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Mirth and creative cognition in the spectating of Aristophanic comedy

Angeliki Varakis-Martin

What can positive psychology tell us about the ancient audience's experience of Aristophanic comedy? Was the comedy a vehicle for the expression of the poet's own political views, or did the festive experience of the comic performance broaden the mind of its spectators, enhancing their ability to process the words and action of the play in a creative and individual way?

Scholars have long debated Aristophanes' political intentions and the influences of his plays on Athenian life. On one side there are those who see Aristophanes' comedy as playful and festive with no serious political intentions (Heath, 1987; Reckford, 1987; Halliwell, 2008), and on the other side sit those who approach Aristophanes as a serious dramatist who exerted political influence (MacDowell, 1995; Henderson, 1998; Vickers, 1997, 2015). In looking to situate current scholarship within longstanding historical debates, Philip Walsh has observed that more recent studies have tried to 'navigate between the traditional binaries', seeing the meaning of Aristophanes as something elusive; a constant negotiation between individual and collective thinking that is dependent on each audience member's engagement with the comic. As Walsh observes, this middle approach 'cautions against dogmatism and champions diversity' (Walsh, 2009: 69). Informed by the criticism of Bakhtin,¹ some of these approaches have sought to understand Aristophanic comedy's political orientation in its nexus of conflicting forces and unstable interactions that promote the active engagement of the spectator in the meaning making of the play. These interactions are partly expressed through the ambivalence of meaning produced by the intertextual dimensions of the text. For example, in his seminal study *Aristophanes and the Definition of Comedy*, Michael Silk examines in detail the expansive and discontinuous quality of Aristophanic comedy with reference to its language, style and characterisation, describing the poet's comic vision as open and 'pregnant with possibility', a world 'where incompatible opposites are found freely co-existing or freely exchanged' (Silk, 2000: 93), destabilising the contemporary world. Echoing Silk's observations regarding the openness and expansive quality of Aristophanic comedy, Charles Platter in his book *Aristophanes and the Carnival of Genres* argues that the Aristophanic text is a 'carnavalesque medley of genres' that continually forces audiences to readjust their perspectives.² In his view, the constant interaction of literary genres (e.g. tragedy, iambic poetry) prevents the emergence of a single dominant interpretive construct, denying the comedy the existence of a fixed interpretive point of view, making it open to multiple readings and meanings. According to Platter, this style of reading

gives access to the ‘joyful relativity’ of Aristophanic comedy whilst at the same time making it appealing to a broad and diverse audience (Platter, 2007: 41).

The ‘openness’³ of Aristophanic comedy has also been considered with reference to its staging, with Joe Park Poe arguing that the frequent instances of unmotivated appearances and fusion of performance styles, especially in the poet’s earlier comedies, far from being intrusive, add to the effect of inconsequential stage action which Aristophanes strives to achieve (Poe, 2000).

Although the aforementioned studies raise some very interesting points about the diverse and unlimited interpretive possibilities of Aristophanic comedy, they do not consider the play as an embodied performance event, excluding from their analysis an important dimension of theatre; the experiential dimension. By experiential dimension, I mean the aspect that looks at theatre, as an event, that is participatory and emotive. From a cognitive point of view, approaching comic performance as an embodied experience and not solely a place of representation is most important in order to get a fuller picture of audience engagement.

The absence of an analysis of the experiential dimension of theatre in most theoretical studies of ancient drama is not without justification. As Felix Budelmann correctly puts it:

People’s experience – in writing, rehearsing, performing, watching, or reading ancient drama – is something that cultural history finds hard to analyse with the tools at its disposal. We have learned that studying the subjective experience of persons past or present is a hazardous endeavour, and more often than not we wisely avoid the topic.

(Budelmann, 2010: 109)

Without claiming that I can offer definitive answers regarding the subjective experience of comic audiences, it is my belief that recent advances in the realm of neuroscience can offer scholars new perspectives. These fresh perspectives, which are grounded on hard data about the brain’s neural activity, offer a way into this elusive but undeniably significant subject by offering a more rounded account of theatre spectatorship, past and present.

In the present chapter, I will approach Aristophanic comedy as an emotive environment that was predominantly mirthful and uplifting. Drawing from theories in cognitive science⁴ and positive psychology that suggest that positive emotion⁵ broadens cognition, I shall argue that mirth and feelings of joy were not merely responses that measured the comedy’s success, but embodied emotions with a fundamental role to play in shaping the audience’s mode of thinking, as well as in enhancing the latter’s level of creative engagement, turning spectators into co-authors in the meaning making of the event.⁶

Aristophanic performance as a positive environment and mirthful performance

Comic performance is normally associated with and used to trigger spontaneous laughter, which is considered the best indicator of positive emotion. As Silk observes:

Although comedy as a mode of art is not recognisable by a cluster of fixed textual references, yet it remains recognisable. It has its repertoire of ‘family characteristics’. The first one is that comedy tends to amuse. Any version of comedy may at some point be serious in some sense of that word but it still tends to amuse. This characteristic effect may be associated with feelings of joy.

(Silk, 2000: 93)

In ancient Athens, Aristophanic theatre was particularly buoyant due to the wider festive framework and scale of the event. Audiences were not only theatre audiences who were witnessing staged celebrations, but also festival participants who were licenced to laugh in a free-spirited manner.⁷ Stephen Halliwell describes this collective laughter as playful. In his study *Greek Laughter: A Study of Cultural Psychology from Homer to Early Christianity*, he repeatedly stresses the importance of the festive framework in the appreciation of the comedy's humour, particularly its obscenities and characters' excessive behaviours. As he states:

within the fully demarcated festive framework the pressures of shame are temporarily lifted. By cultural conventions the theatre audience is not just permitted but encouraged to laugh at everything . . . institutionalising and ritualising a potentially negative force (of shame) into communal celebrations of joy.

(Halliwell, 2008: 247)

Halliwell's analysis sees the broader festival ethos as instrumental in determining the way in which ancient spectators perceived Aristophanic comedy and how they may have responded to its humour. In Halliwell's festive analysis, Aristophanic laughter is playful, as he sees it as a unifying force with the power to relax audience's attitudes and inhibitory controls.

Although one cannot dismiss the presence of other emotions throughout the duration of the comic performance, it is, however, broadly agreed that a mirthful response was the key objective of Aristophanic comedy, which is in contrast to the later Menandrian comedy, aimed to generate laughter from the very beginning.⁸ As the comic poet himself tells us in *Assembly Women*, 'Those who like a hearty laugh should vote for me – I give them laughs' (Halliwell, 2016, trans. 1159: 196).

Niall Slater in his article 'Making the Aristophanic audience' makes a convincing case when he argues that Aristophanes, from the very start of the performance, wanted to warm up his audiences. As part of the comic poet's strategy to bring spectators into a positive and uplifting mood, he mentions warm-up jokes, often a series of shorter jokes, none of which is absolutely essential to understanding the rest of the play (Slater, 1999: 354), or the use of an individual on stage as a model for audience behaviour, as happens in the beginning of *Frogs*, with the presentation of a laughing Heracles (Slater, 1999: 364). In this example laughter is used as a cue and link with the audience. One can only imagine the potential impact of this opening scene, especially when considering the contagious nature of laughing.⁹ In large open-air theatres, emotional contagion, including contagious laughter, takes place with some ease, as audiences are in full view of each other, unifying in this way diverse groups of people. The oldest theatre is that of Dionysus Eleuthereus that was built on the south slope of the Akropolis. The good acoustics of the space might also contribute to this effect. In a study on laughter Scott *et al.* (2014) see laughter not only as a product of humour but as a social emotion associated with bonding, affection and emotional regulation. The study emphasises the distinction between reactive laughter that is driven by outside events, and deliberate laughter that is described as an intentional communicative act that is more controlled (Scott *et al.*, 2014: 618). Ian Ruffell in his essay 'Audience and emotion' highlights the social and collective dimension to the experience of laughter in Aristophanic theatre, drawing attention to these distinctions. He sees the social dimension of laughter as twofold. On one hand, there is the passive side of the transaction where laughter is contagious and comes as a result of being in the presence of laughing spectators. On the other hand, there is the active side of the transaction, where laughter is used by the performer as a cue and link with the audience, creating an 'act of complicity', or even solidarity, between both sides. Ruffell's observation is tied to his broader argument regarding the distinction between

tragedy and comedy, arguing that although comedy and tragedy in Ancient Greece were collective experiences, ‘the potential for a coherent emotive response was more plausible in comedy owing to the social and public dimension of laughter’ (Ruffell, 2008: 49).

On a visual level, the distorted appearance and exaggerated physicality of the stage characters which aimed to make people look ‘ridiculous’ would have created a humorous atmosphere. In Greek performance, the visual appearance of the stage figures and their exaggerated physicality would have captured the audience’s attention, generating a mirthful response, even before listening to what the characters had to say or do. We know, for example, on the basis of visual evidence, that Aristophanic performers, in comparison to tragic performers, were not only distorted and funny in appearance ‘τὸ γελοῖον πρόσωπον αἰσχροῦν τι καὶ διεστραμμένον ἄνευ ὀδύνης’, ‘the laughable mask is something ugly and twisted, but not painfully’ (Aristot. *Poet.* 1449a35, LCL 199: 44), but were probably much more energetic on stage, with what Richard Green describes as ‘rapid and even violent movement’ evoking a heightened sense of excitement (Green, 2002: 111).¹⁰ Every form of communication where gesture, tone of voice and posture are perceptible can transmit affect and this is important to keep in mind when discussing the experience of comic performance in which the visual and aural, somatosensory elements are key components of the performance experience. In the realm of psychology and neuroscience, there is substantial evidence that perception, cognition, emotion and judgement all involve corresponding activation of bodily states, be it during actual encounters with stimuli or during offline processing. For example, in a study conducted to discover movements that could help regulate emotion, researchers identified a set of motor characteristics that predict the elicitation or enhancement of each of the emotions: anger, fear, happiness and sadness. More specifically, a feeling of happiness was predicted by *jumping* and *rhythmic movements*. Happiness was also predicted to be enhanced by *free flow*. Additional motor elements that predicted feeling happy ‘were enlarging the shape of the body in the horizontal (*spread*) and vertical (*rise*) direction as well as *upward* movements in space’ (Shafir, Tsachor and Welch, 2015).

Although comic audiences were not themselves moving rapidly or jumping on stage, they were exposed to stage figures who were physically active and fast-paced. We must assume that this kind of exposure would have affected the spectators’ levels of energy and affective state through empathetic engagement. This type of engagement in theatre has been scientifically explained through the Mirror Neuron System.¹¹ As Vittorio Gallese explains with reference to this system,

Whenever we are looking at someone performing an action, besides the activation of various visual areas [of the brain], there is concurrent activation of the motor circuits that are recruited when we ourselves perform the action. Although we do not overtly reproduce the observed action, nevertheless our motor system becomes active as if we were executing that very same action that we are observing.¹²

Lending support to such observations, according to which action perception involves covert motor activity, it has also been proposed that actions belonging to the motor repertoire of the observer are mapped on the observer’s motor system. More specifically, Calvo–Merino *et al.* (2005) compared the brain activity of dancers who watched their own dance style versus other styles, revealing the influence of motor expertise on action observation. The researchers found greater bilateral activations when expert dancers viewed movements that they had been trained to perform compared to movements they had not. The results show ‘that the human mirror system might be sensitive to the degree of correspondence between the observed action and the motor capability of the observer’ (Calvo–Merino *et al.*, 2005).

These findings are particularly interesting to consider with reference to Aristophanic performance, where we know that comic choruses comprised Athenian citizens. It could be argued that particular popular dances that featured in the comedy may have figured in the motor repertoire of those who had previously trained to be part of a comic chorus or who were familiar with these dances from other festive contexts (e.g. wedding celebrations), making Athenian audiences further engaged in the comic action.

Aside from exaggerated and lively movements, song, dance and musicalised speech were also essential elements of Aristophanic comedy. Music-making typically involves rhythm and always involves tempo, and these both affect emotional experience. These elements would have certainly added to the overall uplifting and energetic atmosphere of the ancient performance. Bruce McConachie in his insightful volume *Engaging Audiences: A Cognitive Approach to Spectating in the Theatre* (2008) explains how, similarly to speech, music and tempo are linked to gesture and intention and musicians can communicate general emotions to listeners regardless of the auditors' musical training. So, for example, in the presence of celebratory music audiences will recognise and embody the emotion of joy. He continues by observing that 'the more spectators join together in one emotion, the more empathy shapes the emotional response of the rest' (McConachie, 2008: 97). Juslin's BRECVEMA model of musical cognition (named after the first letters of the eight mechanisms included: brain stem reflexes, rhythmic entrainment, evaluative conditioning, emotional contagion, visual imagery, episodic memory, musical expectancy, and aesthetic judgement) is the most comprehensive attempt to date to explain how music arouses emotions, adding scientific ground to McConachie's observations.¹³ The model theorises that there are several underlying induction-mechanisms, which range from simple reflexes to complex judgements that mediate between a musical event and an aroused emotion. One of these mechanisms is called *evaluative conditioning*. As outlined by John Sloboda, 'Evaluative conditioning refers to a process whereby an emotion is induced by a piece of music because the stimulus has been paired repeatedly with other positive or negative stimuli' (Sloboda, 2014: 622). Another equally significant mechanism is *emotional contagion* which refers to a process whereby an emotion is induced because the listener perceives the emotional expression of the music and then 'mimics' this expression internally in a similar manner to what happens when one listens to an emotional speech (Sloboda, 2014: 622). Both mechanisms may explain why audiences who are exposed to familiar celebratory tunes experience emotions of joy.

There is evidence from the Aristophanic texts that Aristophanic performance featured popular songs that were already familiar to audiences from different social and ritual settings. The most common musical accompaniment to these songs was the aulos, an instrument which 'probably sounded something like an oboe' (Robson, 2009: 141). Such songs included victory songs, ritual hymns like the phallic hymn in *Acharnians* (263–279) and other celebratory songs, such as the wedding songs in *Birds* (1731) and *Peace* (1319). In the final wedding scene of *Peace*, wedding songs merge with rustic festivities associated with the vintage, showing connections with the popular tradition of grape-harvesting songs (Karanica, 2014: 213).

In her book, *The Songs of Aristophanes*, Laetitia Parker notes:

A proportion of Aristophanes' song is of virtually no poetic significance. It is in lyric metre, because that is how choruses express themselves, because lyric metre and song confer of themselves a certain impetus and heightening of excitement.

(Parker, 1997: 123)

Although some may disagree with Parker's view, she does make an important point about the ability of music to create 'impetus and heightening of excitement' which was hugely important

in the broader festive environment of Aristophanic theatre. For example, in *Frogs*, the songs of both comic choruses are described as *thaumatos* in the play (185, 398), hinting at their emotive impact. The arrival-song of the initiates in particular is described as extremely lively, resembling the ecstatic dances of the Eleusinian mysteries. The words of the chorus suggest a Bacchic experience with the initiates organized in *thiasoi* that engage in wild dance (345–348). A few lines later (350–352) the chorus leader exhorts the chorus to call with its songs to Iacchus, ‘its partner in the dance’ (396). In the first stanza Iacchus is celebrated as the inventor of this ‘marvelous festive song’ (398–400).

When discussing the creative possibilities of conveying Aristophanic comedy’s immediacy and emotive impact on the modern stage, Silk mentions the mode of music as something that could best capture the comedy’s impact, observing a structural resemblance of Aristophanic comedy to many of the popular American musicals of the modern era (Silk, 2007: 292).

In a predominantly upbeat performance environment, where audiences from the very beginning were exposed to energetic stage figures of a humorous nature, popular tunes and vibrant dances, as well as an overall fast tempo, the experience of positive emotion, on a conscious (the feeling component) and subconscious level, would have influenced reasoning.¹⁴ As I shall show in the following sections it was not only the knowledge of cultural conventions and ‘festival ethos’ that relaxed the audience’s attitudes towards the comic action (Halliwell, 2008: 247), but the embodied experience itself which facilitated a more open and flexible way of thinking and of processing the words and actions of the comedy.

Positive emotion and cognitive broadening: the key theories

Decades of research have suggested that emotive experiences, such as emotional feelings and moods, influence not only the content but also the structure of thought, shaping how individuals think as opposed to merely what they think. The most influential figure in the revival of scientific interest in emotion has been the neuroscientist Antonio Damasio, who explored the close relationship of emotion to cognition and how emotion influences reasoning, challenging the distinction between body and mind (Damasio, 1994). Scientific research is constantly presenting us with new evidence for various types of collaboration between affective and cognitive processes.¹⁵ Social psychologist Joseph Forgas explains how contemporary cognitive theories are able to scientifically explain the precise mechanisms for the infusion of affect into thinking:

The idea that affect influences cognition has been around for a long time. How and why does this ‘affect infusion’ occur, and what are the psychological mechanisms that produce it? Unlike earlier conditioning and psychoanalytic explanations, contemporary cognitive theories postulate precise mechanisms responsible for the infusion of affect into thinking and judgments. Affect congruence posits that affect can influence the content of cognition through two complementary mechanisms: inferential processes and memory processes. In addition, affect can also influence how the information is processed.

(Forgas, 2008: 96)

With reference to the latter point, a large amount of research in the realm of positive psychology has shown convincingly that positive emotions, such as mirth and joy, modulate one’s mode of thinking, enhancing performance on many cognitive tasks, especially creative problem tasks that are open-ended.¹⁶ If we are to approach theatre as a complex cognitive process that is carried out within a highly emotive environment (as seen in the previous section), these findings

are important to consider. As Evelyn Tribble correctly states in her introduction to her book *Cognition in the Globe*,

Watching a performance of an unknown play is a complex cognitive process, demanding that audiences attend to identifying characters, following and predicting action, interpreting spatial cues, and listening to complex patterned language.

(Tribble, 2011: 9)

In regards to Aristophanic comedy, with its many allusions and interpretive possibilities, watching could be described as a cognitive process that requires one to constantly move beyond the information provided from the text and stage action through associative thinking, making it comparable to a creative cognitive task. Kidd, in his study *Nonsense and Meaning*, uses the metaphor of centre and periphery to explain the distinctiveness of one's experience when engaging with Aristophanic comedy:

The deeper one delves into the richness of comedy's meaning, the more one unearths a complex set of allusions or allegories, the further one seems to drift from the comedy itself. It is as if in the pursuit of meaning, one becomes distanced from the comedy's centre, not closer to it.

(Kidd, 2014: 187)

Here, Kidd suggests that the ability to make broad and remote associations is an essential part of one's cognitive process when engaging with the Aristophanic world. If this is true, how far does our emotive state facilitate this type of associative thinking?

Before addressing this question in more detail, it is important to review some of the key cognitive theories which have informed my analysis. These theories propose that cognitive broadening is facilitated and promoted when one is experiencing feelings of joy and mirth. Although these theories have never been tested in the context of theatre, they do show how positive emotion (that is, normally evoked from viewing comic clips or listening to happy tunes) influences one's performance in creative cognitive tasks and open-ended problems. The latter could be described as comparable to some of the playful and loosely connected Aristophanic stage actions and language.

Alice Isen's extensive work on positive emotion, which extended over two decades, provides the strongest evidence that positive emotion broadens cognition and facilitates creative thinking (Isen, Daubman and Nowicki, 1987). Isen hypothesised that the reason positive affect increases creativity is because it primes and broadens the associative process that increases the odds of remote associations that are original.¹⁷ Her conclusions fit with Barbara Fredrickson's 'broaden and build theory' which has proposed that positive affect, including mirth and joy, broadens one's scope of attention and thought-action repertoire (Fredrickson, 2001), and Rowe and colleagues' work that contends that positive emotion, such as feeling amused, results in relaxation across the semantic and visuospatial cognitive domains, increasing the breadth of information available for cognitive processing (Rowe, Hirsh and Anderson, 2006).

But what exactly is meant by cognitive broadening and how might this enhance creative thinking?

Rowe proposed that in the visual spatial domain, positive affect results in a 'leaky' attentional filter, allowing peripheral, irrelevant information to be more fully processed. In the context of an open-air theatre this could mean that one is more able to process visual information that

extends beyond the frame of the stage and into the real world (world of audience and broader landscape). In the conceptual domain, positive affect is associated with an increased capacity to generate remote associates for familiar words, indicating that access to internal semantic information is facilitated by positive affect in such a way that more distant and thus more novel semantic associations become closer and more easily accessible. For example, it has been shown that when participants in psychology experiments are asked to come up with semantic associations for the word 'pen', those in a positive affective state generate a number of unusual and remote associations, such as 'barn' and 'pig', stemming from their unusual interpretation of pen as a fenced enclosure, as compared to those in a neutral state, who come up with the same high-frequency associates, such as 'paper'.¹⁸ It is more likely therefore that those in a positive emotive state will come up with a greater number of diverse and novel responses. As I shall show in the following section, this is particularly interesting to consider when thinking of Aristophanes' playful use of language and stage actions.¹⁹

Ashby and Isen were the first to connect the observed cognitive broadening ('leaky' visual attention and ability to make remote semantic associations) to increased levels of dopamine, which is a neurotransmitter involved in controlling movement and posture and modulating mood, and which plays a central role in positive reinforcement and dependency. Their study provided for the first time a description of the neuropsychological mechanisms that underlie the influence of positive affect, including mirth, on cognition, bridging the literatures on positive affect and cognitive broadening and novel thinking. Ashby and Isen's theory is known as the 'dopaminergic theory of positive affect'²⁰ and assumes that creative problem solving is increased and creativity is enhanced partially 'because increased dopamine release in the anterior cingulate improves cognitive flexibility and facilitates the selection of cognitive perspective' (Ashby *et al.*, 2002: 249). Although in the last few years there have been a number of critical reviews²¹ of Ashby's popular hypothesis and scientists have sought to refine the dopaminergic theory of positive affect (Rowe *et al.*, 2006), it is still broadly agreed that there is not only a strong correspondence between an increase in dopamine levels and flexible thinking (Zabelina *et al.*, 2016), but also a link between positive affect, including mirth, and dopamine release.

Building on from Ashby and colleagues' dopaminergic theory, it has also been proposed that induced smiles increase dopaminergic activity in various brain regions, among them the midbrain dopamine system and the prefrontal cortex, suggesting that the expressive component of an emotion could both induce positive emotion and broaden cognition (Wiswede *et al.*, 2009).²² Thus, a facial movement, such as smiling, is not only understood as a response to environmental stimuli but can also alter the way in which we perceive that stimuli. This is particularly important to consider when trying to analyse the experience of comic performance which has as its prime objective a mirthful response.

Finally, it has been suggested by cognitive scientists that flexible thinking is not only a by-product of mirth and joy but that it also induces positive emotion, increasing the probability that those who have adopted a flexible mode of thinking will sustain their positivity over prolonged periods of time (Chermahini and Hommel, 2011). In the context of Aristophanic performance, it also points towards the possibility that, once comic audiences were brought into a joyful emotive state (e.g. through warm-up jokes), they were more likely to sustain it, not only because of the positive atmosphere and funny appearance and actions of the comic characters, but also because of their flexible and creative way of processing those actions. In discussing the open-air theatre performance experience, Peter Meineck argues that the expansive views of Greek theatre may have also facilitated abstract thinking and memory retrieval 'that transcends both spatial and temporal frames of reference' through the release of dopamine, which is 'the main neurotransmitter used for controlling the gaze when scanning

distant space' (Meineck, 2017: 72). Thus, the Greek audience may have been able to sustain a flexible mode of thinking, not only because of their emotive state, but also because of the 'dopamine-inducing' open-air environment in which they were situated.

Taken together, all the aforementioned studies propose that emotions and performance environments can have an effect on how the brain processes visual and conceptual information.²³ These findings are important when looking at comic performance, as they connect positive emotive states and the expressive component of positive emotion (smiling) to associative and flexible thinking. This kind of thinking is highly desirable when viewing a comedy which is allusive, inter-theatrical and playful. Although it is important to acknowledge that theatre is not a laboratory and words presented as autonomous items on a piece of paper (as happens in most creative cognitive tasks that are carried out as part of psychology experiments) are perceived differently to those that are found within a particular dramatic and performance context – where the prosodic (intonation) and paralinguistic (volume and gestures) signals affect understanding – it is undeniable that words and actions carry a particular set of meanings depending on the diverse abilities and experiences of the audience. As I shall show in the following section, in Aristophanic comedy, where the narrative structure is relatively loose and does not always follow a consequential logic, the physical actions and allusive language of the characters can more easily be approached as separate and autonomous items open to free association and multiple interpretations. Thus, a broadening of attention, as a result of feeling mirthful, can be seen to facilitate a more creative engagement with the play, allowing for a fuller appreciation of its interpretive potentialities.

Aristophanes' 'multiplicity' of meaning and creative cognition

In Aristophanic comedy, especially in the poet's earlier comedies (e.g. *Achamians*), the narrative structure is relatively loose and does not always follow a consequential logic. Silk's analysis, for example, talks of Aristophanic comedy's use of discontinuity and accumulation as part of the poet's broader comic vision that 'sees and conveys the world in sequences as much as consequences' (Silk, 2000: 157). As Silk observes, the sequences of autonomous items that are observed in many of Aristophanes' passages are 'hard for many modern sensibilities to grasp unmediated by conceptualised and abstracted causality' (Silk, 2000: 157). These passages follow a simple parataxis and a reluctance to subordinate words, phrases and clauses.²⁴ Such accumulation of words often requires one to find alternative and novel ways to connect various and seemingly unrelated items. In comparing Aristophanic comedy to Classical tragedy and Menandrian comedy, Silk observes,

Classical tragedy and Menandrian comedy conform to laws of decorum, laws of homogeneity and laws of processive coherence, from which departure is difficult and probably destructive. Aristophanic comedy, with its own coherence, yet has at least some freedom to conform – or not. If comedy means freedom, this is comedy at its most comic.

(Silk, 2000: 159)

This seemingly non-causal accumulation of items in the text is often reflected in Aristophanic staging. In his article 'Multiplicity, discontinuity, and visual meaning in Aristophanic comedy', Poe talks of Aristophanic comedy's distinctive feature of 'multiplicity' which means that Aristophanes gives his public a great deal to see: people and things doing things simultaneously on stage. These actions are not always mentioned in the text (Poe, 2000: 258). This, in Poe's view, is an expression of the comedy's openness and absurd nature. For example,

frequently actors run into the *skene* in the middle of a dialogue, normally to fetch something, like Dicaeopolis' basket of charcoal in *Achamians*, returning soon, if not immediately, while spoken dialogue continues. In Poe's view, in tragedy gestures and physical actions are pointed out in the text to emphasise their significance, something that does not happen in comedy. Tragedy's tendency to hierarchise and focus on what is most meaningful encourages it to ration action for the sake of emphasis, encouraging concentrated attention (Poe, 2000: 259). Contrary to this, in Aristophanic comedy the action seems more various and undirected.²⁵ With reference to comedy's multiple entrances and exits, Poe observes,

What is humorous about a succession of exits and entrances to fetch an altar, a basket, a goat, a lustral water? What is funny about the spectacle of the comings and goings of neutral figures like mute attendants? I think that there are two complementary answers to these questions. One is simply that part of Old Comedy's humour seems to lie in its violation of the dramatic norms of tragedy. The second, more basic answer, however, is that comic openness can extend beyond absurdity to meaninglessness.

(Poe, 2000: 280)

Poe's observations highlight the openness of the comedy in terms of interpretation. What Poe describes as meaningless I would argue is the exact opposite, especially if one accepts that audiences adopt a cognitively flexible mode of thinking and a broadening of attention as a result of feeling mirthful. The comic action of these exits and entrances, I would argue, is not meaningless but open to unlimited readings, allowing the spectator to engage creatively with the performance and to bind diverse and seemingly unrelated items in novel ways. The suggestion that positive emotion enhances a more holistic processing of external visual space, which involves attending to more visual stimuli simultaneously, would have made this task all the more effortless, especially in an ancient open-air theatre where audiences were much more aware of their surroundings. As already mentioned, positive mood states are associated with greater global or holistic processing (i.e., seeing the forest before the trees) vs. local processing (i.e., seeing the trees before the forest). This involves attending to more stimuli in both external visual space and internal semantic space, potentially derived from long-term memory, allowing access to more information to simultaneously influence creative solution efforts. As Rowe and colleagues conclude with reference to the examined thesis, positive affect may serve to broaden the scope of attentional filters:

Positive moods facilitate tasks requiring a more global and encompassing style of information processing . . . but impair those calling for a narrow, focused style, such as selective visual attention. A buoyant mood may represent a fundamental shift in the breadth of information processing, the result of which would be to cultivate a more open and exploratory mode of attention to both exteroceptive and interoceptive sources of information.

(Rowe et al., 2006)

In this respect, we can see how Aristophanes' 'multiplicity of action', which is a task requiring a global style of information processing that may have been facilitated by the broader joyful atmosphere of the performance (distorted stage figures, vibrant dances and popular songs), would have contributed to broadening the spectator's mode of thinking, which would have in turn generated original interpretive solutions.

The juxtaposition and often accumulation of many seemingly incompatible and/or unrelated items in Aristophanic comedy, especially in the poet's earlier plays (which also happen

to be some of his most buoyant comedies), create a climate of radical ambivalence ‘forcing audiences to choose from a broad range of interpretive possibilities’ (Platter, 2007: 31). This choice of possibilities would have been maximised if the spectator’s attention was broadened. When one adapts an exploratory mode of attention, as a result of feeling mirthful, the lack of an Aristotelean causality is not ‘difficult to grasp’ because the brain is instantly able to consider a broader array of interpretive options and discover alternative and novel ways in which words, sounds, actions, stage objects and sentences could relate to each other. If in a relatively neutral state, however, like when trying to read the comedy in a more neutral emotive state, it is most likely that this discontinuity and accumulative narration may at first cause frustration, or may require more effort, in an attempt to find alternative ways to make sense of the comedy. As a result, people may reject to interpret what at first seems incomprehensible, labelling it as ‘meaningless’. Kidd, for example, argues that some of Aristophanes’ passages are meaningless and scholars must resist the temptation to try and find meaning in everything they read because one of the playful features of Aristophanic comedy could be found in this very lack of ‘serious’ and ‘contextual’ meaning (Kidd, 2014: 10). Interestingly, Kidd acknowledges that these passages do not lack meaning, but lack a particular kind of ‘serious’ meaning that, I would add, is directly connected to a certain type of concentrated thinking, which is focused, systematic and logical, instead of broadened, creative and free flowing.

Michael Vickers in his volumes *Pericles on Stage* and *Aristophanes and Alkibiades* builds his key argument about Aristophanes’ allusions to well-known political personalities around the premise that audiences were able to appreciate Aristophanic characters as operating on many different levels. He talks about ‘polymorphic characterisation’ in which different facets of an individual’s personality or public image could be played by a different character of the play, or alternatively, a single dramatic character might embody features of different well-known historical personalities. As he argues, audiences would have been able to draw upon these features which could have acted as a common point of reference binding the play in a rather unconventional manner. In his view, the most damaging thing to a proper understanding of Aristophanes is the principle of ‘one thing at a time’, according to which we must not turn our attention to two different levels of humour operating simultaneously (Vickers, 2015: vxiii). A broad associative ability and flexibility of thought inhibits such ‘one thing at a time’ reasoning, encouraging a more expansive interpretation of the comic world and its characters. At the same time, it facilitates the imaginative integration of disparate information into creative interpretive solutions, promoting an active engagement in the meaning making of the play. The pleasure that comes from Aristophanic comedy often depends upon the freedom and non-prescriptive way in which the play encourages one to creatively engage with the comedy, catering for diverse audiences of different abilities. The person’s ability to understand and gain pleasure from Aristophanes’ playful and interpretatively open humour would seem to depend, at least partly, upon ideational fluency (the ability to produce many ideas to fulfil certain requirements), associative fluency and cognitive flexibility, which are creative cognitive abilities that are increased when one is experiencing emotions of joy.

Conclusion

The most influential cognitive theories to date regarding the relationship of positive affect and cognition are relatively consistent in their findings that positive emotions, such as mirth and joy, cause a broadened mode of thinking which facilitates creativity. This knowledge can add valuable insights to our understanding of the elusive topic of Aristophanic spectatorship. Studies which describe Aristophanic comedy as an ‘open’ rather than ‘closed’ world could be

validated not only through the dialogic and playful discourse of the play with its many allusions, or through the aesthetic of open-air performance, but also through the global and broadened perceptual focus from which a mirthful audience would have experienced the comedy's expansive world.²⁶

In discussing the mode of thinking of comic characters more generally, John Moreall highlights the fact that all comic protagonists are divergent thinkers by whom a dozen imaginative answers to a problem may be found. As he explains,

In contrast to the rigidity of tragic thinking comic thinking is flexible. Its protagonists do not approach life with simple concepts and narrow category systems into which every experience has to fit. They have messier sets of concepts which apply here but not there, today but not yesterday . . . The flexible thinking in comedy matches the complexity, diversity and movement of life itself.

(Morreall, 1998: 340)

If we are to rely on the existing scientific evidence, we can safely assume that flexible thinking is experienced by mirthful audiences. A mirthful response is, thus, not only a response to the humour of the comedy, but also an emotive state that shapes the way in which audiences experience and make sense of the comic world. When approaching Aristophanic theatre as a predominantly positive environment, and not simply a text or a site of representation, we can appreciate its broader social and political benefits. As an embodied emotion, mirth allows people to focus more broadly and to make more lateral connections, and these were clearly Athenian assets, related to creativity and novel thinking.

Notes

- 1 Bakhtin's favoured example of this type of dialogic discourse in the field of literature was the novel which he defines 'as a diversity of speech types and a diversity of individual voices, artistically organised', tracing novelistic dialogism back to folk practices of carnival. Carnival thus provided the novelist with a reservoir of dialogic practices, allowing for the 'carnivalisation' of speech (Bakhtin, 1981: 426). The utopian communicative conditions of carnival with its freedom and festive laughter provided Bakhtin with an archetype for dialogic discourse and it is on the basis of such a model that he undertakes his analysis of the novel.
- 2 Platter's analysis is centred around language, and more specifically the carnivalisation that happens in Aristophanes' language. He uses Bakhtin's model of carnival as a concept that assumes a metaphorical character that is pre-dominantly literary and sees 'carnivalisation' as a systemic feature of discourse (Platter, 2007).
- 3 In his analysis of comic stage action Poe uses the term 'open' to explain the absurdity of Aristophanic comedy. 'Comedy is open in the sense that the laws of probability are suspended . . . as comedy becomes more open, action becomes more absurd, for openness creates theoretically unlimited comic possibilities, anything goes' (Poe, 2000: 270).
- 4 Cognitive science helps us understand how humans perceive the world and construct their experience. In the field of cognitive science a new paradigm emerged during the 1980s: that of embodied cognition. This type of cognition holds that the mind is embodied and embedded in our environments. As the research into embodied cognition has developed over the past few decades there has been a turn towards cognitive science in the humanities. In the realm of theatre studies this 'cognitive turn' has started to expand significantly (McConachie, 2008). See also Shapiro (2014).
- 5 The use of the terms positive emotion and positive affect are often used indiscriminately by psychologists and cognitive scientists in the scientific literature. My own usage of the terms emotion and affect in this chapter will refer to both the conscious experience of positive emotion (the feeling component) and the responses of the autonomous nervous system that accompany affective states and which have a direct impact on cognitive processing. As D. S. Levine nicely summarises, 'There is some confusion

in the scientific literature between three commonly used and closely related terms: emotion, affect, and mood. In clinical terminology, “emotion” tends to be used for what a person is feeling at a given moment. Joy, sadness, anger, fear, disgust, and surprise are often considered the six most basic emotions, and other well-known human emotions . . . “Affect” tends to be used for the outward, physical signs of emotion as in the phrase “flat affect” to describe the presentation of some types of schizophrenics. “Mood” tends to be used for a pervasive emotion over a longer period of time, anywhere from a day to several years. However, psychologists and modelers are far from consistent in their use of these terms; in particular the words “emotion” and “affect” are often interchanged. Many recent scholars have attempted to formulate a comprehensive definition of emotion. Yet by and large they have not been able to improve on Aristotle’s statement (in *Rhetoric*) that “Emotion is that which leads one’s condition to become so transformed that his judgment is affected, and which is accompanied by pleasure and pain” (Levine, 2007: 38). For LeDoux, ‘The terms “emotion” and “feeling” are, in fact, often used interchangeably. In English we have words like fear, anger, love, sadness, jealousy, and so on, for these feeling states, and when scientists study emotions in humans they typically use these “feeling words” as guideposts to explore the terrain of emotion’ (LeDoux, 2012: 653). Goschke and Bolte propose a working definition according to which ‘emotion’ can be conceived ‘as psychophysiological response patterns which involve several components including an evaluation of the significance of an event in the light of one’s needs, motives and goals; the physiological responses of the autonomous nervous system as indicated by different indicators of increased arousal; specific facial and postural expressions and finally the feeling component’ (Goschke and Bolte, 2014: 404). It is important to note that it is possible various emotions were categorised differently in ancient Greece and this is something we must bear in mind when analysing the ancient experience of emotion. See Plamper (2015), Meineck (2017) and Salvo, Cairns and Fulkerson (2015).

- 6 Unlike most studies on Aristophanic laughter that examine mirth as an element that contributes to and is reflective of the aesthetics and narrative of the comedy, this chapter will treat mirth as an embodied emotion and affective state that facilitates creative thinking. Halliwell, for example, describes comic laughter as an emotive response that ‘punctuates a performance with appropriate rhythms of involvement and approval, thereby complementing and enhancing the work of the actors’ (2004: 190). Sommerstein’s analysis of laughter draws upon the Aristophanic text through a careful consideration of a number of passages from the surviving plays specifically referring to different kinds of laughter, including ‘shared laughter’. He describes ‘shared laughter’ as spontaneous and caused by a pleasurable experience, ‘namely a festival’. This kind of laughter, in his view, is closely related to the pattern of Old Comedy, which includes moments of feasting and festive events. As he states, ‘All those in Aristophanes, who laugh when they escape from suffering, laugh as a group. Corresponding to this, the schemes of Aristophanes’ heroes are only successful when they are capable of creating shared pleasure’ (Sommerstein, 2009: 112).
- 7 The festival context of Greek theatre has been well documented in studies such as Pickard-Cambridge (1968) and Csapo and Slater (1995).
- 8 Menandrian comedy, in comparison to Aristophanic comedy, became more organised in its form with an interest in realism and romantic feelings. As Kidd mentions, ‘The wild cognitive storm that is Old Comedy had subsided while more reasonable sources of pleasure arose’ (Kidd, 2014: 189).
- 9 Provine suggests that there is a possibility ‘that human beings have auditory feature detector neural circuits that respond exclusively to this species-typical vocalisation . . . in turn the feature detector triggers the neural circuits that generate the stereotyped action pattern of laughter’ (1996: 38). On contagious laughter see also Provine (1992, 2000).
- 10 For an approach to Greek drama through vase-paintings that depict comic stage figures see Taplin (1993). Also Green (2002).
- 11 In his discussion of science and cognitive theory Mark Fortier observes how mirror neurons pinpoint the difference between reading a play and seeing a production. As he states: ‘the emotional power of this effect has led some cognitive theorists to posit empathy and feeling as inherently, biologically, dominant, even unavoidable in theatre. In theatre we cannot escape empathy, and intellect and understanding are secondary’ (Fortier, 2015: 190). For a survey on mirror neurons see Rizzolatti and Sinigaglia (2016); also Kilner, Friston and Frith (2016) and Binder *et al.* (2017).
- 12 Gallese (2001: 35).
- 13 See Juslin (2013).
- 14 In some climactic moments of the performance where the intensity of the emotion may have been extreme, such as during exhilaration of laughter, we must assume that cognition would have been de-regulated and cognitive performance decreased. The Yerkes–Dodson law is an empirical relationship

- between arousal and performance. The law states that performance increases with physiological or mental arousal, but only up to a point. When levels of arousal become too high, performance decreases. The process is displayed as an inverted U-curve which increases and then decreases with higher levels of arousal. See Yerkes and Dodson (1908). Stephen Kidd in his recent study on *Nonsense and Meaning in Ancient Greek Comedy* draws a connection between the exuberant context of particular comic moments and the appearance of long compound Aristophanic words. He presents as an example a 62-syllable unintelligible word at the celebratory end of *Assembly Women*, arguing that the more heightened the emotions, the greater the risk a comedian could take with his audience because of the joyous ambience in which such a word would have materialised (Kidd, 2014: 150).
- 15 From a neuroanatomical viewpoint it has been indicated that none of the brain's structures or regions are exclusively devoted to emotion or cognition; instead their respective systems most probably overlap. 'Affect is represented by a widely distributed functional network that includes both sub-cortical (affective) and anterior frontal regions (cognitive). Thus no brain area can be designated specifically as cognitive or affective ... The affect-cognition distinction is phenomenological rather than ontological' (Duncan and Barrett, 2007). LeDoux proposes that emotions are in fact part of higher-order cognitive processing and not distinct: 'Emotional states of consciousness, or what are typically called emotional feelings, are traditionally viewed as being innately programmed in subcortical areas of the brain, and are often treated as different from cognitive states of consciousness, such as those related to the perception of external stimuli. We argue that conscious experiences, regardless of their content, arise from one system in the brain. In this view, what differs in emotional and nonemotional states are the kinds of inputs that are processed by a general cortical network of cognition, a network essential for conscious experiences' (LeDoux and Pine, 2016).
 - 16 In the sphere of literary theory, Bakhtin, in his book *Rabelais and His World*, emphasises the importance of creative thinking through laughter, within the context of community celebrations. In Bakhtin's analysis, the broader environment is deeply attached to cognition and refers to the carnival's immediate context of collective participation and festive laughter, eliminating the distinction between social hierarchies, but also fixed roles, like between those who dress up and engage in revelry behaviour and those who observe the carnival festivities. What is of particular interest is the connection Bakhtin makes between positive emotion through festive laughter and people's ability to overcome fear and most importantly inhibition, not only in terms of physical behaviour, but also in terms of thinking. 'Laughter has a deep philosophical meaning ... it is a peculiar point of view relative to the world; Through laughter the world is seen anew, no less (and perhaps more) profoundly than when seen from the serious standpoint' (Bakhtin, 1968: 94).
 - 17 Many of the demonstrated effects of positive affect – such as flexible, creative and unusual thinking – might be better conceptualised as consequences of a broadening of focus (e.g. accessing more conceptual and visual information), rather than synonyms of it. As Zabelina *et al.* (2016: 4) argue when discussing the relationship between a creative mind set and 'leaky' attention, 'indeed for creativity leaky attention may help people notice information that is outside their focus of attention, and integrate this information into their current information processing, leading to a creative thought. This mechanism is akin to reduced latent inhibition, or reduced ability to screen or inhibit from conscious awareness stimuli that were previously experienced as irrelevant. In other words reduced latent inhibition may enhance creativity by enlarging the range of unfiltered stimuli available in conscious awareness, thereby increasing the odds of synthesizing novel and useful combinations of stimuli'.
 - 18 The Isen *et al.* (1987) data and the creative problem solver both agree that the most common associate is not necessarily lost or unavailable to the positive affect subjects. Instead, both the data and the model suggest that other responses are also cued, so that the dominant response becomes somewhat less dominant than it is under neutral affect conditions, and less typical responses become relatively more accessible. See Ashby *et al.* (2002).
 - 19 For more on Aristophanes' use of comic wordplay see Kidd (2014: 137–147).
 - 20 The theory proposes that moderate increases of positive affect are increased with phasic dopamine release in midbrain areas (ventral tegmental area, VTA) and that ascending dopamine projections to the anterior cingulate cortex and basal ganglia mediate effects of positive affect on executive attention and cognitive set switching, thereby enhancing creative and flexible thinking. However, this theory does not assume that positive affect simply turns dopamine on or off. Instead, it is assumed that moderate levels of dopamine are present even under neutral affect conditions. The induction of mild positive affect is assumed only to slightly increase these normal dopamine levels. See Ashby *et al.* (2002). Ashby's and Isen's approach is inspired by insights into the neurobiology of reward, the encounter of which

has been shown to induce both positive mood and phasic increases of dopamine. The added factor of motivational intensity that differentiates between positive emotions with high motivational intensity (appetitive) and those with low motivational intensity (consummatory) is also important to consider in relation to cognitive broadening. As Subramaniam and Vinogradov (2013) note, 'We must emphasize that the relationship between positive mood, reward processing, dopamine neuromodulation, and cognitive control is likely to be highly non-linear and complex. Studies from animals and humans reveal that the prediction and receipt of rewards is associated with phasic activation of midbrain dopaminergic firing, while a positive mood is associated with overall increased prefrontal dopamine release each with distinct implications for cognition'. (See also Seth and Friston, 2016.)

- 21 These critical studies consider the possibility that there exists an optimal level of dopamine release depending on the nature of the cognitive task and one's individual dopamine level (Chermahini and Hommel, 2011). Taken together, these neuropsychological cognitive studies provide strong support for the general theory that dopamine mediates the influence of positive affect on human cognitive abilities and that positive affect expands and enhances human cognitive abilities. These approaches use spontaneous eye-blink rates, an indirect but well-established clinical marker of the individual dopamine level, to monitor the impact of mood manipulation.
- 22 The facial-feedback hypothesis claims that the facial expression itself – that is, the movement of the facial muscles producing the expression – triggers both the physiological arousal and the conscious feeling associated with the emotion. The idea that the muscular movements involved in certain facial expressions trigger the corresponding emotions was first introduced by Sylvian Tomkins. See Elkman (1995). Another study on smiling proposed that wilful and spontaneous facially expressed positive emotions (Duchene Smiles), the act of smiling, broaden cognition (Johnson *et al.*, 2010). This study is based on the broaden hypothesis, part of Fredrickson's (1998) broaden-and-build theory, and proposes that positive emotions lead to broadened cognitive states. For the relationship of mirth and laughter and insights into the neural basis of laughter, see also Caruana *et al.* (2015).
- 23 More recently it has also been proposed that benign situations that do not trigger conscious feelings of positive emotional arousal could also expand attentional scope, suggesting how implicit positive affective cues may instigate psychological responses analogous to those traditionally associated with conscious emotional arousal. This is important to consider in theatre environments where frequently the atmosphere of the performance may be uplifting and full of energy without audiences continuously being conscious of their feelings (Friedman and Förster, 2010).
- 24 Silk gives a number of examples of such Aristophanic lists with inconsequential ordering from a number of plays describing it as a key characteristic of Aristophanes' writing. See Silk (2000: 98–158).
- 25 'The more open comedy becomes, confronting the spectators with the unexpected, the unmotivated and the impertinent, the more amorphous the dramatic situation becomes and the more the dramatic illusion fades into the background. It sometimes therefore is very weak, so that a dramatically unmotivated appearance of someone who has no role in the plot, far from being inappropriate or intrusive, adds to the effect of undirected, inconsequential coming and going of mutes which in places Aristophanes strives to achieve' (Poe, 2000: 276). *Contra* English (2005: 2). In her article 'The evolution of Aristophanic stagecraft', Mary English argues that some visual elements, including stage objects, could have acted as links between the somewhat disjointed scenes. 'While this "distancing" effect might be active in some instances, many of the visual elements of Aristophanic comedy work to highlight the larger themes of the play and act as a link (albeit not the only one) between the somewhat disjointed scenes'.
- 26 As Silk observes, 'We may ponder the significance of the way that Aristophanic comic drama can break its illusion and establish a complicity between actors and spectators then return to the illusion as if nothing has happened. In a sense nothing has happened. There is no real breach, because actually or potentially the complicity is always there . . . the frame it breaks is already open – open to and open like the life outside it' (Silk, 2000: 91).

References

- Ashby, F. G., Isen, A. M. & Turken, A. U. 1999. 'A neuropsychological theory of positive affect and its influence on cognition'. *Psychological Review*, 106, 3: 529–550. doi: 10.1037/0033-295x.106.3.529.
- 2002. 'The effects of positive affect and arousal on working memory and executive attention' in S. Moore & M. Oaksford (Eds.), *Emotional Cognition: From Brain to Behaviour*. Amsterdam: John Benjamins: 245–287.

- Bakhtin, M. 1968. *Rabelais and His World*. Trans. Hélène Iswolsky. Cambridge: Cambridge University Press
- 1981. *The Dialogic Imagination: Four Essays*. Ed. Michael Holquist, trans. Caryl Emerson and Michael Holquist. Austin, TX: University of Texas Press.
- Barajas, Mark S. 2014. 'Thinking and feeling: The influence of positive emotion on human cognition'. *The Hilltop Review*, 7, 1, Article 3.
- Binder, E., Dovern, A., Hesse, M. D., Ebke, M., Karbe, H., Saliger, J., Fink, G. R. & Weiss, P. H. 2017. 'Lesion evidence for a human mirror neuron system'. *Cortex*, 90: 125–137. doi: 10.1016/j.cortex.2017.02.008.
- Budelmann, Felix. 2010. 'Bringing together nature and culture: On the uses and limits of cognitive science for the study of performance reception' in E. Hall & S. Harrop (Eds.), *Theorising Performance: Greek Drama, Cultural History and Critical Practice*. London: Duckworth: 108–122.
- Calvo-Merino, B., Glaser, D. E., Grèzes, J., Passingham, R. E. & Haggard, P. 2005. 'Action observation and acquired motor skills: An fMRI study with expert dancers'. *Cerebral Cortex*, 15: 1243–1249. doi: 10.1093/cercor/bhi007.
- Caruana, Fausto, Avanzini, Pietro, Gozzo, Francesca, Francione, Stefano, Cardinale, Francesco & Rizzolatti, Giacomo. 2015. 'Mirth and laughter elicited by electrical stimulation of the human anterior cingulate'. *Cerebral Cortex*, 71: 323–331. doi: 10.1016/j.cortex.2015.07.024.
- Chermahini, S. A. & Hommel, B. 2010. 'The (b)link between creativity and dopamine: Spontaneous eye blink rates predict and dissociate divergent and convergent thinking'. *Cognition*, 115, 3: 458–465.
- 2011. 'Creative mood swings: Divergent and convergent thinking affect mood in opposite ways'. *Psychological Research*, 76, 5: 634–640. doi: 10.1007/s00426-011-0358-z.
- Colzato, L. S. 2010. 'Search dopaminergic control of attentional flexibility: Inhibition of return is associated with the dopamine transporter gene (DAT1)'. *Frontiers in Human Neuroscience*. doi: 10.3389/fnhum.2010.00053.
- Csapo, E. & Slater, W. J. 1995. *Context of Ancient Drama*. Ann Arbor, MI: The University of Michigan Press.
- Damasio, A. R. 1994. *Descartes' Error: Emotion, Reason, and the Human Brain*, 3rd ed. New York: Putnam Pub Group.
- Duncan, S. & Barrett, L. F. 2007. 'Affect is a form of cognition: A neurobiological analysis'. *Cognition & Emotion*, 21, 6: 1184–1211. doi: 10.1080/02699930701437931.
- Elkman, P. 1995. 'Sylvian Tomkins and facial expression' in V. E. Demos & S. S. Tomkins (Eds.) *Exploring Affect: The Selected Writings of Silvan S. Tomkins*. Cambridge: Cambridge University Press: 209–225.
- English, M. 2005. 'The evolution of Aristophanic stagecraft'. *Leeds International Classical Studies*, 4.03: 1–16.
- Forgas, J. P. 2008. 'Affect and cognition'. *Perspectives on Psychological Science*, 3, 2: 94–101. doi: 10.1111/j.1745-6916.2008.00067.x.
- Fortier, M. 2015. *Theory/Theatre*. London: Routledge.
- Fredrickson, B. L. 1998. 'What good are positive emotions?' *Review of General Psychology*, 2, 3: 300–319. doi: 10.1037//1089-2680.2.3.300.
- 2001. 'The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions'. *American Psychologist*, 56, 3: 218–226. doi: 10.1037/0003-066x.56.3.218.
- Friedman, R. S., & Förster, J. 2010. 'Implicit affective cues and attentional tuning: An integrative review'. *Psychological Bulletin*, American Psychological Association (APA), 136, 5: 875–893.
- Gallese, V. 2001. 'The "shared manifold" hypothesis: From mirror neurons to empathy'. *Journal of Consciousness Studies*, 8 (v-vii): 33–35.
- Goschke, T. & Bolte, A. 2014. 'Emotional modulation of control dilemmas: The role of positive affect, reward, and dopamine in cognitive stability and flexibility'. *Neuropsychologia*, 62: 403–423. doi: 10.1016/j.neuropsychologia.2014.07.015.
- Green, Richard. 2002. 'Towards a reconstruction of performance style' in Pat Easterling & Edith Hall (Eds.), *Greek and Roman Actors: Aspects of an Ancient Profession*. Cambridge: Cambridge University Press: 93–126.
- Halliwell, S. 1995. *Aristotle's Poetics, LCL*. Cambridge, MA, Harvard University Press.
- 2008. *Greek Laughter: A Study of Cultural Psychology from Homer to Early Christianity*. Cambridge: Cambridge University Press.
- 2014. 'Laughter' in Martin Revermann (Ed.), *The Cambridge Companion to Greek Comedy*. Cambridge: Cambridge University Press: 189–205.
- 2016. *Frogs and Other Plays*. Oxford: Oxford University Press.

- Heath, M. 1987. *Political Comedy in Aristophanes*. Hypomnemata, 87. Göttingen: Vandenhoeck & Ruprecht.
- Henderson, J. 1998. 'Attic Old Comedy, frank speech and democracy' in K. Raafaub & D. Boedeker (Eds.), *Democracy, Empire and the Arts in Fifth Century Athens*. Cambridge: Cambridge University Press: 255–273.
- Isen, A. M., Daubman, K. A., & Nowicki, G. P. 1987. Positive affect facilitates creative problem solving. *Journal of Personality and Social Psychology*, 52, 6: 1122–1131. doi: 10.1037/0022-3514.52.6.1122.
- Isen, A. M., Niedenthal, P. M., & Cantor, N. 1992. 'An influence of positive affect on social categorization'. *Motivation and Emotion*, 16, 1: 65–78. doi: 10.1007/bf00996487.
- Johnson, K. J., Waugh, C. E. & Fredrikson, B. L. 2010. 'Smile to see the forest: Facially expressed positive emotions broaden cognition'. *Cognition and Emotion*, 24.10: 299–321.
- Juslin, P. N. 2013. 'From everyday emotions to aesthetic emotions: Towards a unified theory of musical emotions'. *Physics of Life Reviews*, 10, 3: 235–266. doi: 10.1016/j.phrev.2013.05.008.
- Karanica, A. 2014. *Voices at Work: Women Performance, and Labor in Ancient Greece*. Baltimore, MD: Johns Hopkins University Press.
- Kidd, S. E. 2014. *Nonsense and Meaning in Ancient Greek Comedy*. Cambridge: Cambridge University Press.
- Kilner, James M., Friston, Karl J. & Frith, Chris D. 2016. 'An account of the mirror neuron system'. *Discovering the Social Mind: Selected Works of Christopher D. Frith*. London: Routledge.
- Konstan, D. 2015. 'Affect and emotion in Greek literature'. *Oxford Handbooks online*. doi: 10.1093/oxfordhb/9780199935390.013.41.
- LeDoux, J. 2012. 'Rethinking the emotional brain'. *Neuron*, 73, 4: 653–676. doi: 10.1016/j.neuron.2012.02.004.
- LeDoux, J. E. & Pine, D. S. 2016. 'Using neuroscience to help understand fear and anxiety: A two-system framework'. *American Journal of Psychiatry*, 173.11: 1083–1093.
- Levine, D. 2007. 'Neural network modeling of emotion'. *Physics of Life Reviews*, 4/1: 37–63.
- Limone, J. 2011. 'Time in theatre' in B. Reynolds (Ed.), *Performance Studies: Key Words, Concepts and Theories*. New York: Palgrave Macmillan: 215–225.
- McConachie, B. A. 2008. *Engaging Audiences: A Cognitive Approach to Spectating in the Theatre*. New York: Palgrave Macmillan.
- MacDowell, D. M. 1995. *Aristophanes and Athens: An Introduction to the Plays*. Oxford: Oxford University Press.
- Meineck, P. 2017. *Theatrocracy: Greek Drama, Cognition and the Imperative for Theatre*. London and New York: Routledge.
- Morreall, J. 1998. 'The comic and tragic visions of life'. *Humor: International Journal of Humor Research*, 11, 4. doi: 10.1515/humr.1998.11.4.333.
- 1999. *Comedy, Tragedy, and Religion*. Albany, NY: State University of New York Press.
- 2014. 'The comic vision of life'. *The British Journal of Aesthetics*, 54, 2: 125–140.
- Parker, Laetitia. 1997. *The Songs of Aristophanes*. Oxford: Oxford University Press.
- Pickard-Cambridge, W. 1968. *The Dramatic Festivals of Athens*. 2nd ed., rev. J. Gould-D. M. Lewis. Oxford: Oxford University Press.
- Plamper, J. 2015. *The History of Emotions: An Introduction*. Oxford: Oxford University Press.
- Platter, C. 2007. *Aristophanes and the Carnival of Genres*. Baltimore, MD: Johns Hopkins University Press.
- Poe, J. P. 2000. 'Multiplicity, discontinuity and visual meaning in Aristophanic comedy'. *Rheinisches Museum Für Philologie*, 143.3, 4: 256–295.
- Provine, R. R. 1992. 'Contagious laughter: Laughter is a sufficient stimulus for laughs and smiles'. *Bulletin of the Psychonomic Society*, 30, 1: 1–4. doi: 10.3758/bf03330380.
- 1996. 'Laughter'. *American Scientist*, 84: 38–47.
- 2000. *Laughter: A Scientific Investigation*. London: Penguin.
- Reckford, K. J. 1987. *Old and New Comedy*. London: University of North Carolina Press.
- Rizzolatti, G. & Craighero, L. 2004. 'The mirror neuron system'. *Annual Review Neuroscience*, 27: 169–192.
- Rizzolatti, G. & Sinigaglia, C. 2008. *Mirrors in the Brain: How Our Minds Share Actions and Emotions*. Oxford: Oxford University Press.
- . 2016. 'The mirror mechanism: A basic principle of brain function'. *Nature Reviews Neuroscience*, 17.12: 757–765.
- Robson, J. 2009. *Aristophanes: An Introduction*. London and New York: Bloomsbury.
- Rowe, G., Hirsh, J. B., & Anderson, A. K. 2006. 'Positive affect increases the breadth of attentional selection'. *Proceedings of the National Academy of Sciences*, 104/1: 383–388. Proceedings of the National Academy of Sciences. doi: 10.1073/pnas.0605198104.

- Ruffell, I. 2008. 'Audience and emotion' in M. Revermann & P. Wilson (Eds.), *Performance, Iconography, Reception: Studies in Honour of Oliver Taplin*. Oxford: Oxford University Press.
- Runco, M. A. & Pritzker, S. R. 1999. *Encyclopedia of Creativity*. San Diego, CA: Academic Press.
- Salvo, L., Cairns, D. L., & Fulkerson, L. (Eds.). 2015. *Emotions between Greece and Rome* (BICS supplements: vol. 125). London: Institute of Classical Studies, School of Advanced Study.
- Scott, S., Lavan, N., Chen, S., & McGettigan, C. 2014. 'The social life of laughter'. *Trends in Cognitive Sciences*, 18, 12: 618–620. <http://doi.org/10.1016/j.tics.2014.09.002>.
- Seth, Anil K. & Friston, Karl J. 2016. 'Active interoceptive inference and the emotional brain'. *Philosophical Transactions of the Royal Society B*, 371.1708: 20160007. doi: 10.1098/rstb.2016.0007.
- Shafir, T., Tsachor, R. P., & Welch, K. B. 2015. 'Emotion regulation through movement: Unique sets of movement characteristics are associated with and enhance basic emotions'. *Frontiers in Psychology*, 6: 2030. <http://doi.org/10.3389/fpsyg.2015.02030>.
- Shapiro, L. 2014. *The Routledge Handbook of Embodied Cognition*. London: Routledge.
- Silk, M. S. 2000. *Aristophanes and the Definition of Comedy*. New York: Oxford University Press.
- 2007. 'Translating/transposing Aristophanes' in E. Hall & A. Wrigley (Eds.), *Aristophanes in Performance, 421 BC–AD 2007: Peace, Birds and Frogs*. Oxford: Legenda: 287–308.
- Slater, N. W. 1999. 'Making the Aristophanic audience'. *American Journal of Philology*, 120, 3: 351–368. Baltimore, MD: Johns Hopkins University Press.
- Sloboda, J. 2014. *Handbook of Music and Emotion: Theory, Research, Applications*. Oxford: Oxford University Press.
- Sommerstein, A. H. 2009. *Talking about Laughter: And Other Studies in Greek Comedy*. New York: Oxford University Press.
- Stets, Jan E. & Turner, Jonathan H. 2007. *Handbook of the Sociology of Emotions*. New York: Springer-Verlag New York.
- Subramaniam, Karuna & Vinogradov, Sophia. 2013. 'Improving the neural mechanisms of cognition through the pursuit of happiness'. *Frontiers in Human Neuroscience*, 7. DOI: 10.3389/fnhum.2013.00452.
- Taplin, O. 1993. *Comic Angels*. Oxford: Oxford University Press.
- Tribble, E. 2011. *Cognition in the Globe*. London: Palgrave.
- Van Holstein, M., Aarts, E., van der Schaaf, M. E., Geurts, D. E. M., Verkes, R. J., Franke, B., van Schouwenburg, M. R., et al. 2011. 'Human cognitive flexibility depends on dopamine D2 receptor signaling'. *Psychopharmacology*, 218, 3: 567–578.
- Vickers, M. 1997. *Pericles on Stage: Political Comedy in Aristophanes' Early Plays*. Austin, TX: University of Texas Press.
- 2015. *Aristophanes and Alcibiades: Echoes of Contemporary History in Athenian Comedy*. Berlin. Walter de Gruyter GmbH.
- Wadlinger, H. A. & Isaacowitz, D. M. 2006. 'Positive mood broadens visual attention to positive stimuli'. *Motivation and Emotion*, 30, 1: 87–99.
- Walsh, Philip. 2009. 'Debates over Aristophanes' politics and influence'. *Classical Receptions Journal*, 1, 1: 55–72.
- Wiswede, D., Münte, T. F., Krämer, U. M., & Rüsseler, J. 2009. 'Embodied emotion modulates neural signature of performance monitoring'. *PLoS ONE*, 4/6: e5754. Public Library of Science (PLoS). DOI: 10.1371/journal.pone.0005754.
- Yerkes, R. M. & Dodson, J. D. 1908. 'The relation of strength of stimulus to rapidity of habit-formation'. *Journal of Comparative Neurology and Psychology*, 18: 459–482. doi: 10.1002/cne.920180503.
- Zabelina, D. L., Colzato, L., Beeman, M., & Hommel, B. 2016. 'Dopamine and the creative mind: Individual differences in creativity are predicted by interactions between Dopamine genes DAT and COMT'. *PLoS ONE*, 11, 1: 1–16.