Seja and Russ 1999; Jent, Niec, and Baker 2011). Other researchers have highlighted the importance of pretend play in acquiring the ability to manage aggression and delay the need for gratification (Berk, Mann, and Ogan 2006; Hirsh-Pasek et al. 2009). Early pretend play has also been implicated in creativity in later life (e.g. Russ 2004; Singer and Singer 2005). When children take on different roles it allows them the opportunity to acquire social skills such as communication, problem-solving and empathy (Hughes 1999). Garvey (1990) also tells us that pretend play is the "voluntary transformation of the here and now, the you and me, and the this or that, along with any potential action that these components of a situation might have".

1.2.2 Storytelling: fact, fiction and make-believe

Pretending is also foundational to our ability to engage with stories. Following the commentary on Searle (1979) in Schaeffer (2013), we adopt Searle's premise that fictional narratives—stories—first comprise pretend speech acts in which the author is pretending to assert that events of the story took place. Second, for Searle, stories are episodes of "intended playful pretense" where the act of pretending is shared between reader and author and narratives "publicly function as props in a game of make-believe". Although the nature and operation of fictional logic is deeply contested in philosophy and literary theory (and is beyond our scope here), most accounts of the nature of fiction and "truth in fiction" argue for the role of pretence and make-believe (*inter alia,* Lewis 1983; Currie 1990; Byrne 1993; Goodman 2011; Gatzia and Sotnak 2013). Byrne (1993), for instance, argues that authors invite readers to "make believe that certain propositions are true" following the case made in Currie's work, which asserts that

> *the author who produces a work of fiction is engaged in a communicative act, an act that involves having a certain kind of intention: the intention that the audience shall make believe the content of the story that is told. (Currie 1990, 24)*

Ryan (2008) applies such premises in her analysis of interactive digital fictional worlds, observing that such media relies on an "act of make believe whose prototype can be found in children's role playing games", which may take the form of first-person embodiment or third-person observation. We also recognise that pretending as storytelling offers a particular way to access the world, for example, concerns were recently expressed that very young children were re-enacting scenes from the adult video game series Grand Theft Auto, in effect that exposure to the game's contingent information opened doors to other worlds (reported in the *Daily Telegraph* newspaper, February 2014). More positively, make-believe has a major role in design. Sophisticated 3D models, for instance, allow architects, town planners and their clients to walk through, if not other worlds, then possible cities and the buildings therein. Interaction designers and potential users make frequent use of scenarios that describe

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imaginary usage situations and personas who animate them. It is commonplace for users to be asked, in exactly these terms, to evaluate a design by pretending to carry out tasks from a make-believe scenario with a simple prototype which they pretend is the finished version. Design fictions—descriptions of future technologies and the possibilities they afford—support technology stakeholders and designers in more speculative make-believe (Auger 2013 among many others).

Finally, Toon (2010) has explicitly adopted Walton's make-believe theory of representation in art to consider how models are used in scientific reasoning. He argues that these models are props in games of make-believe in a manner which "prescribe specific imaginings" that is they afford and constrain particular kinds of reasoning analogous to the ways in which dolls and teddy bears prescribe the pretend play of children. An example of this is Einstein's famous thought experiment which involved him chasing a beam of light, an act of make-believe which contributed to the theory of special relativity.

We now consider how pretending is instantiated as a mode of cognition.

1.3 Instantiation: embodied cognition

Consistent with current thinking in cognitive science, we recognise that this cognition is not confined to the brain alone. Conventional treatments of cognition have, in recent years, been complemented by newer formulations which variously describe it as "dynamic", "external", "embodied" and/or "situated". While space does not permit anything like a thorough treatment of these different accounts, cognition as an embodied phenomenon does present itself as being particularly relevant. Our reasons for this selection are simple: pretend play in children, for example, is joyously physical and active, or was until the advent of tablet computers, while adult pretending, ranging from acting to acting-out also implicates the body. Recent neurological evidence further suggests that the experiences of reading a novel through to being immersed in virtual reality rely on neural mirroring of the actual, embodied behaviour (e.g. Turner 2014).

1.3.1 Defining embodiment

There is no one definition of embodiment, indeed as Wilson (2002) has shown, there are many. It is, however, generally agreed that the concept refers to the way in which our understanding of, and behaviour within, the world is defined and constrained with respect to the form and capabilities of our bodies. Merleau-Ponty's argument that we access the world only though our lived bodies, via the "intentional arc", remains foundational while more recent authors extend or complement this premise in a range of theoretical treatments (e.g. Merleau-Ponty 1945/1962; Valera, Thomson, and Rosch 1991; Lakoff and Johnson 1999; Gallagher 2006; Clark 2008; Shapiro 2011). Borrowing from Lakoff and Johnson (ibid, 17) we might write, "that human reason is a form of animal reason, a reason inextricably tied to our bodies and the peculiarities of our brains" and "that our bodies, brains, and interactions with our environment provide the mostly unconscious basis for our everyday metaphysics, that is, our sense of what is real". As pretending is an expression of this, our embodiment necessarily defines what can be pretended. This is perhaps most easily witnessed in our use of language and metaphor, that is, how we talk about the world.

While these largely theoretical positions are undoubtedly interesting, in recent years Haans and IJsselsteijn (2012) have successfully integrated Metzinger's work (which we discuss immediately below) with telepresence research concluding that telepresence arises from the way we are embodied. In much the same manner we argue that many of the limits of pretending are again a consequence of the way in which we are embodied.

1.3.2 Morphology, body schema and body image

Metzinger (2003a, 2003b, 2010) has proposed three different forms or orders of embodiment based on the morphology of the body, the body schema and the body image, respectively. First, since all human beings have a similar morphology it is reasonable to assume that we all have, or are capable of, very similar experiences, unless we have a physical condition which limits our capabilities. Our morphology thus affords a certain

range of experiences and denies us others—we are normally bipedal and dexterous but we cannot fly without the aid of machines, nor can we see in the ultraviolet. This first order of embodiment is the most basic.

Next, our body schema is involved in the regulation of posture and movement and constrains the possibilities for movement and action. This second order of embodiment determines which of the many ways we might actually do something (e.g. drink from a cup or wield a light sabre) is instantiated. Our body schema is also dynamic which enables us to actively adjust to changing situations. Importantly for this discussion, it is at this level of description that we find external tools acting as functional extensions to the body. There is a corpus of empirical research which substantiates the claim that the body schema can be extended to seamlessly incorporate tools and technological artefacts. As a result, the tool temporarily becomes part of this tool-body functional unit.

Finally, the body image comprises our perceptions of the body, which include the way we see and experience our bodies, as well as any conceptual knowledge we have about them. From this perspective, it has been suggested that the body image can be thought of as intrinsic to consciousness itself. Again, tools and other artefacts can become part of this image but here the integration operates at the level of the central nervous system itself, that is, the tool effectively belongs *within* rather than at the periphery of the body (cf. the "rubber hand illusion"—Botvinick and Cohen 1998).

From this it is reasonable that we maintain an understanding of the position, disposition of our bodies and how tools are being used. This is perhaps the weakest reading of embodiment: at the other extreme, embodiment is a defining characteristic of our cognition. Between the two, lies our ability to pretend.

1.3.3 Embodied language and storytelling

According to a variety of researchers, our use of language readily reflects our embodiment. We consider this from two perspectives. First, Lakoff and Johnson (1999) tell us that "spatial-relations are at the heart of our conceptual system" (30). These relations are not directly observable but form the basis of our ability to make sense of the external world. They are based on bodily projections (or to phrase this differently, our sensorimotor experiences) such as "in front of us", "behind us", "above us" and "to our right". These sensorimotor experiences, they argue, subsequently become conceptualised as metaphors. These embodied metaphors in turn are aggregated to form more complex metaphors. In essence, Lakoff and Johnson argue that *all* our cognition relies on rather simple bodily experience and thus by this reading, so, too does pretending.

Embodiment is also fundamental to storytelling. While there is considerable discussion in narratological theory of the body as a metaphor for aspects of wider human and societal conditions, our focus here concerns the qualities of the embodied form and the physical capabilities of narrators or characters in themselves. Actors in a story may be entirely homologous with their real-world counterparts, or alternatively vary from the normal in certain respects, or merge with other types of being. What then limits or supports their credibility in storyworlds? Punday (2003), while observing that embodiment has received relatively little attention from narratologists, offers a useful discussion of how fictional bodies inhabit fictional spaces, commenting that expectations about the type of kinetic motion available to physical bodies and the type of physical environments in which (human) bodies can survive limit what fictional spaces are available and credible—just as in episodes of pretending. Drawing on Scarry's discussion of the novels of Thomas Hardy (Scarry 1983) Punday further observes that fictional bodies have access to several kinds of space: those to which a character has ordinary physical access, those to which they have perceptual access (hearing a conversation in a neighbouring room, observing a scene through a window), and spaces accessed only in the imagination or in dreams, arguing that even the fictional imagination remains constrained by real-world physical experience. Even fantastical travel remains thus

constrained: Punday cites the example of magical movement in the Harry Potter series, where physical metaphors such as being sucked through rushing water are employed, rather than descriptions of forms of travel completely removed from ordinary experience. Where such novel bodily travel is presented to the reader—as in the manifold forms of transportation found in fantasy and science fiction—then it tends to be instantaneous and completely *disembodied*.

2 How is pretence expressed?

We also propose that pretending is a form of thinking which is predominantly schematic in expression. Schemata have been proposed as both representations of knowledge and of action. In the case of pretending, we argue that these schemata are also embodied and reflect many of our everyday behaviours.

Schemata hold representations of objects and the relations among them, which can vary between the simple to the complex, and the individual to the social. Event schemata are more usually treated as scripts (schemata for action), proposed by Schank and Abelson (1977) as cognitive structures that describe a sequence of events in a given context and provide a readiness to respond appropriately. A script comprises a set of "slots" with rules as to what these can hold. This can be most easily seen in Schank and Abelson's most famous example, the restaurant script. This script describes how to behave in a variety of restaurants by simply changing the contents of the "slots" from, say, Chinese to Indian.

2.1 Mirroring the real world

Developmental psychologists have established that what is pretended (i.e. the contents of a pretend episode, and the behaviour of those pretending) is governed by the same kinds of laws and restriction that we encounter in the real world. Reality may be suspended, but not wholly. These rules, we argue, support believability. The adherence to these laws and restrictions has been described as "mirroring" and is derived from real-world behaviour. (We note here that to date, almost all empirical work on the operation of pretending *per se* has been conducted with children, and there is no extant account of adult pretending.)

Possibly the most frequently cited example of mirroring is Leslie's description of a children's tea-party. He found that when he "tipped out" and "spilled" the contents of one of the teacups, the children regarded this cup to be "empty" and continued to consider the non-tipped cups to be "full". So, while empty or spilled tea cups could be refilled with tea, "full" cups could not. From quite a different perspective Kendall (1990) echoes much of this when he observes that games, cinema and a variety of other media are governed by "principles of generation" which are "reality-oriented". This *reality principle* is, of course, based on similarities to the real world. He also proposes the *mutual belief principle* for fantastic worlds, based on a tacit agreement between the creator of these worlds and those who experience them, and, we argue, echoing the spoken and unspoken contracts among participants in pretend play.

Nichols and Stich (2005) tell us that pretending begins with a premise which forms the basis for subsequent *inference* and *embellishment*. The premise may be bound or constrained by schematic structures, writing: "clusters or packets of representations whose contents constitute 'scripts' or paradigms detailing the way in which certain situations typically unfold" (34). The role of schemata or script-like structures also features in philosophical treatments of story, although they are not always acknowledged in such terms.

Similarly, Walton's pretence theory (1990) refers to "background propositions" which are imported by readers to extend the content provided in the text and thus support pretence, while Currie (1990) and Gatzia and Sotnak (2013), for instance, discuss the role of "background assumptions". Such existing knowledge structures populate the background of the fictional world while make-believe allows the reader to insert novel premises into the text within the constraints of the fictional world.

Again, the narratologist Wolf (2014) elaborates the "principle of access-facilitating, detailed world-making", whereby both real-world knowledge and familiar albeit fantastic genres function as schemata supporting the act of pretence which constitutes the storyworld. Fantastic or unnatural forms within fictional texts take many forms such as the storyworld's topology, temporality, physical laws and the capabilities of human, animal or other animate bodies. Alber (2013) further points out that for the active, sense-making reader, story scripts and frames are frequently blends of fictional genres or aspects of the real world. Other schematic fictional devices include the ascription of the unnatural to dreams, fantasies or hallucinations, its employment as allegory, satire or parody, or a role as part of a transcendental world (heaven, hell, Scotland and so forth), or as a basis for the construction of the reader's own tale, and finally a simple, serene acceptance of the strange. Alber suggests that such cognitive strategies in turn permit a fresh view of the real world, thus adding to the list of functions afforded by pretence.

2.2 Quarantining

Complementing mirroring is quarantining. Quarantining ensures that the events which occurred within the pretended episode are taken to have effects only within it. Continuing with the tea-party example, the children do not expect that "spilling" their "tea" will result in the table really being wet. Behaviour and the consequences of those behaviours are confined (quarantined) to the pretend episode. Perhaps the most interesting aspect of quarantining is when it fails. The failure to quarantine the attitudes, beliefs, events, personae and behaviours of the pretend episode is a source of childhood terrors, but in adult life may be taken to be a mark of mental illness. Popular familiarity with such failings is evident in the all too frequent media reports of campus gunmen which attribute their behaviour to having played violent video games, although meta-reviews suggest that reliable evidence of cause-and-effect is much more sparse (e.g. Ferguson 2007; Barlett, Anderson, and Swing 2008), and indeed Tavinor (2007) argues that many researchers appear to be unaware of the mechanism of quarantining.

2.3 The logic of events and of actions

Principles for fictional illusion-making are proposed by Wolf (2014) and Mieke Bal in her now-classic introduction to the field of narratology. In short, most narrative texts rely on homology with the human "logic of events" whereby the sequence of events is experienced as in accordance with "some form" of the real world (Bal 1997). The phrase "some form" is important here, since as many narratologists argue, as discussed above, while that form may be a familiar, story genre it is not necessarily one that mirrors the extant physical world, but may be *unnatural.* Thus readers of fairy tales readily accept that dragons exist, that animals talk and that heroes in seven league boots cover just over 30 kilometres in a single stride; in science fiction that the warp drive performs a similar feat. This is congruent with Wolf's "principle of consistency", whereby fictional works enhance the meaningfulness of their storyworlds by rules either identical to those apparently operating in real life, or by a "secondary kind of plausibility" acquired through links to generic (schematic) conventions: cf. the earlier discussion of scripts and schemata. Ryan (2008) further notes that the digital world is also subject to a set of "specific laws".

3 Animation, embodiment and pretending

At this point we shift from considerations that are primarily based on theoretical treatments of pretending to practice-based research. Animation supports storytelling that would otherwise be impossible: this section considers how animators make things believable.

Animation calls on a variety of techniques including hand drawings and painted cels; stop motion, utilising a diverse range of physical media (puppets, clay, human actors, paper and cloth cut-outs); and computer-based 2D and 3D methods. This is reflected in a similar diversity

of outcomes. But irrespective of medium or technique, animators consider that for their work to be successful it must be believable. As such, animation affords insights into the limits of pretence. Wells (1998), for example, observes that it is the tension between belief and disbelief which is central suggesting that the act of viewing an animated movie is a dynamic process challenging the viewer's willingness to pretend. Believability is not a prime concern for all animated movies (cf. abstract animation), but there is a significant body of work where it is; and bearing this mind a selection of examples and counter-examples are presented to examine the constraints upon pretending in the contexts of viewing or creating an animated movie. The focus is predominantly upon the embodied, animated character and utilises examples ranging from the traditional to state of the art animated computer-generated imagery.

3.1 Embodiment in animation

We have already identified pretending as a form of embodied cognition and there is complementary evidence from the practice of animation. Students studying animation are typically required to act out actions—to act as though, while Disney himself would frequently take stories and act them out in meetings to show how he intended an animator to create a character action. Marc Davis, one of Disney's core animators (referred to as "The Nine Old Men") regarded drawing as a form of acting in which the limits of the individual body are overcome and thus serving as a means of overcoming the limits of pretending (Thomas and Johnston 1981, 66). The consequences of this liberation are visible in cartoons where characters can readily reform their bodies back to normal after various physical traumas or their limbs stretch and articulate in strange ways (examples include, Hanna Barbera's *Tom and Jerry* and the *Looney Tunes* short films by Warner Brothers). Body morphology and body schema derived from the real world are redefined, violated and exaggerated for the purpose of entertainment without compromising believability.

Acting is more directly involved where rotoscoping and motion/performance capture are employed in the creation of an animated character. Rotoscoping involves tracing over live-action footage frame-by-frame thereby creating a distinct form of animated movie. In terms of character, the animator is presented with an actor's performance from the live-action footage and required to interpret that along with the other elements of the image to create the required aesthetic for the animated movie. The animator is thus working with a secondary performance from their character, entailing the risk that if motion is created for motion's sake and removed from the actor's original theatrical intention, the opportunity to create the illusion of believable life is prejudiced. Hooks observed that some of the live-action rotoscoped for the *Pocahontas* character in the Disney feature was inappropriate because the actress involved—a dancer, walked like a dancer (toes out, ball of the foot down first) and not as the character should (Hooks 2003). In this situation, any deviation from the established body schema was considered undesirable.

In motion capture, an actor's movements are recorded by computer and applied to either a 2D, or more usually, a 3D digital model, as discussed, for example, in Chen, Shen, and Prior (2008). The model can then perform the same actions as the original actor. In addition to bodily movement the increasing resolution of the technique now makes it possible to capture more complex facial movements and emotions—a technique referred to as performance capture. Motion or performance capture techniques are used to animate characters in computer games and movies utilising 3D computer-generated images. Perhaps the most notable success in character creation has been that of Gollum in the last two movies of *The Lord of the Rings* trilogy. The final performance of Gollum was typically a blending of 3D character design, acting, motion capture and animation. While in some cases motion capture data enabled a realism of movement considered impossible with animation, animation was also essential, as the non-human Gollum needed to move in ways an actor could not. So the performance should be

regarded as extended and distributed across a number of people involved in the film's production including: the actor, concept artists, 3D artists and animators, modellers and the motion capture crew.

However, when similar techniques have been applied in the creation of hyper-realistic *human* characters the results are often less than convincing to the extent that the character can elicit strong negative emotions and is said to have fallen into an "uncanny valley" (e.g. Mori 1970; Sobchack 2006; Plantec 2007; Aldred 2011). Consequently, the limits of pretending may be more limited in familiar situations. AQ16

3.2 Embodiment in cartoon animation

As we discuss below, conveying character is crucial to successful animation, and a significant part of character creation relies on embodied motion. An analysis of the work of the Disney studios (Thomas and Johnston 1981) reveals that considerable efforts were made to convey believability in animated cartoons through appropriate visual and motion design which conveyed verisimilitude yet was still entertaining. During the 1920s and 1930s the Disney house style evolved from one familiar in newspaper cartoons with characters created from basic shapes and having simple actions, to more sophisticated characters with realistic movement. The greater complexity of these evolved characters opened up the narrative potential of their stories allowing Disney Studios to create a number of successful feature-length movies. In such a situation an animator would be challenged to apply caricature and exaggeration to their character: action had to be refined to the simplest visual statement while retaining personality through movement to create a convincing and entertaining performance—something a good actor or mime artist would do. The animation techniques used were collated, refined and documented into a set of 12 fundamental animation principles—effectively the rules of the trade. In essence, the principles were an encapsulation of careful observations of movement and behaviour in the real world (e.g. squash and stretch, anticipation and so forth) together with techniques created in studio to bring out a character's personality and acting (staging). These principles have proved to be robust and are applicable to other forms of animation, including 3D computer animation (Lasseter 1987).

Disney had a clear notion that what the studio was producing had to communicate effectively to an audience through what was termed "audience involvement" (Thomas and Johnston 1981). Achieving audience involvement could be equated to successfully establishing an entertainment environment that would enable pretence to support almost anything in terms of narrative. It can be seen that familiarity is a significant element in shared pretence. Disney said that there must be an entry point through which audiences can identify the situation of the story, and the best way is through a character or settings that resembles someone or something they have known. The situation should be schematic, afford a shared emotional reaction or an easily recognisable aspect of someone's personality (Thomas and Johnston 1981). What is recognisable and credible is to a large extent fluid and culturally determined, and indeed instances of responses to changing societal norms can be found in Disney's increasingly active personification of female characters from *Snow White and the Seven Dwarves* in the 1930s to *Mulan* in the 1990s (Shen 2007).

4 Discussion

So, to return to the research questions posed at the start of this paper: What are the limits of pretending (and believability) and how do these help us to define what is involved when we pretend? Having reviewed and synthesised evidence from cognitive science, developmental psychology and narratology we proposed that pretending is defined and constrained by the fact of our embodiment and expressed schematically.

4.1 Embodied pretending in theory

We introduced embodiment to the discussion of pretending by way of pretend play, in suggesting that it was readily recognised in the natural exuberance of children. Pretending in children is often

very physical and so, embodiment ought to be a factor. Beyond that, the arguments from philosophy and cognitive science are also persuasive. Obviously, the fact of our embodiment must *constrain* the range and type of pretending. Similarly our cognition must reflect the experiences we have (which are generally mediated by our bodies). Despite this we *have* yet to say very much about actual "tangible" consequences of these constraints beyond making quite slight observations.

However, if we consider the comprehension of pretending rather than its production or expression, this changes. Understanding pretence in another (or expressed on screen as an animation) is primarily a social process (or set of processes) and social cognition itself relies on our ability to "read minds", that is, understand what the pretender (or animated character) is doing, thinking, feeling and intending. Gallese and Sinigaglia (2011) have written convincingly about how we do this from both embodied and neurological perspectives. In essence, they bring together two ideas: first, that we simulate the mental states of the other agent we are trying to understand and that this simulation is embodied (with all that implies). This embodiment is instantiated by way of a "mirror mechanism". This mechanism is described as the mapping of the sensory, motor and affective state of another onto the corresponding systems of the perceiver. Together this results in an embodied simulation (ES) which enables us to read the minds of other people. Gallese and Sinigaglia write:

> *A core claim of ES theory is that similar constraints apply both to those representations of one's own actions, emotions and sensations involved in actually acting an experiencing and also to the corresponding representations involved in observing someone else performing a given action or experiencing a given emotion or sensation; and the constraints are similar because the representations have a common (bodily) format.* (2011, 515)

If we were to add "pretending" to the list of actions, emotions and sensation then we can see a kind of mirroring operating between pretender and observer or between animation and audience. Embodiment is essential to how we understand pretending.

4.2 Schematic pretending

Schematic pretending, we have suggested, is evidenced in its expression. We can see it in pretend play when it is described as "mirroring" (which is used in a different sense to the section immediately above—see Section 2.1); we have seen it various forms of make-believe where it is called the "reality principle" (Kendall 1990); it appears in narrative where it is recognised variously as "genres", "scripts", "background assumptions" or "background propositions". It has also been suggested that our memories are organised in this form to aid with retrieval (or re-creation). We now extend this to suggest that it is also an aspect of anthropomorphism.

Just as the portrayal and engendering of affect is an essential part of acting and crucial in the establishment of an empathic relationship with the audience, the animator needs to create an empathetic response for their character (Hooks 2003, 2011). We suggest that it is one of the means by which the audience can empathise with a character, they identify with, and share the feelings of, that character, projecting themselves into what they observe. Indeed Disney asserted that cartoon characters in the studio's classic animations needed to be human enough for the audience to understand them and identify with their situation and in order to achieve audience involvement, the goal of the animator was to make the audience *feel* the emotions of the characters rather than appreciate them intellectually (Thomas and Johnston 1981, 22). Or, put in another way, the successful animator uses anthropomorphism to support empathy with the make-believe character by the familiar schemata of human behaviour.

Shared affect also plays a role in anthropomorphism, one of the defining characteristics of much animation, and most significantly in the work produced by Walt Disney Animation Studios (Artz 2002). Anthropomorphism that is,

seeing the human in non-human, is all but ubiquitous human judgement (Guthrie 1993). People commonly attribute human goals, beliefs and emotions to animals, vacuum cleaners, coffee makers and websites (e.g. Govers, Hekkert, and Schoormans 2004; Turner, Wilson, and Turner 2009). In essence, anthropomorphism involves attributing human-like characteristics and mental states to non-human agents and objects (Gray, Gray, and Wegner 2007).

Animals are often the leading characters in Disney movies, and it is possible to identify two distinct types: the animal as an animal, where the animal would behave much like its equivalent in nature. Examples can be found in backgrounds of pastoral or woodland scenes. Then there is the animal created as character such as Mickey Mouse, Goofy and Donald Duck where anthropomorphism has been utilised. Techniques used to anthropomorphise are diverse; but when coupled with appropriate motion and sound design are able to convey sufficient familiarity to enable an animated character to successfully act out a narrative of feature film length, and instigate and maintain audience engagement. Signifiers for such characters include clothing or associations with certain props. Embodiment again plays an important role in the alterations to bodies and facial features enable animated characters to communicate through human-like gestures and facial expressions: enlarging the eyes or adding the whites of eyes could enhance expressiveness; mouths were designed to be expressive and enable dialogue to be spoken convincingly. Paws became gloved hands to facilitate gestures; and human-like qualities were enhanced when animals that were naturally quadrupeds started walking on two legs. Consequently, anthropomorphism became a convention animators used to develop and communicate an animated character to an audience and has been successfully applied to animals, abstract forms and inanimate objects frequently seen in advertising. Examples of character concepts which exhibit anthropomorphism are shown in Figure 1.

Finally, even when animation breaks the boundaries of strict naturalism, they continue to follow familiar schemata which themselves are remain predicated on everyday, recognisable realism.

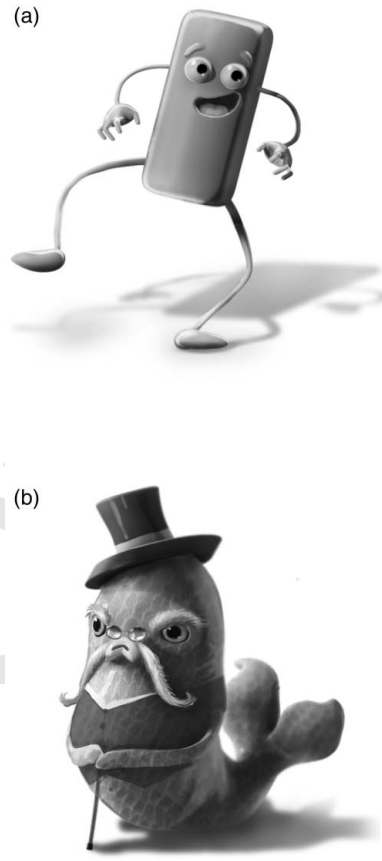

Figure 1. Applying the human (schematic) body image to (a) a pencil eraser and (b) a carp.

4.3 Further work

After this primarily theoretical discussion, we identify three areas of further work.

First, this discussion has primarily focused on pretending as a cognitive faculty but in practice pretenders employ a whole host of external artefacts and representations—not least of which are animated cartoon strips. Indeed the original meaning of pretender is someone who "reaches out for something". So, with respect to further work, we need to develop this account of pretending to include the external. We recognise that

Walton has already done this but from quite a different perspective and one which does not include embodiment.

Second, Cosmides and Tooby (2000) tell us that our ability to pretend is the result of cognitive de-coupling, that is, our ability to make use of contingent information, that is, pertaining to that which is close at hand. They write, "arguably, one central and distinguishing innovation in human evolution has been the dramatic increase in the use of contingent information for the regulation of improvised behaviour" (53). From this reading, pretending is revealed as an improvised behaviour and one which is readily susceptible to empirical study.

Finally, while this paper has paid some attention to the role of anthropomorphism in pretence and its relationship to believability, this again merits empirical work.

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Note

[1] Imagination has proved to remarkably difficult to define. Walton (1990, 19), for example, writes, "What is it to imagine? We have examined a number of dimensions along which imaginings can vary; shouldn't we now spell out what they have in common?—Yes, if we can. But I can't". Similarly Strawson (1970) writes,

> *The uses, and applications, of the terms 'image', 'imagine', 'imagination', and so forth make up a very diverse and scattered family. Even this image of a family seems too definite. It would be a matter of more than difficulty to identify and list the family's members, let alone their relations of parenthood and cousinhood.*

Given these difficulties we will confine our discussion to pretence.

References

Alber, J. 2013. "Unnatural Narratology: The Systematic Study of Anti-Mimeticism." *Literature Compass* 10 (5): 449–460.

Aldred, J. 2011. "From Synthespian to Avatar: Reframing the Digital Human in Final Fantasy and The Polar Express." Accessed May 26, 2014. http://www.tft.ucla.edu/mediascape/Winter2011_Avatar.pdf.

Artz, L. 2002. "Animating Hierarchy: Disney and the Globalization of Capitalism." *GlobalMedia Journal* 1 (1), Article No. 9. Accessed May 26, 2014. http://lass.purduecal.edu/cca/gmj/fa02/gmj-fa02-artz.htm.

Bal, M. 1997. *Narratology.* Toronto: University of Toronto Press.

Barlett, C. P., Anderson, C. A., and Swing, E. L. 2008. "Video Game Effects – Confirmed, Suspected, and Speculative: A Review of the Evidence." *Simulation & Gaming* 40 (3): 377–403.

Berk, L. E., T. D. Mann, and A. T. Ogan. 2006. "Make-Believe play: Wellspring for development of self-regulation." In *Play = Learning: How Play Motivates and Enhances Children's Cognitive and Social-Emotional Growth*, edited by D. Singer, R. M. Golinkoff, and Hirsh-Pasek. New York: Oxford University Press.

Botvinick, M., and J. Cohen. 1998. Rubber Hands 'Feel' Touch That Eyes see. *Nature* 391: 56.

Byrne, A. 1993. "Truth in Fiction: The Story Continued." *Australian Journal of Philosophy* 71 (1): 24–35.

Chen, K. M., S. T. Shen, and S. D. Prior. 2008. "Using Music and Motion Analysis to Construct 3D Animations and Visualisations." *Digital Creativity* 19 (2): 91–104.

Clark, A. 2008. *Supersizing the Mind*. Oxford University Press.

Currie, G. 1990. *The Nature of Fiction*. Cambridge: Cambridge University Press.

Ferguson, C. J. 2007. "The Good, the Bad and the Ugly: A Meta-Analytic Review of Positive and Negative Effects of Violent Video Games." *The Psychiatric Quarterly* 78 (4): 309–316.

Gallese, V., and C. Sinigaglia. 2011. "What Is so Special About Embodied Simulation?" *Trends in Cognitive Sciences* 15 (11): 512–519.

Garau, M., H. R. Widenfeld, A. Antley, D. Friedman, A. Brogni, and M. Slater. 2004. "Temporal and Spatial

Variations in Presence: A Qualitative Analysis." In 7th annual international workshop on presence.

Garvey, C. 1990. *Play*. Harvard University Press.

Gatzia, D. E., and E. Sotnak. 2013. "Fictional Truth and Make-Believe." *Philosophia* 1–13.

Goodman, J. 2011. "Pretense Theory and the Imported Background." *Open Journal of Philosophy* 1: 22–25.

Govers, P. C. M., P. Hekkert, and J. P. L. Schoormans. 2004. "Happy, cute and tough: Can designers create a product personality that consumers understand?" In *Design and Emotion, the Experience of Everyday Things*, edited by D. MacDonagh, P. Hekkert, J. Van Erp, and D. Gyi, 345–349. London: Taylor & Francis..

Gray, H. M., K. Gray, and D. M. Wegner. 2007. "Dimensions of Mind Perception." *Science* 315: 619.

Guthrie, S. 1993. *Faces in the Clouds: A New Theory of Religion*. New York: Oxford.

Haans, A., and W. A. IJsselsteijn. 2012. "Embodiment and Telepresence: Toward a Comprehensive Theoretical Framework." *Interacting with Computers* 24: 211–218.

Hirsh-Pasek, K., R. M. Golinkoff, L. E. Berk, and D. G. Singer. 2009. *A Mandate for Playful Learning in Preschool: Presenting the Evidence.* New York: Oxford University Press.

Hooks, E. 2003. *Acting for Animators*. Portsmouth: Heinemann.

Hooks, E. 2011. "Empathy Matters." Accessed January 20, 2014. www.awn.com/print/blog/empathy-matters.

Hughes, F. P. 1999. *Children, Play, and Development*. Needham Heights, MA: Allyn & Bacon.

Jent, J. F., L. N. Niec, and S. E. Baker. 2011. "Play and Interpersonal Processes." In *Play in Clinical Practice: Evidence-Based Approaches*, edited by S. W. Russ and L. N. Niec. New York: Guilford Press.

Lakoff, G., and M. Johnson. 1999. "*Philosophy in the Flesh*." Basic Books.

Leslie, A. 1987. "Pretense and Representation: The Origins of 'Theory of Mind'." *Psychological Review* 94 (4): 412–426.

Lewis, D. 1983. "*Truth in Fiction. Philosophical Papers*. 1 (pp. 261–275). New York: Oxford University Press.

Marr, D. 1982. *Vision. A Computational Investigation into the Human Representation and Processing of Visual Information*. Cambridge, MA: MIT Press.

Merleau-Ponty, M. 1962. *Phenomenology of Perception*. Translated by Colin Smith. London: Routledge.

Metzinger, T. 2003a. Being No One: The Self-model Theory of Subjectivity. Cambridge, MA: MIT Press.

Metzinger, T. 2003b. Phenomenal Transparency and Cognitive Self-reference. *Phenomenology and the Cognitive Sciences* 2: 353–393.

Metzinger, T. 2010. *The Ego Tunnel: The Science of the Mind and the Myth of the Self*. Basic Books.

Nichols, S., and S. Stich. 2005. *Mindreading: A Cognitive Theory of Pretense*. OUP.

Plantec, P. 2007. "Crossing the Great Uncanny Valley." Retrieved December 20, 2013 from http://www.awn.com/print/vfxworld/crossing-great-uncanny-valley.

Punday, D. 2003. *Narrative Bodies: Toward A Corporeal Narratology.* Palgrave Macmillan.

Russ, S. W. 2004. *Play in Child Development and Psychotherapy*. Mahwah, NJ: Earlbaum.

Ryan, M. -L. 2008. "Fictional Worlds in the Digital Age." In *A Companion to Digital Literary Studies*, edited by Susan Schreibman and Ray Siemens. Oxford: Blackwell.

Scarry, E. 1983. "Work and the Body in Hardy." *Representations* 3: 90–123.

Schaeffer, J.-M. 2013. *Fictional vs. Factual Narration. In the Living Handbook of Narratology*, edited by Hühn, Peter et al. Hamburg: Hamburg University. Accessed March 20, 2014. www.lhn.uni-hamburg.de/article/fictional-vs-factual-narration.

Schank, R. C., and R. Abelson. 1977. *Scripts, Plans, Goals, and Understanding*. Hillsdale, NJ: Earlbaum Associates.

Searle, J. [1975] 1979. *Expression and Meaning*. Cambridge: Cambridge University Press.

Seja, A. L., and S. W. Russ. 1999. "Children's Fantasy Play and Emotional Understanding." *Journal of Clinical Child Psychology* 28: 269–277.

Shapiro L. 2011. *Embodied Cognition*. Oxford: Routledge.

Shen, L. F. 2007. "Anime Pleasures as a Playground for Sexuality, Power, and Resistance." In *MiT5, Media in Transition: Creativity, Ownership, and Collaboration in the DIGITAL AGE*, 27–29.

Singer, D. G., and J. L. Singer. 2005. *Imagination and Play in the Electronic Age*. Cambridge, MA: Harvard University Press.

Sobchack, V. 2006. "Final Fantasies: Computer Graphic Animation and the [Dis] illusion of Life." In *Ani-*

mated Worlds, edited by S. Buchan, 171–182. Eastleigh: John Libbey.

Strawson, P. F. 1970. "Imagination and Perception." In *On Experience and Theory*, edited by L. Foster and J. W, 31–54. Amherst: University of Massachusetts Press.

Tavinor, G. 2007. "Towards an Ethics of Video Gaming." In Proceedings of the 2007 conference on future play, November 1–8. New York, ACM Press.

Telegraph newspaper. 2014. Accessed April 23, 2014. http://www.telegraph.co.uk/technology/video-games/10632958/Six-year-old-children-acting-out-sex-and-drug-scenes-from-Grand-Theft-Auto-says-headteacher.html.

Thomas, F., and O. Johnston. 1981. *The Illusion of Life*. New York: Disney Editions.

Turner, P. 2014a. Presence: is it Just Pretending? *AI & Society.*

Turner, P. 2014b. The Book Problem. *AI & Society.*

Turner, P., L. Wilson, and S. Turner. 2009. "Do Web Pages Have Personalities?" Proc. European conference on cognitive ergonomics, 62–70.

Valera, F. J., E. Thomson, and E. Rosch. 1991. *The Embodied Mind: Cognitive Science and Human Experience*. MIT Press.

Van Leeuwen, N. 2011. "Imagination is Where the Action Is." *The Journal Of Philosophy* cviii (2): 55–77.

Vygotsky, L. S. 1990. "Imagination and Creativity in Childhood." Translated by F. Smolucha. *Soviet Psychology* 28 (1): 84–96 (Original work 1930).

Vygotsky, L. S. 1991. "Imagination and Creativity in the Adolescent." Translated by F. Smolucha. *Soviet Psychology* 29 (1): (Original work 1931).

Walton, K. L. 1990. *Mimesis as Make-Believe: On the Foundations of the Representational Arts*. Harvard University Press.

Wells, P. 1998. *Understanding Animation.* London: Routledge.

Wilcox, F. M. 1956. *Forbidden Planet*. Metro-Goldwyn-Mayer.

Wilson, M. 2002. "Six Views of Embodied Cognition." *Psychonomic Bulletin & Review* 9 (4): 625–636.

Wolf, W. 2014. "Illusion (Aesthetic)." In *The Living Handbook of Narratology*, edited by P. Hühn, Peter. Hamburg: Hamburg University. http://www.lhn.uni-hamburg.de/.

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